OPENING OF NORTH KOREA'S NUCLEAR ENERGY SECTOR: DOMESTIC AND INTERNATIONAL DIMENSIONS

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MASTER OF PHILOSOPHY

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CERTIFICATE

This is to certify that the dissertation entitled, **"OPENING OF NORTH KOREA'S NUCLEAR ENERGY SECTOR: DOMESTIC AND INTERNATIONAL DIMENSIONS"**, submitted by **JASWANT SINGH KAIN** in partial fulfilment of the requirements for the award of the Degree of **MASTER OF PHILOSOPHY**, has not been previously submitted for any degree of this or any other university. This is his own work.

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I hereby declare that the dissertation titled, "**OPENING OF NORTH KOREA'S NUCLEAR ENERGY SECTOR: DOMESTIC AND INTERNATIONAL DIMENSIONS**", being submitted to the Centre for East Asian Studies, School of International Studies, **Jawaharlal Nehru University,** in partial fulfillment of the requirements for the award of the Degree of **MASTER OF PHILOSOPHY**, has not been previously submitted for any degree of this or any other university.

Jaswant Singh Kain

DEDICATED TO.....

MY PARENTS

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Chapter-1

Chapter 1

Democratic People's Republic of Korea's Energy Sector 1945-1990: Surplus to Shortage

Democratic People's Republic of Korea (hereafter referred as North Korea) was proclaimed on 9 September 1948. It emerged about three weeks after the establishment of Republic of Korea (South Korea) on 15 August 1948. Even as the debate intensified about the peninsular, regional and international circumstances of establishment of two states, each claiming to represent the interests of all Koreans, there were clear and fundamental differences in terms of ideology, institutions, instruments, objectives and priorities of both the states.[1] No less important was the fact that there were significant disparities in terms of human as well as agricultural, mineral, industrial resources between North and South Korea. This chapter attempts to highlight the major features of the vital energy sector of North Korea from 1945 to 1994.

[1] For Details see, Cumings, Bruce, Korea's Place in the Sun: A Modern History, W.W. Norton and Co., New York 1997; Handerson, Gregory, Korea:The Politics of Vortex, Cambridge, 1968. Myers, Robert J., *Korea in the Cross Currents: A Century of Struggle and the Crisis of Reunification*, Palgrave, New York, 2001.

Energy is the key to raise productivity in all economic activities. To sustain the economic development of a country, a regular and reliable source of energy is essential. The existing and expected sources of energy are an important determinant in formulating the economic policy of a country. This chapter seeks to examine the following issues: (a) Korea's energy sector during the Japanese colonial rule; (b) The energy scenario in the later half of 1940s (from 1944-48) when the communist state's administrative claim was established in North Korea; (c) Damages that were caused to North Korea industrial sector in general and energy sector in particular during the Korean War; (d) North Korea's policies and programmes with regard to re-building and strengthening the energy sector in the economic plans from 1952 to 1994. It was however in 1994, that North Korea initiated a policy of directly linking its energy sector with security, economic and diplomatic issues with the United States and its allies.

Korea was colonised by Japan from 1910 to 1945. The Japanese colonial policies were no different from the colonial policies of western colonial powers in terms of exploiting the human and material resources of the subjugated people. The Japanese systematically sought to exploit the agricultural resources like rice and rich minerals of Korea. Korea was used as a supply source of food and raw materials for the Japanese economy. The Japanese invested in irrigation facilities mainly in the southern region and in

mining and electricity in northern part of Korea. Rice and barley were mainly grown in the south, which had 75 percent of all paddy land, while the north mainly cultivated wheat and corn.[2] Japanese ambitions to increase its colonial expansion in Asia especially in Korea, Manchurian and North China as "Greater East Asia Co-Prosperity Sphere" compelled Japan to shift focus from agriculture to heavy industries in its colonies.

The industrial growth in the 1930s was based upon energy, mineral resources and hydro-electric power. Electric power capacity was used to provide energy for the metallurgical and chemical industries. According to one source, "in 1940 the North's share of heavy industry production was 86 percent of the total of Korea. By 1944, it was producing 92 percent of total electric power, 88 percent of the total metallurgical output and 82 percent of chemical output".[3]

Energy production and consumption is one of the most important indicators of a nation's stage of industrialization. Industrial production, mechanized farming, modern transport and communication and improved

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2 Park, Bong Ho, "Natural Resources and Industrial Location in South and North Korea", *International Conference on the problem of Korea Unification*, (Report, Seoul: Asiatic Research Centre, Korea University, 1971), pp.476-478.

3 Sup, Shinn-Rinn, et.al, Area Handbook for North Korea, U.S. Government Printing Office, Washington D.C., 1969, p.295.

living conditions increase a modernizing country's energy demand rapidly. This is certainly true in the case of Korea if we see the development of electric power stations which were in operation in Korea during the colonial era. The development of electric power was increased by fifteen times between 1910 and 1923, and by 1938 it increased to twenty five times in just 15 years.[4]

Development of Electric Stations in Operation in Korea (in 1,000 kW)

1910	1917	1923	1931	1938
1.7	8.0	25.4	162.8	668.1

Source: Chōsen Keizai Nempō

According to another source, "in 1929, Korea's electric power capacity was slightly below 48,000 kW and 72 percent of the total energy was produced by thermal power plants. By 1938, electric power generating capacity reached 868,000 kWh, and of which 83 percent was hydroelectric.[5] During this decade the hydro-electric generating facilities were extensively developed, it became possible by tapping water resources especially in the northern part of the Korean Peninsula. The pace of development accelerated due to the availability of coal and hydro-electric power during the Japanese colonial rule. Energy

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4 Kim, Kwan-Suk, "An Analysis of Economic Change in Korea", *in* Andrew C. Nahm, ed., Korea Under Japanese Colonial Rule, The Centre for Korean Studies, Institute of International and Area Studies, Western Michigan University, 1973, p.109.

5 Ho, Samuel Pao-San, "Colonialism and Development: Korea, Taiwan and Kwantung", in Ramon H. Myers and Mark R. Peattie, ed. The Japanese Colonial Empire, 1895-1945, Princeton University Press, Princeton, N.J., 1984, p.367.

intensive heavy industries (Chemical, Metals and Machinery) accounted for 44 percent of the total value of manufacturing produced between 1938 and 1940, as compared to only 26 percent during 1926 and 1929.[6]

When colonial rule ended in August 1945, Korea inherited a deformed and destroyed economy. The situation further deteriorated, as Japanese troops had destroyed major industrial and mines, when they left Korea. According to one estimate, the list of damaged or destroyed, include 64 mines completely flooded, 174 mines partially flooded, six factories including the Sup'ung hydroelectric power plant completely destroyed and 47 factories partially destroyed.[7] There was also some sort of vacuum in terms of technical knowledge that unabled Koreans to repair and re-start the Japanese factories and other facilities. It was the result of Japanese monopoly on all technical and managerial positions during their rule. When they left in 1945, they took away all the plans and other documents regarding these facility with them and there was hardly anybody to run these factories in Korea.[8]

In February 1946, a North Korean Interim People's committee was formed in Pyongyang under the chairmanship of Kim Il Sung, to establish a

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6 Ibid. p.367.

7 Chung, Joseph Sang-Hoon, "The North Korean Economy: Structure and Development", Hoover Institution Press, Stanford University, California, 1974, p.57.

8 Breidenstein,Gerhard and W. Rosenberg, "Economic Comparison of North and South Korea",

Socialist economic system. The first priority of North Korea was to implement land reforms and nationalization of industries because the Japanese agricultural policies created a serious tenancy, massive migration of peasants and an unequal distribution of land ownership. It is estimated that about 90 percent of North Korea's industrial enterprises were nationalized in 1946 and central economic planning was initiated in the following year. The state's control over the economy and efforts at planning were largely concentrated in industry, the main goal of the first two one year plans of 1947 and 1948 and two year plan of 1949-50 were the restoration of the destroyed Japanese industrial facilities and expansion of the state's control over the commercial and transport sector.[9]

When North Korea adopted its national emblem, it was indicative of its economic priorities and its ideological stand. The national emblem of North Korea bears the design of a grand hydroelectric power station under the beaming light of a five pointed red star, with the ears of rice forming an oval frame bound with a red ribbon bearing the inscription "The Democratic People's Republic of Korea". "The Hydroelectric power station inside the emblem symbolizes modern, independent industry resting on powerful heavy industry and working class".[10]

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9 Dernberg, Robert F., "The state Planned, Centrelised System: China, North Korea, Vietnam", *in* Scalopino Robert A., (ed.), Asian Economic Development: Present and Future, Institute of East Asian Studies, University of California, Berkeley (California, 1985), p.19.

10 Pang Hwan Ju, Korean Review, Foreign Languages Publishing House, Pyongyang, Korea 1988.

Economic and technical assistance from the Soviet Union was a crucial factor in North Korea's rapid restoration of its industrial capabilities. It is estimated that the Soviet Union provided North Korea a total of 546 million US dollar in grants and loans covering the period January 1946 to 1949. The USSR also dispatched and stationed a considerable number of technical advisors with expertise in different industries.[11] The relatively uninterrupted supply of electric power and fertilizers are other important factors which enabled North Korea to readily restore its economy. Although the volume of electric power generated in the North Korea had fallen to 3,934 million kWh in 1946 from 8,137 million kWh in 1944, it was soon restored in 1949 to 75 percent of its pre-liberation volume, or 6,131 million kWh..[12]

Korean Peninsula witnessed a three year long devastating war, which started in June, 1950 and ended on July27, 1953 with the signing of a truce agreement, commonly known as "Armistice Agreement" which was concluded between Chief of North Korean People's Army, Commander of Chinese Volunteer's Army and United Nations Command (UNC) led by the United States of America. The war was a disaster for North Korea as it was

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11 Koo, Bon-Hak, Political Economy of Self Reliance: Juche and Economic Development North Korea, 1961-1990, Research Centre for Peace and Unification of Korea, 1992, p.65.

12 Chung, Joseph Sang-Hoon, No.6, p.86.

heavily bombed, major cities were rubbled to the ground and industry was shattered. Agriculture production slumped. The human losses were enormous, according to an estimate at least 12 percent of the population and possible 15 percent were killed.[13] North Korea maintained that "the US imperialist had dropped an average of 18 bombs on every square kilometer of the Northern half of the Republic, reducing Pyongyang and other towns and villages to ashes. Industry, agriculture, railways, transport and all other spheres of national economy as well as educational, cultural and public health establishments were destroyed. The people lost nearly all their dwelling houses and household goods and were short of food and clothing".[14]

According to an estimate about 8,700 factories and state enterprises, 600,000 housing units and over 5,000 schools ruined, and 370,000 hectares of rice paddies fields were in a state of devastation. In monetary terms, the total damage in North Korea amounted to 420 billion won.[15] It was estimated that Power production in 1953 was 26 percent of the 1949, fuel 11 percent, metallurgical output 10 percent and chemical production 22 percent. The total

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13 Callum MacDonald, *In* Smith Hazel, (ed.), North Korea in the New World Order (Macmillan Press Ltd. London, 1996), p.5

14 Pang Hwan Ju, no.9.

15 North Korean Economy, *Korea Development Institute*, p. –673, (cited by –Ko, Sung Hyo, Understanding North Korea's Economy, Yang, Chae Song (Trans.) *P'yongminsa*, 1993.)

industrial output in 1953 was only 64 percent of the 1949.[16] In 1944, the total electricity production of Korea, mainly from power stations in North Korea was about 5,800 million Kwh and power stations were primary targets of the US bombing during the Korean War.[17] The primary task in the post-Korean war therefore was to regain the lost industrial growth and rehabilitation of the Korean people.

A Three-Year Plan (1954-56) was drawn for the rehabilitation and development of the North Korean national economy. The basic objective of the plan was to restore the pre-war level in all spheres and to strengthen foundations of industrialization. The Three-Year Plan was completed ahead of schedule and it was claimed that the industrial and agricultural outputs surpassed the pre-war level.[18]

The "Juche" principle came to be pursued as self-reliance, was first enunciated by Kim Il Sung on 28 December 1955. Juche economy policy emphasized the development of heavy industry and agricultural self-

16 Sup, Shinn-Rinn, no.2, p.297.

17 Kim, Kwan-Suk,no.3

18 Tsuru Sunao, Korea a Trail Blazer, Foreign Language Publishing House, Pyongyang, Korea, 1981, p.103.

sufficiency. This is clearly seen in the Speech of Kim Il Sung- "Our Party's line in the building of heavy industry was to create our own solid base of heavy industry which would be able to produce at home most of the raw materials, fuel, power, machines and equipment needed for development of national economy by relying on the rich natural resources and sources of raw material in our country".[19] In pursuit of self-reliance, North Korea did not become a member of Comecon, the trading system of the Soviet bloc, opting instead for 'selective participation'. In other way, it sought most of the advantages of Comecon like barter trade, no need for convertible currencies while avoiding the major risk of compromising on economic and political independence.[20]

The thrust area of the Five-Year Plan (1957-61) was to improve industrial output and it grew at a rate of 36.6 percent every year. An increase in the industries was achieved by building more than 1000 local factories with various capacities and major hydroelectric generating plants such as Puch'on-gang (260 Mw), Chanjin-gang(390 Mw), Hoch'on-gang(394 Mw) were refurbished to increase industrialization in North Korea.

In the first seven-year plan (1961-67), the objectives were to carry out an overall technological reconstruction and the cultural revolution. The

19 Pang Hwan Ju , no.9.

20 Callum MacDonald, no.12.

primary task for this period was to build heavy industry by developing the machine-building, chemical, fuel, power and ferrous metallurgical industries and thus make it serve it light industry and agriculture more effectively. One of the greatest successes in building heavy industry during the seven-year plan period was the establishment of machine-building industry. A 6,000-ton press, large sized tractors, large-sized excavators and large-sized locomotives, vessels of a 5,000-ton class, and even equipment for power stations, metallurgical plants and chemical factories were produced. The total value of industrial and agricultural output was 74 percent in 1969 as against 34 percent in 1956.[21] One of the major factors in the rapid industrial growth was the electricity production. By 1970, North Korea had already achieved the mark of 16,500 Kwh million of electricity that is clearly seen in the electrification of the rural areas in North Korea. In 1958 it was 49 percent, by 1963, it reached to 71 percent and it achieved 100 percent by the end of 1970.[22]

The Six-Year Plan (1971-76) was carried out with the emphasis on strengthening its Juche character. For instance, it had to be, at least, more than 70 percent self-reliant in regard to raw materials and the iron and steel industry development with domestic fuel. In addition, it was envisaged to mass-produce large equipment for the metallurgical, cement and chemical industries, high-

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21 Tsuru Sunao, no.17.

22 Chung, J.S., "North Korea's Seven Year Plan", *Asian Survey*, June, 1972, P.530.

capacity power-generating equipment, large-sized bulldozers, large-sized excavators and vessels of 10,000-ton class. It was claimed that the Six -Year Plan was fulfilled one year and four ahead of the set time by August 1975.[23]

During the plan period industrial output grew at an average annual rate of 16.3 percent, with the production of means of production increasing 2.6 times and consumer goods 2.4 times along with 1,055 factories and enterprises such as power plants, iron and steel works, machinery plants, chemical factories, textile mills and necessary factories. In this period industry produced 28,000 million kWh of electricity (1975) at a ratio of five to five between hydroelectricity and thermoelectricity, 50 million tons of coal (1975), 4 million tons of steel (1976).[24] The growth rate between 1961 and 1975 was remarkable and gross output of electrical machines was increased 4.1 times, Generators increased to 13.5 times, Transformers 3.9 times, electric motors to 2 times and number of technicians rose to 4.3 times. During these years innovation proposals were introduced in 23,320 items.[25] Oungi an oil based thermal power station was completed with a capacity of 200Mw.

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23 Tsuru Sunao, no.17.

24 Sung, Kim Il, "Report to the Fifth Congress of the Worker's Party of Korea in 1970", Kim Il Sung- Selected Works III, Foreign Language Publishing House, Pyongyang, Korea, 1971.pp.11-113.

25 Fersei, Mastapha, The Sun in the East, Foreign Language Publishing House, Pyongyang, Korea, 1983, p.85.

At the First Session of the Sixth Supreme People's Assembly in 1977, the President reported that- "At the end of the Second Seven-Year Plan we shall produce annually 56,000-60,000 kWh of electricity, 78-80 million tons of coal, 7.4-8 million tons of steel, one million tons of nonferrous metals, 5 million tons of engineering goods, 5 million tons of chemical fertilizers, 12-13 million tons of cement, 3.5 million tons of aquatic products, and 10 million tons of grains; reclaim 100,000 *changbo* of tideland; and more than double today's production figures in many fields of the national economy."[26] The main focus of this plan was to expand and consolidate the fuel and power bases in particular, for regular and reliable source of energy. This was evident in the President's speech in which he said that hydro electric–generating facilities should be increased but thermal power stations should be given more priority as they are cheap and also guarantee regular supply of energy during the dry season.[27] Bukchang (1600Mw), Chonjin (150Mw) and Chonchonang (200MW) thermal power plants were completed during this plan.

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26 Tsuru Sunao, no.17.

27 Sung, Kim Il, "Report to the Fifth Congress of the Worker's Party of Korea in 1970", Kim Il Sung- Selected Works III, Foreign Language Publishing House, Pyongyang, Korea, 1971.pp.11-113.

Development of Production inNorth Korea

Items↓ Years→	1949	1970	1978	1984
Electric power (million kWh)	5,924	16,500	35,000	56,000-60,000
Steel (million tons)	0.144	2.2	4.5	7.4-8
Coal (million tons)	4.005	27.5	60	70-80
Cement (million tons)	0.537	4	9	12-13
Chemical Fertilizers (million tons)	0.401	1.5	4	5

Source: Tsuru Sunao, *Korea a Trail Blazer*, Foreign Languages Publishing House, Pyongyang, Korea, 1981, p.133.

North Korea assigned priority to mining industry over the manufacturing industry with a view to increase coal and ore output. Programmes were launched to reconstruct large mines to increase their output to the maximum, while medium and small size as well as new large coal and other mines were extensively developed. The mining industry was also comprehensively mechanized and large, modern high-speed mining equipment were introduced, including multi-purpose excavating machines and hydraulic prop aggregate, drum coal cutter. North Korea is mining different kinds of minerals in large quantities among them coal outputs accounts for an overwhelming proportion. The coal fields in Tokchon, Sunchon and Kaechon regions of the northern part of South Pyongan Province are considered to be the biggest anthracite-producing centre. The second biggest hard coal field is

the one in the southern part of South Pyongan Province around Pyongyang. Kowon coal field is the anthracite-producing centre in the eastern part of the country. North Korea also has large deposits of soft coal. Brown makes up a large proportion of soft coal in North Korea. It is mined in North Hamgyong Province and the Anju area in South Pyongan Province.[28]

The Anju coalmines are the biggest coal-producing centres in North Korea. It contains abundant deposits and produces coal of good quality. It plays an important role in the coal mining industry of North Korea.There are also many Peat, Low-calorie coal and Sapropelic coal fields of local significance. During the Six-Year plan (1971-1976) period, the coal industry was modernized and expanded, and Toksong, Sochang and Kumya Youth coal mines were developed. There were also plans of reconstruction and expansion of coal mines in the Anju area with their rich deposits. The large coal mines in Sunchon, Tokchon, Pukchang and Kangdon area and in the northern regions and other areas were also planned to be expanded. Many new coal mines including low- calorie and sapropelic coal mines are also planned to be extensively developed.[29]

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28 Pang Hwan Ju, no.9

29 Ibid.

Coal* Production of North Korea	
Year	(Million Short Tons)
1975	44
1976	45
1977	45
1978	45
1979	48
1980	47
1981	50
1982	52
1983	50
1984	51
1985	53
1986	61
1987	62
1988	66
1989	69
1990	71
1991	73
1992	74
1993	78
1994	78
1995	78

* Coal includes anthracite, sub-anthracite, bituminous, sub-bituminous, lignite and brown coal.
Data from Oil & Gas Energy Database.
Source: EIA- International Energy Annual.

Coal is the major source of primary energy in North Korea, which holds 81 percent share of the total primary energy and 83 percent of the final consumption. Most of the coal is mined domestically but North Korea imports bituminous coal and coking coal from China and Russia. Until 1989, it imported 2.574 million tons of coal, but after 1989 imports from Russia had substantially decreased.[30] There was substantial increase in the coal production

30 Kim, Jeong-In and Seung-Jun Kwak, "Practical Approaches for Energy Sector Cooperation Between South and North Korea", in Chang-Ho Yoon and Lawrence J.Lau, North Korea In Transition: Prospects for Economic and Social Reform, Edward Elgar Publishing Limited, UK, 2001,p.240.

(as shown in the table above) in the mid 1980s (especially 1986). In 1985, it was 53 million short tons and next year it reached to 61 million short tons. A decade later in 1995, it rose to 78 million short tons. These was a substantive increase in the coal consumption in North Korea (as shown in the table given below). According to an estimate it was 47.8 million short tons in 1980, whereas in 1990 it reached to 74 million short tons, a 26.2 million short tons or almost 55 percent increase in coal consumption in just one decade. The ratio of coal production with the coal consumption in the given years indicates that coal consumption is higher than production. North Korea is importing a limited quantity of coal from outside to keep balance between coal production and coal consumption.

Coal * Consumption of North Korea	
Year	(Million Short Tons)
1980	47.5
1981	54.6
1982	57.2
1983	54.7
1984	54.5
1985	63.7
1986	63.2
1987	65.3
1988	68.8
1989	71.8
1990	74.0
1991	75.3
1992	76.5
1993	80.2
1994	80.1
1995	80.5

Data from Oil & Gas Journal Energy Database.
Source: Energy Information Administration.

Electricity generation is primarily coal-fired and hydroelectric, in about equal proportions, with a small amount of oil-fired electricity generation capacity associated with the oil refinery at Sonbong and in two other plants. Much of the generation capacity was installed in the 1970s and 1980s. According to an estimate there are 500 electricity generation facilities in North Korea, this includes 62 major power plants that operate as part of the interconnected transmission and distribution grid. The remaining plants being small, isolated hydroelectric facilities or facilities associated with industrial installations. One estimate suggests that 85 percent of total national generation takes place in the 62 major power plants; other, unofficial reports suggest generation at smaller plants is insignificant. The 62 "major" plants reportedly include 42 hydroelectric plants and 20 thermal plants. Of the thermal plants, 18 are fired primarily with coal.[31]

Trends of Primary Energy in North Korea (Million TOE)

1972	1976	1985	1990	1995	Average growth rate (%,1972-96)
21.67	26.68	36.25	36.22	24.6	0.6

Source: IEA (1997).

31 David F. Von Hipple, Timothy Savage and Peter Hayes, The NORTH KOREA Energy Sector: Estimated Year 2000 Energy Balance and Suggested Approaches to Sectorial Redevelopment, *Report Prepared* for The Korea Energy Economic Institute (KEEI), By Nautilus Institute for Security and Sustainable Development, Berkeley, USA, September13, 2002, p. -9.

Thermal generating capacity in 1990s was approximately 3,200 megawatts. Table provides plant by-plant capacities of some of the thermal generating facilities in North Korea. The total of the listed plants (6 plants, 2,850 MW in1990s) comes up short of both the 20 thermal facilities connected to the grid and to the 4,500 MW of capacity reported in official documents to be the overall total. If 3,200 MW total is correct, this figure means that the additional 14 grid-connected thermal facilities have an average capacity of about 25 MW each. It is considered that there are additional smaller or industry-associated plants. Major thermal power plants are connected to the national transmission and distribution (T&D) grid; only two thermal power plants are reported to be oil-fired. One is the 200 MW plant at Sonbong listed as "Oungi" in the table (sometimes also referred as "Oung gi"and "Unggi") the other one is believed to be small.[32]

Major Thermal Generating Facilities in North Korea

S.No	Name	Capacity (Mw)	Fuel	Year Completed
1.	Pyongyang	500	Coal	1968
2.	Bukchang	1600	Coal	1985
3.	Chongjin	150	Coal	1984
4.	Chonchonang	200	Coal	1979
5.	Oungi	200	Oil	1973
6.	Sunchon	200	Coal	1988
7.	East Pyongyang	50	Coal	1992
Total of Listed Plants		**2900**		

Source: Nautilus Institute for Security and Sustainable Development- Report Prepared for The Korea Energy Economics Institute (KEEI), September 13, 2002, p. -41.

[32] Ibid.

Since 1990, the only reported major addition to planned thermal power plants has been the completion in the early 1992 is 150 MW East Pyongyang plant. According to some reports only 50 MW of the 150 MW plant was actually completed, and only with great difficulty, as Russian assistance was not available at that time to complete the work on the plant that was started in the 1980s in collaboration with the USSR. A number of other thermal generating facilities reported to be under construction in North Korea. A list of under construction or planned thermal generating facilities is provided in the table given below.

Thermal (Fossil-Fuel) Generating Facilities reported to be Under Construction of " Planned for Construction" in North Korea

S.No.	Name	Capacity (Mw)	Fuel	Year Started	Year Completed
1.	Pyunghung (?)	200	Coal		
2.	Suncheon (?)	200	Coal		
3.	Dongpyungyang	600	Coal		1993-1996
4.	Kimchaek	150	Coal	1988	
5.	Hamhyng	100	Coal	1994	
6.	Central	150	Coal		
7.	12wol	Unknown	Coal	1990	1993
8.	Haeju	1200	Coal	1989	
9.	Ahnju Hamheung	150	Coal	1989	
Total of Listed Plans		**2750**			

Source: Nautilus Institute for Security and Sustainable Development- Report Prepared for The Korea Energy Economics Institute (KEEI), September 13, 2002, p. - 42.

There are many large rivers like the Taedong River, the Amnok, the Tuman, the Chongchon, the Han and the Rakdong. There are natural lakes created by volcanic activities or earth movements, lagoons and river-bed like Chon, Somji, Changyon, Paengnok, Kwangpo, Manpo, Tongjong. Large-scale irrigation projects and the hydroelectric stations had created artificial lakes. There are more than 1,700 artificial lakes and reservoirs, among them over 100 are large ones like Supung, Changjin, Pujon, Changjagang, Manpung, Chansu, Yonpung, Sohung and Unpa. In 1990s approximately 4,500MW of electricity was generated. Table below provides a listing of those major hydroelectric facilities. The 20 plants on this list were built prior to 1990s account for approximately 3,100 of the 4,500 MW of hydroelectric capacity in service in 1990s. Electricity from several plants (Supung, Ounbong, T'aep'enmang, and Weewong) is exported to China.[33]

[33] Ibid.

Major Hydroelectric Generating Facilities in the North Korea

S.No.	Name	Capacity (Mw)	Year Completed	Year Refurbished
1.	Supung	400		
2.	Kymgansang cascade	13.5	1930	1938
3.	Puren cascade	28.5	1932	
4.	Puch'on-gang	260	1932	1956
5.	Chanjin-gang	390	1936	1958
6.	Hoch'on-gang	394	1942	1958
7.	Tonno-gang	90	1959	
8.	Kangae	246	1965	
9.	Ounbong	200	1970	
10.	Sodusu-1	180	1974	
11.	Sodusu-2	230	1978	
12.	Sodusu-3	45	1982	
13.	Taedong-gang	200	1982	
14.	Mirim	32	1980	
15.	Ponhwa	32	1983	
16.	Hwan-gang	20	198?	
17.	Tonhaw	20	198?	
18.	T'aep'enmang	90	1989	
19.	Weewong	200	1989	
20.	Nam-gang	200	1994	
21.	Dokro River	36		
Total of Listed Plans		**3,307**		

Source: Nautilus Institute for Security and Sustainable Development- Report Prepared for The Korea Energy Economics Institute (KEEI), September 13, 2002, p. - 44.

North Korea has planned some major hydro-electric generating plants and some of them are reported to be underconstruction. The targeted capacities (about 2,990 Mw) of these plants are almost equal to the existing capacity in terms of electricity generation. A list of these planned or under construction is given below with their capacities and the year of commencement.

Major Hydroelectric Generating Facilities reported to be Under Construction or " Planned for Construction" in North Korea

S.No.	Name	Capacity (MW)	Year Started	Year Completed
1.	Taechun	700	1982	
2.	Kumgang Mountain	800	1985	1996 (1st Phase)
3.	Sodusu-4	200	1990	
4.	Namkang	Unknown	1983	
5.	Youngwon	Unknown	1986	
6.	Ehrangcheon	Unknown	1986	
7.	Jabgjakang	240		
8.	P'och'on	820		
9.	Oranch'on	180		
10.	Heech'on	Unknown	1989	
11.	Kymyan-gang	Unknown		
Total of Listed Plants		**2,990**		

Source: Nautilus Institute for Security and Sustainable Development- Report Prepared for The Korea Energy Economics Institute (KEEI), September 13, 2002, p. - 45.

There are no operating oil wells in North Korea. Oil and petroleum products have increased North Korean dependency on the outside world. All crude oil and some petroleum products are imported from China, Iran, and Libya. North Korea also purchased (in 1990s) some refined products from the open market. These products, principally diesel fuel, heavy oil, gasoline, and kerosene (in that order of importance) sum to a total of approximately 640,000 tons of oil equivalent.[34] Since 1990, crude oil imports have been restricted by a number of economic and political factors. According to one estimate transport sector consumes a major fraction of oil products used in North Korea, around 70% of its petroleum, which is much higher than South Korea's 32% and

[34] Choi Su Young, Study of the Present State of Energy Supply in North Korea, *Research Institute for National Unification* (RINU), Seoul, (ROK), 1993.

Philippine's 58%.[35] The use of oil for electricity generation is limited primarily to a single heavy-oil-fired Power plant associated with an oil refinery is the 200 MW plant at Sonbong listed as "Oungi".

North Korea's Import of Crude Oil

Selected Years and Countries, Thousand Metric Tons

From	1991	1992	1993	1994	1995
China	1,100	1,100	1,050	830	1,020
Libya	-	200	100	80	80
Iran	750	220	210	-	-
Russia	40	-	-	-	-
Total	1,890	1,520	1,360	910	1,100

Source: Korea Trade Development Corporation.1996.

The North Korea had considerable resources of Uranium.Starting in the mid-1960s, and with the technology assistance from the Soviet Union, North Korea built a research reactor (initially 2 kWt, later upgraded to 8 kWt) at Yongbyong. In the 1980s, it constructed its 30 MW Gas-cooled reactor, which is graphite-moderated and capable of using natural uranium. It was able to avoid relying on foreign suppliers for uranium enrichment technologies. It constructed a reprocessing facility at Yongbyong. [36]

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35 North Korean Economy Situations, *Korean Development Institute*, 1995 (Seoul: KDI, 1996), p.114.

36 Kim, Jeong-In and Seung-Jun Kwak, no.26,Also see; David Von Hipple and Peter Hayes, NORTH KOREA Energy Sector: Current Status and Scenario for 2000 and 2005, Presented at the Conference, *Economic Integration of the Korean Peninsula*, Washington, D.C., 5-6 September 1997.

The table below gives estimated details of Energy Balance for the year of 1990, in which coal & coke, crude oil, refined products; Hydro/nuclear, wood/biomass, charcoal and electricity are taken into account with their contribution in the total energy production.

North Korea's Estimated Energy Balance for 1990

Units:Terajoules(TJ)*	Coal & Coke	Crude Oil	Refined Products	Hydro/ Nuclear	Wood/ Biomass	Charcoal	Electricity	Total
Energy Supply	1,335,949	119,261	26,604	240,180	382,050	-	-	2,124,044
Domestic Production	1,317,960			240,180	355,383			1,913,524
Import	68,392	119,261	26,604		26,664			240,923
Export	30,403							30,403
Input to International Marine Bunker								
Stock Changes								
Energy Transformation	(461,926)	(119,261)	91,639	(240,180)	(10,667)	3,520	142,726	(589,149)
Electricity Generation	(381,683)		(20,851)	(240,180)			199,800	(442,914)
Petroleum Refining		(119,261)	112,489					(6,771)
Coal Production/Preparation							(8,654)	(8,654)
Charcoal Production					(10,667)	3,520		(7,147)
Coke Production								
Other Transformation								
Own Use	(63,900)						(14,955)	(78,855)
Losses	(16,343)						(28,466)	(44,809)
Fuel for Final Consumption	894,023		118,243		371,383	3,520	147,726	1,534,895
Energy Demand	894,301		118,529		367,526	3,435	147,663	1,531,454

*One Terajoule is equal to one trillion joules, Which is the equivalent of approximately 24 tons of crude oil (tons of oil equivalent). Figures in this table should be considered accurate to at best two significant digits.

Source: David F. Von Hipple and Peter Hayes, Engaging North Korea on Energy Efficiency, *The Korean Journal of Defense Analysis*, Vol.8, No.-2, winter, 1996.

North Korea's Sector-wise Energy Balance Sheet for 1990

Units:Terajoules(TJ)*	Coal & Coke	Crude Oil	Refined Products	Hydro/ Nuclear	Wood/ Biomass	Charcoal	Electricity	Total
Industrial Sector	558,979		51,728		1,600		91,740	704,047
Iron and Steel	275,921						24,671	300,592
Cement	95,669						5,504	101,174
Fertilizers	23,994						21,504	45,403
Other Chemicals	10,474		41,728				6,616	58,818
Pulp and Paper	4,026						932	4,959
Other Metals	25,805						3,421	29,226
Other Minerals	-						-	-
Textiles	29,385						2,497	31,882
Building Materials	37,204						189	37,393
Non-Specified	56,500		10,000		1,600		26,500	94,600
Transport Sector			33,794				7,882	41,675
Road			24,387					24,387
Rail			1,381				3,882	5,262
Water			940					940
Air			2,086					2,086
Non-Specified			5,000				4,000	9,000
Residential Sector								
Urban	233,899		6,503		262,310	3,435	13,398	519,545
Rural	117,956					3,435	9,275	137,170
	115,943				262,310		4,122	382,375
Agriculture Sector								
Field Operations	9,750		5,005		44,950		2,572	62,277
Processing/Other			2,619				907	3,526
	9,750		2,368		44,950		1,664	58,750
Fisheries Sector								
Large Ships			1,073				100	1,173
Processing/Other			873					873
			200				100	300
Military Sector								
Trucks and Other	38,467		17,425				24,039	79,932
Transport			5,926					5,926
Armaments			2,368					2,368
Air Force			2,299					2,299
Naval Forces			6,731					6,731
Military Manufacturing	887						79	967
Buildings and Other	37,580		100				23,960	61,640
Public/Commercial Sector	34,915						7,932	42,847
Non-Specified/Other Sector								
Non-Energy Use			3,000					3,000
	18,290				58,667			76,957
Electricity Gen. (Gross Twhe)	28.31		1.51	25.69				55.50

*One Terajoule is equal to one trillion joules, which is the equivalent of approximately 24 tons of crude oil (tons of oil equivalent). Figures in this table should be considered accurate to at best two significant digits.

Source: David F. Von Hipple and Peter Hayes, Engaging North Korea on Energy Efficiency, *The Korean Journal of Defense Analysis*, Vol.8, No.-2, winter, 1996.

The problems in the energy sector cannot be seen, excluding other sectors of the North Korean economy. There is always a complex inter-dependence between the various sectors and sub-sectors in an economy, as malfunctioning of a sector affects the working capabilities or output of other sector and economy as a whole. North Korean has been facing some economic difficulties over the years; particularly in the 1990s.North Korean GNP (Gross National Product) gradually increased gradually until 1990 to $23.1 billion but declined continuously to $21.2 by 1994, while its per capita income declined from $1,064 to $923 in corresponding years. There is also decline in North Korea's trade volume, it was $5.24 billion in1988 and declined to $2.11 billion in 1994.[37]

North Korea's Gross National Product

Selected Years, Current US Dollars and Percent of Growth

Category	GNP (US$)	GNP Growth %	Per Cap GNP (US$)	Trade (US$ Billion)
1985	15.1	2.7	757	3.10
1986	17.4	2.1	853	3.57
1987	19.4	3.3	936	4.15
1988	20.6	3.0	980	5.24
1989	21.1	2.4	987	4.80
1990	23.1	-3.7	1,064	4.64
1991	22.9	-5.2	1,038	2.72
1992	21.1	-7.6	943	2.66
1993	20.5	-4.3	904	2.64
1994	21.2	-1.7	923	2.11

Sources: Bank of Korea, *Estimates of North Korea's GNP* (Seoul: Korean Government, June, 1995), National Unification Board, *Economic Indicators Of North and South Korea* (Seoul: Korean Government, Dec., 1995).

[37] Whee, Gook Kim, "Problem and Remedies of the North Korean Economy: A Strategic Approach", *The Korean Journal Of Defense Analysis*, Vol.8,no.2,1996,p.231.

If the GNP share in various sectors of the North Korean economy in early 1990s are examined it shows that situation was disturbing in some of the sectors. The GNP share in agriculture and mining fell by 10.2% and 8.5% respectively in 1990. Economic conditions worsened as manufacturing declined by 13.4% in 1991 and 17.8% in 1992, and construction dropped by an alarming 26.9% in 1994.

North Korea's Industrial Growth Rate

Selected Years, Percent of Growth

Category	1990	1991	1992	1993	1994
GNP Growth	-3.7	-5.3	-7.6	-4.3	-1.7
Agriculture	-10.2	2.8	-2.7	-7.6	2.7
Mining	-8.5	-6.8	-6.1	-7.2	-5.5
Manufacturing	-1.5	-13.4	-17.8	-1.9	-3.8
Elec.Gas.Water	-2.2	-4.5	-5.7	-8.7	4.2
Construction	5.9	-3.4	-2.1	-9.7	-26.9
Service	0.3	2.5	0.8	1.2	2.2

Sources: Bank of Korea, *Estimates*, 1995; National Unification Board, *Economic Indicators*, 1995; The National Statistical Office, *Major Statistics of Korean Economy* (Seoul; Korean Government, March 1996).

North Korea's GNP share in agriculture fluctuated to 29.5% and mining remained at 7.8% in 1994. The manufacturing share fell to 23.6% while service rose to 27.9 in 1994. Also, the GNP share in the heavy industries dropped from 22.0% in 1991 to 16.6% in 1994, while that in light industry decreased from 8.0% to 7.0% correspondingly. North Korea's share of employment was

35.0%, 47% and 18% in the primary, secondary, and tertiary sectors in 1990 when the corresponding ROK's share was 17.9%, 27.6%, and 54.5%.[38]

North Korea's Industrial Structure
Selected Years, Percent of Nominal GDP

Category	1991	1992	1993	1994
Agriculture	28.0	28.5	27.9	29.5
Mining	7.9	9.2	8.2	7.8
Manufacturing	30.0	24.6	24.7	23.6
(Light)	8.0	6.3	6.8	7.0
(Heavy)	22.0	18.4	17.9	16.6
SOC & Service	34.0	37.7	39.2	39.0
Elec. Gas.Water	5.0	5.1	4.8	4.8
Construction	8.2	9.1	6.3	6.3
Service	20.9	23.5	25.9	27.9
(Government)	13.9	15.0	16.8	18.6
(Other)	7.9	8.6	9.0	9.3

Sources: Bank of Korea, *Estimates*, 1995; National Unification Board, *Economic Indicators*, 1995; Jisoon Lee, "*Recent Development In North Korea*," presented to the seminar held at Tysons Corner, Virginia on March8, 1996.

In the light of above-mentioned facts, we can say that North Korean economy is facing a serious problem of stagnation or slow down in its performance in some sectors in the beginning of 1990s.There are many reasons responsible for this situation both, internal and external, some of them are discussed below.

One of the major factors, which affected North Korea badly, was the disintegration of the Soviet Union, which must have caused a major setback to North Korean economy. Annual trade with the Soviet Union, which had been

[38] Whee Gook Kim, no.35.

the North Korea's most important trade partner, shrank by 68.7 percent in 1991 from the previous year. North Korea's ratio of bilateral trade with the Soviet Union crashed to 14.1 percent from the previous year's 37 percent. The total volume of foreign trade in 1991 diminished by 16 percent, as North Korea was not in a position to produce and export internationally competitiveness products with which it could have earned currency.

North Korea's Export and Import with the Former Soviet Union. (Million US$, %)

Export/Import	1990		1991	
	Amount	Share	Amount	Share
Total Export	1,264	100	950.8(-24.8)	100.0
To Former USSR	440,0	34.8	171.0(-61.2)	18.8
Total Import	1,823	100.0	1,643(-9.9)	100.0
From Former USSR	701.5	38.5	193.7(-72.4)	11.8
Total Trade	3,088.5	100.0	2,594.2(-16.0)	100.0
Former USSR	1,141.9	37.0	364.7(-68.1)	14.1

Source: KOTRA, *Trends in North Korea's Foreign Trade In 1991,* 1992, p.11.

The termination of close trade relations with the former Soviet Union had other implications for North Korea, for example in 1990, North korea purchased 400,000 tons of crude oil and by 1991, it came down to 40,000 tons. The supply of crude oil to the North Korea has fallen to by an annual average of 65 percent from 1990 t0 1995. Although it is only 10 percent of the North Korea's total energy needs, it is the only suitable source of energy in some critical sectors of the economy. The North Korea's reserves of coal could not

be used on its place. The oil shortage has severely hit the North Korean energy sector as whole but the entire economy.[39]

It is not only the Soviet Union's collapse that has affected North Korean economy but, also the fall of Eastern Europe allies of the Former Soviet Union, as they used to be the major trading and aid partners of North Korea. In recent years Chinese demands for transaction in hard currency created problems to the North Korean economy. China's actions such as reducing crude oil supplies in view Pyongyang's non-payment; insisting the bilateral trading be conducted on a foreign basis and refusing to write off debts were not designed to bring about any liberalization of North Korea's regime, but to promote stability in the country, and security of its borders.[40]

There are some internal factors, which are also affecting the energy sector in the North Korean economy. Unlike many Asian countries, North Korea does not have a semiconductor industry as they are important in Power generation, transmission and distribution. As a result imports of computer equipment are difficult for electronic automation and control system that are important in

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[39] Hong-Tack Chun and Jin Park, North Korean Economy: A Historical Assessment, Korea Development Institute, Seoul, 1996.p.671.

[40] Stephen Kirby, The Effects of Regional Power Factors on Inter-Korean Relations and Implications of the Nuclear Issue for the Northeast Asian Security Order.*In* Hazel Smith, *Ed.* North Korea in the New World Order, Macmillan Press Ltd., London, 1996, p.55.

terms of improving the efficiency of industrial processes, boilers, and other equipment. Inefficient infrastructure of energy sector in North Korea is reportedly aged or poorly maintained. Buildings apparently lack insulation, and the heating circuits in residential and other buildings apparently cannot be controlled by residents. Industrial facilities are likewise either aging or based on outdated technology, and often (particularly in recent years) are operated at less-than-optimal capacities from an energy efficiency point of view.[41]

It is estimated that about 85 percent of North Korea's hydroelectric generating capacity had become unusable due to the flood of 1995 and 1996. The damage caused by the floods to hydroelectric generating facilities is that floods have filled impounds with silt, reducing the capacity of dams and clogging spillways and channels. It is also believed that it has caused damage to gates, turbines, and other mechanical equipment [42]

There are many hydroelectric facilities in North Korea which are reported to be of the "run-of-river" variety, which means that their output is more subject to variations in stream flow than plants that rely on larger impoundment with greater water storage. So it is very difficult to get fix

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41 David F. Von Hipple and Peter Hayes, Engaging North Korea on Energy Efficiency, *The Korean Journal of Defense Analysis*, Vol. VIII, No. 2, Winter 1996, p-180.

42 David F. Von Hipple and Peter Hayes, no.39.

volume or quantity of electricity through out year and it is not possible to increase the electric generation by increasing the quantity of the impoundment alone, but power efficient and modern power generating equipment are also needed to increase power generation in the North Korea.

As mentioned earlier North korea has substantial coal reserves, and yet the varying quality of its coals, and the location of some of its better coal reserves, made it difficult for utilization. Some of the coals mined in North Korea have ash contents as high as 65 percent and heating value as low as 1000 kcal/ kg (roughly one-sixth the energy contents of high-quality coals). Untreated coals of this quality can be expected to have a low efficiency of combustion, and the large volume of bottom and fly ash generated when these coals are burned create a disposal problem.[43] Approximately one-half of the coal reserves in the important Anju mining area (located northwest of Pyongyang) are located under the seabed. North Korea lacks the technology to effectively and safely extract this coal, which includes some of the higher-quality coal in the area. In mines in the Anju district that are in areas close to the sea, it has because necessary for miners to pump six tons of sea-water per ton of coal mined, due to saltwater intrusion into the low-lying coal seams.[44]

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43 David F. Von Hipple and Peter Hayes, no.44.

44 David F. Von Hipple, Timothy Savage and Peter Hayes, no.29.

Equipment problems at thermal power plants and load centers have also added complications to the power generation in North Korea as a result, the generation efficiency of the thermal power stations is low, and breakdowns are frequent. Industrial facilities are like wise either aging or based on out dated technology, and often are operates at less-than-optimal capabilities from energy-efficiency point of view.[45]

The unified electrical grid in North Korea established in 1958. North Korean T&D (Transmission and Distribution) system runs a fairly complex grid of 62 power plants, 58 substations, and 11 regional transmission and dispatching centers. The T&D system is controlled by the Electric Power Production and Dispatching and Control Centre (EPPDCC) in Pyongyang.[46] These centres operated by telephone and telex, without the aid of automation or computer systems. This causes poor frequency control, poor power factor, and frequent power outages.[47] The power generation system lacks spare parts as well as testing equipment for maintenance activities.[48] According to a North

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45 David F. Von Hipple and Peter Hayes, no.39.

46 Ibid. p. -14.

47 Kim, Jeong-In and Seung-Jun Kwak,no.26,p.243.

47 The United Nations Development Programme (UNDP) has recommended transfers of modern technologies to increase power efficiency that includes electric power distribution system comopnents, such as high-capacity fuses, circut breakers automatic switches and transformers. For details see, United Nations Development Programme"Second Country Programme for the Democratic People's Republic of Korea", DP/CP/DRK/2, February 1987, pp.11-12.

48 Kim, Jeong-In and Seung-Jun Kwak,no.26,p.243.

Korean official estimate, losses in transmission and distribution system 16 percent of total power generation, where as the Ministry of Unification in South Korea estimates it to 50 percent .

North Korea's energy sector is facing serious problems especially since the beginning on the 1990s in terms of import of certain commodities such oil, coal equipment, technologies etc and some internal factors like poor infrastructure, maintenance and in efficient use of power facilities etc. It was therefore, not surprising that North Korea began to pay greater attention to developing its nuclear energy sector. North Korea seem to have realized that given the complexities of the nuclear energy needs and the post cold war balance of forces, the only way it could develop its energy sector, meet the oil requirements especially during short and medium term and upgrade its technology was to work an frame work that would restructure its energy sector and simultaneously restructure its relations with the United States and other advanced countries. How to work out an acceptable equation between mutual understanding and mutual cooperation of North Korea and the United States became the major concern of North Korea in the early 1990s.

Chapter-2

Chapter 2

North Korea's Opening Efforts

North Korea's efforts to open its economy to include non-communist and advanced countries, began in September 1984, when it established a Joint Venture Law[1] followed by three implementing laws on the taxes in 1985 [2]. It has been argued by some that Kim Il Sung's visit to China in 1982, followed by Kim Jong Il's visit next year, were viewed to have a closer look at the Chinese pattern of opening its economy[3], especially the objectives, institutional, structures, priorities, pace etc. and learn appropriate lessons from Chinese experience.

However, North Korea's attempts to open its economy didn't meet with the positive response due to many reasons. It was only in 1991, it achieved success with the establishment of Tumen River and Rajen-Sonbong area as a free economic and trade zone. The indifferent response of outside powers prompt North Korea to re-write the "Joint Venture Law" again in 1992, while

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1 All these measures included in on resolution- adopted in the Third Congress of the Seventh Supreme People's committee held in 1984—on 'Strengthening South-South Cooperation and External Economic Activities and Further Developing Foreign Trade'.

2 Lee, Hy-Sang , " The August Third Program of North Korea: A Partial Rollback of Central Planning", *Korea Observer*, Vol. 21, No.4, Winter,1990.pp.457-475; "The Economic Reforms of North Korea: The Strategy of hidden and Assimilable Reforms", *Korea Observer*, Vol.23, No.1, Spring,1992.pp.45-79.

3 Lee, Man Woo, "Is North Korea Changing Course?", *Asian Perspective*, Vol.9, No.1, Spring-Summer 1985.

allowing 100 percent direct foreign investment in North Korea. Since then, it has introduced tens of other laws and enforcement decrees, including the "Law for Foreign Enterprises" and the "Land Lease Law" to pave the way for foreigners to invest in North Korea. One of the major conditions to promote foreign investment and economic activities is the supply of power. North Korea had to ensure that, it had cost-effective, uninterrupted supply of energy and other infrastructure variables, before it made efforts to open its economy to foreign investments for an accelerated diversified pattern of development. Some of the on-going projects are discussed below-

Tumen River Project:-

The Tumen River Area Development Project (TRADP) is an ambitious project shaped by North Korea, China, Russia, Mangolia, South Korea and Japan to create free-trade zone in Northeast Asia. The idea of a special development project in Tumen river region was mooted in 1989, in terms of forming a Northeast Asia economic cooperation bloc. The idea gained momentum, after a series of regional conferences held in Changchun, Jilin Province in 1991. United Nations agency United Nations Development Project shown great interest in the concept and brought in Russia and Japan into the discussion, on the feasibility of "Joint development of the Tumen Delta". [4] The involved

[4] Zhu, Yuchao. " Northeast Asian Regional Economic Cooperation: Tumen River Area Development Project" International Studies Association Conference: February 1995; "Tumen River Delta: Promising Land of Northeast Asia."Xinhua News Agency. May 13, 1993.

countries and the UNDP planned a 20-years project, costing over $30 billion dollars, to transform and develop the Tumen River area into the transportation and trading zones for Northeast Asia.

Tumen project was planned to convert an area-from the Chinese town of Yanji to the sea of Japan and Chongjin in North Korea to Vladivostock in Russia, into a trade and transport complex with 11 separate harbours, three international airports and an inland portrail zone. Most of the funding are sought from outside private investors and foreign assistance agencies.[5] There are three phases of development:-

In the first phase, Tumen River Economic Zone (TREZ), about 1000 sq. Km free district that includes North Korea's Rajin, China's Hunchun and Russia's Posyet. This zone is the core of the project and located at the mouth of the Tumen river. The second phase is the Tumen Economic Development Area(TEDA), with an area of about 10,000 sq. Kilometers located near the ocean that covers North Korea's Chongjin, China's Yanji, and Russia's Vladivostock. The third phase is an expanded region called Northeast Asia Regional Development Area that covers an area of 370,000 sq. km of the river valley and covering the border provinces of the three countries together.[6]

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5 Kaye, Lincoin, "Hinterland of Hopes", *Far Eastern Economic Review*,.16 January,1992,pp.16-17; "Trade and Trade offs", Far Eastern Economic Review, 16 January,1992,pp.18-19.

6 Valencia, Mark J.,"Tumen River Project", *East Asian Executive Reports*, Published by East Asian Executive Reports, Inc. Volume 14, Number 2; Pg. 9.

North Korea agreed to establish Northeast Asian Bank with a Dutch Commercial Bank in the Tumen River Special Economic Zones. The bank is named ING Northeast Asian Bank and will capitalize 15 million dollars, out of which ING will hold 70 percent equity share and rest will be hold by North Korea.

One of the aspects of this project in the location of this region. The regional market encompasses nearly 300 million people, has a collective GNP of almost $3 trillion, and accounts for nearly one third of world trade. The multilateral involvement makes it a more reliable and promising project in terms of trade and investment in the Northeast Asian region. [7]

The area around the Tumen has vast resources of oil, minerals, coal, timber and farmland in large quantity. It also has ample sources of fresh water and flat land. The Russian area has large reserves of oil, coal and gas, as good source power, as well as huge mineral resources of gold, tin, diamonds, iron, phosphate, copper and molybdenum. China also has oil and coal reserves with other minerals like, magnesium, magnetite, molybdenum and magnates.

[7] Clifford, Mark. "Send Money: North Korea Appeals for Investment in Free-Trade Zone." Far Eastern Economic Review, 156 (September 30, 1993), p,72.

Mangolia contributes large amount of coal and North Korea has large ores of tungsten, graphite, gold, brite, mica and iron. [8]

One of the main aspects is this project is the availability of raw material especially the source of energy such as oil, coal and natural gas in the surrounding area of Tumen River, that could ensure energy supply not only to North Korea, but Northeast Asia as whole. It provides North Korea new opportunities to utilize the abundant resources like minerals, timber, petroleum of its neighboring countries China and Russia. Far eastern part of Russia has good energy resources like hydropower, petroleum, natural gas, coal and others. On the other hand China's Northeastern part that touches North Korea's border estimated to have 45 percent of petroleum and other minerals.[9] Therefore, $2 billion of its $30 billion target is assigned for the power development in this project.

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[8] Yuan, Shuren, Song, Deqing, and Tuan, Chi Hsien. "Geographical Position and Resource Combination of the Tumen River Economic Growth Triangle,"Paper presented at the Sejong Institute, August 4-5, 1994: 1-19

[9] Lee, Duk Hee, Industrial Location Planning in North Korea, *in* Yoon, Chang- Ho, and Lawerence J. Lau, (eds.), *North Korea in Transition: Prospects for Economic and Social Reforms*, Edward Elgar Publishing Limited, UK,2001.pp.279.

Rajin-Sonbong Economic and Trade Zone

Rajin-Sonbong zone was established in 1992 by North Korea with the adoption of wide ranging legislation to boost economic development and investment and transit-trade, primarily through the introduction of foreign investment. This economic and trade zone is a coastal zone at the Northern tip of North Korea.[10] It is a part of Tumen River Plan, that covers North Korea's Ranjin-Sonbong Zone, China's Yonbian Korean Autonomous prefecture in eastern Jilin Province and Russian far East's Southern Primrose territory (including Vladivostak and Nakhodka cities). This zone is a strategic shipment point for cargo between China and Japan. It was aimed to use North Korean and Russian raw material with Japanese and other foreign capitals, turned out product for sale world wide.[11]

It offered a unique set of comparative advantages over other Asian region. This area has a great importance as it offers competitive transit-trade opportunities to and from Northeast China and Siberia because of its geographical position, recent cross-boarder infrastructure and post development and deep ice free ports, natural resources and tourism

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[10] Kim, Icksoo, The Rajin-Sonbong Economic and Trade Zone(RSETZ): THE Sources of Difficulties and Lessons for the Future, *in* Yoon, Chang- Ho, and Lawerence J. Lau, (eds.), *North Korea in Transition: Prospects for Economic and Social Reforms*, Edward Elgar Publishing Limited, UK,2001.pp.301-302.

[11] United Nations Industrial Development Organization , /Annual Report on Rajin-Songbong, 1996.

opportunities. The zone offers tax incentives and relatively low land lease and labour costs. [12]

It is North Korea's biggest experiment with capitalism, where it has participation of many countries like Russia, China, Mongolia, Japan, South Korea etc. and has active involvement of United Nations Industrial Development Organisation (UNIDO), an UN agency. North Korea has setup Rajin Business Institute (RBI) and its Rajin Business Information Centre (BIC) in collaboration with UNIDO to modern business, financial and legal training as well as to provide up-to-date market information and reference services. In September 1996, Rajin-Sonbong Zone International Investment and Business Forum took place under the sponsorship of the UNIDO, United Nations Development Programme (UNDP) and the Korean Committee for the Promotion of External Economic Cooperation (CPEEC) that was visited about 200 delegates, investors and businessmen from the UNDP, the Chinese Governor, Denmark, Germany, the United States, Sweden, Singapore, Britain, Australia, Italy, India, Japan, Canada, Finland, Netherlands and other countries

[12] Zhu, Yuchao. "Northeast Asian Regional Economic Cooperation: Tumen River Area Development Project." International Studies Association Conference: February, 1995.

(26 in all) to promote the economic development of the Northeast Asian region and development of bilateral and multi-lateral economic cooperation.[13]

Joint ventures and wholly foreign enterprises have been established in telecommunication, transportation, tourism, banking, seafood processing and other services with Thai, Singaporean, Chinese, Russian, Japanese and overseas Korean investors. China has already invested over $ 120 million in infrastructure, and foreign companies had brought in nearly $ 100 million into factories and real estate. Foreign businessmen has already clinched $ 282 million in deals with North Korea.[14]

North Korea's efforts to invite foreign investment and seeking cooperation in developing its industrial structure is one of the major steps in opening its economy and restructuring its economic and commercial relations with the outside world especially with the advanced industrialized countries. It is continuously seeking opportunities and support in terms of latest technologies, finance and mutual cooperation. Energy is one of the key areas where it has great interest in early 1990s as it also had felt a great need of searching alternative sources of energy to sustain industrial activities and growing energy demands at home.

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[13] UNIDO Annual Report 1997.

[14] Lavalle, Michael P., "The Tuman River Development Area: A Future Trade and Transportation Hub in North East Asia", *Far Eastern Economic Review*, July,1997

Some have viewed that inception of these two projects have increased the demand of energy in North Korea. North Korea's opening efforts not only sought foreign investment in its territory, Northeast Asia has good resources of energy which could sustain and fulfill energy requirements of whole Northeast Asia. If this kind of economic cooperation progresses smoothly, power plant constructions to supply electricity is essential for the industrial establishments. It was one of the move which seemed to cater both needs foreign investment and energy cooperation for North Korea.

Chapter-3

Chapter 3

U.S –North Korea relations and Development of North Korea's Energy Sector

Towards the end of the 1980s, even as North Korea refused to participate in the Seoul Olympics, it was apparent that, it would have to initiate new set of policies to cope-up with the emerging profound changes in the world order in general and in the region in particular. In other words North Korea had to re-formulate its pattern of mobilizing resources and look for new sources of external assistance to sustain and strengthen its economy. It obviously realized that there was a need to diversify relations with advanced industrialized countries that would have to include its adversaries the United States and Japan. It therefore, had to look beyond China, Russia and East European countries and initiate measures to establish workable and sustainable relations with South Korea, the United States and Japan. It also had to go beyond the objectives and framework of interrelated projects (Tumen River Project and Rajin- Sonbong).

The prolonged, bitter and hostile relation between North Korea and the United States have hardly any parallel in history. Many have found it difficult to comprehend the basis of the persistence and intensity of confrontation

between two unequal states like North Korea and the United States. The disparities between states covers a range of areas including size, population, level of development, military might, weapons of mass destruction, place and role in the world politics, economy, trade, institution like UN and its subsidiaries, and participation in conflict situations. And yet an attempt has been made in the post-cold war era to evolve a framework which could be described as co-existence with confrontation and confrontation without conflict.

It is not that, the feelers and signals emerging from one side was not responded by the others side, to bring some improvement in the otherwise tense relations across the Demilitarized Zone (DMZ), where North Korean and American soldiers are engaged in an eyeball to eyeball confrontation. Even at the height of tension both sides tried to resolve the crisis situations on the basis of a realist approach. This was most clearly visible while handling such major developments like the Pueblo crisis of 1968 and the Axe wielding incident.[1] There were also a few attempts by both sides to allow unofficial contacts between the two sides.

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1 Krishnan, R.R., "The Pueblo Crisis", Paper presented at the Seminar on '*Crisis Management in International Politics*', School of International Studies, JNU, January 10-11,1974.

Until the 1980's the only official contact between North Korea and the United States was at the meetings of the Military Armistice Commission in Panmunjom inside the Demilitarized Zone. However the US military had played a key role in involving the UN politically and militarily during Korean imposed economic sanctions against North Korea. The US passports became invalid for travel in North Korea and US diplomats around the world were instructed to avoid contacts with their North Korean counterparts in the third countries. The US economic sanctions continued to increase as the table below indicates.

US Sanction against North Korea

Date	Related laws	Sanctions
January 28,1950	Export control act	Ban on exports to Korea
December 17,1950	Trading with the enemy act	Freeze on North Korea assets in U.S. announcement of the overseas assets control regulations, which virtually made a total ban on trade and monetary transactions with North Korea.
September 1, 1951	Trade agreement extension act	Prohibitions from giving MFN status to North Korea
August 1,1962	Foreign assistance act	Ban on grant of aid to North Korea
January 3, 1975	Trade act (1974)	Prohibitions from giving GSP benefits to North Korea
May 16, 1975	Export control act	Application of a comprehensive embargo on

		North Korea by the us export-import bank
October 5, 1986	Act on Ex-im bank	Prohibition from giving credits to N. Korea by the us export-import bank
January 20, 1988	Export control act	Listed as a terrorism supporting country, North Korea was subjected to bas on trade, grants by the GSP, the sale articles listed among the munitions control items, and aid and credits from the exports-import bank; u.s. instructions to vote against in case an international monetary institution was to decide on a grant of aid to N. Korea
April 4,1988	International arms trading regulations (revised)	Ban on sales of defense industry material and services as well as imports and exports with North Korea
March 6,1962	Munitions control items	Confirming North Korea was involved in giving missile technology to Iran and Syria, the us banned the exports articles listed among the munitions control items and the government's contract wit n. Korea for two years; application of these bans on all activities of North Korea related to the manufacture of missiles, electronics, space aviation, and military aircraft

Source: Zachary s. Davis et all, "Korea: procedural and jurisdictional questions regarding possible normalization of relations with North Korea," *CRS report* for congress (November 29,1994).

North Korea and the United States began to interact, when North Korea sent an open letter to the US Congress in April 1973, pointing out that since two Koreas were now conducting dialogue (as they did in 1971 and 1972) the United States should stop supplying weapons to South Korea and discontinue Joint Military exercise. The North Koreans made another approach in 1979, but again did not succeed. North Korea's Central People's Committee sent an open letter to the U.S. Congress proposing talks to negotiate a peace settlement. It was also ignored.[2]

In the late 1980s, the cold war rivalry between the United States and the USSR started fading. The end of cold war tilted the balance of world heavily in favour of the United States. The deepening crisis in the Soviet union and East Europe led many countries including Non-Aligned countries to reformulate and restructure their foreign policy and priorities. Korean Peninsula There was the year when Soviet Union started withdrawing itself from, the alliances covertly. This events created "power vacuum" in different regions of the world and forced many countries to readjust their foreign policies according to the emerging new world order. Korean peninsula also faced the same thing North Korea that had been a close ally of the Soviet Union during cold war tried

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2 Oh, Kong and Ralph C. Hassing, North Korea: Through the Looking Glass, Brooking Institution Press, Washington, D.C., 2000, pp.165-170.

cope-up with the changing realities and tried for self- dependency in many fields.

The first notable change in the U.S.- North Korea relationship came in the late 1980s, when in October 1988, the Reagan Administration slightly relaxed restrictions on trade and people to people exchanges with North Korea, and allowed US diplomats to meet with their North Korean counterparts in third world countries. From December 1988 to September 1993, North Korean and US officials at the political councilor level met in Beijing no less than thirty-forty times to discuss issues of mutual interest. The first breakthrough in the US-North Korean relations came with an announcement on 27 September 1991,by the US President George Bush that, the US would withdraw all tactical nuclear weapons, which also included those in South Korea from Overseas. This was for the first time that North Korea was given an assurance that Korean peninsula would be free of nuclear weapons. On 8 November 1991, South Korean President Roh Tae Woo announced that South Korea would Not manufacture, posses, store, deploy or use nuclear weapons and this was later confirmed on 18 December1991, He made a public statement that there were no nuclear weapons anywhere in the South Korea. President Bush also confirmed this statement when he visited South Korea and he also made

commitment not to use nuclear weapons against non-nuclear states that has signed the NPT.[3]

Towards the end of 1980s some measures were initiated to facilitate North Korean and the US rapprochement. It came against the backdrop of significant political changes in South Korea and announcement of a new Nord politik [4] of President Roh Tae Woo. The new policy sought to achieve diplomatic cross-recognition. South Korea would establish relations with communist states while encouraging non-communist states, especially the United States and Japan to improve relations with North Korea.

The policy seemed to have encouraged North Korea to re-structure North–South Korean relations. After several rounds of inter-Korean talks at the Prime Minister level and changing regional and international scenes led to the announcement of the historical agreement on "Re-conciliation, Non-aggression and Exchange and Cooperation" in 1991. The 25 article of Basic Agreement came to be described as "comprehensive, concrete agreement which took a historic and realistic view of both bilateral problems and found systematic ways and means to simultaneously improve political, systemic, economic, military dimensions and

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3 Ahn, Byung-Joon, "Arms Control and Confidence Building on the Korean Peninsula", *In* Andrew Mack ed. Asian Flashpoint: Security and the Korean Peninsula, ANU, Canberra, 1993,p.102.

4 For the Full text of the Policy see, Korea and World affairs, Vol. 12,No. 2, summer 1988, pp. 627-638.

international aspects of inter-Korean relations" [5] Not less significant was the conclusion of the six point "North-South Joint Declaration on De-Nuclearization of the Korean Peninsula" in 1992.

The US-North Korean relations improved only slightly as a result of the Beijing talks and Pyongyang became more eager to move faster towards establishing relations with the United States and Japan to compensate for its flagging relations with China and Soviet Union. Although North and South Korea had concluded the Basic Agreement and the De-Nuclearization of the Korean Peninsula Agreement and later North Korea signed the much delayed Safeguard Agreement Which allowed for the inspection of its nuclear sites to IAEA, there were doubts in some quarters, especially in the US about the North Korean nuclear programme.

The imprints of cold war still exist but the changing equations in regional and international brought in some positive developments. These developments can be seen in two ways. First the years from 1988 to 1992 have been described as the year of détente in the Northeast Asia. Détente became possible with the improving relations between four major powers involved in region namely the United States, Russia, South Korea and North Korea, in the

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5 Krishnan,R.R., Text of speech delivered at a seminar on "The United Nations, United States and Two Koreas: Changing Equations", at New Delhi on 23.03.1995.

second development North Korean nuclear development was viewed with alarm and as potential threat to peace and stability in the region.[6]

North Korean nuclear program started in 1965, when North Korea received its first nuclear reactor, a small (2 megawatt) medical and industrial research model from the Soviet Union at Yongbyon. A new 5- megawatt reactor was completed in Yongbyon. North Korea signed the nuclear non-proliferation treaty on the insistence of Soviet Union. The first sign that North Korea had an indigenous nuclear programme came in March 1984, when US satellite identified an apparent nuclear reactor vessel under construction at Yongbyon. The design of this reactor was not a proof that north intended to start on a nuclear programme. However, from March 1986 photograph began to show that construction of building typical of a reprocessing plant for separating plutonium. As North Korea was not signing the safeguard agreements, the credibility of North Korea came into serious doubts.[7] In may, 1989 the US central Intelligence Agency (CIA) claimed that it had evidence that North Korea had built a plutonium reprocessing facility at Yongbyon for

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6 Kirby, Stephen, " The Effects of Regional Power Factors on Inter –Korean Relations and Implications of the Nuclear Issue for the Northeast Asian Security Order" *in* Hazel Smith ed. North Korea in the New World Order, MACMILLION PRESS LTD, London, 1996, pp.53-73.

7 For details see Romesh Ratnesar, How Dangerous Is North Korea?, Times, January 13, 2003;Mack, Andrew, "North Korea and the Bomb", Foreign Policy, No.83 (Summer, 1991),

8 pp.89-91; Nuclear Weapon Program- North Korea, at http://www.fas.org/nuke/guide/North Korea/nuke/created by John Pike.

converting Nuclear waste into weapon grade material. In February 1990, a top secret KGB document revealed in March 1992, suggested that North Korea had actually completed a bomb. In the late 1980s speculations about a North Korean plutonium processing facility began to come in picture and raised the North Korean nuclear issue to an alarming level.

The importance of United States place on nuclear nonproliferation, the North Korean nuclear program drew Washington into dialogue. Pyongyang's first move was to insist that it would discuss its nuclear program only with the United States, not with the International Atomic Energy Agency or South Korea. US-North Korea hold talks at undersecretary level in New York in January 1992 and North signed the Nuclear Non-proliferation Treaty (NPT) and the IAEA's nuclear inspections began. When preliminary inspections suggested that North Korea was hiding some of its nuclear programs, the United States threatened to seek UN economic sanctions and insisted that North Korea should accept "Special Inspections" of the sort that had been imposed on Iraq. Historically, North Korea is the only country in the developing world, which faces direct threat from a superpower, from its very inception.[8] In response to this pressure and also as a result of the resumption of

[8] Spector, Leonards with Jacquelyn R. Smith, Nuclear Ambitions (Boulder: Westview Press, 1990), p.119.

the US-South Korean Team Spirit Military exercise in 1993. North Korea announced its intentions to withdraw from the NPT in March 1993.

North Korea's March 1993 announcement of its intentions to withdraw from the Nuclear Non-Proliferation treaty (NPT) increased proliferation threat to the world. Although North Korea's Nuclear Program was long viewed with serious concern by the US policymakers, the rejection of a demand by the Vienna-based International Atomic Energy (IAEA) that it allow a "special inspection" of two suspected nuclear waste sites at its Yongbyon nuclear facility before March 31,1993. North Korea not only rejected the demand for special inspections but it barred the IAEA from further routine inspections as well. It also refused South Korean demands to implement a December 1991 bilateral Denuclearization Agreement, which among other things provided for negotiation of a mutual inspection regime.[9]

The sense of crisis deepened in Mid-May, 1994, when North Korea began to remove the fuel rods in its 5-MW reactor without adequate monitoring by IAEA inspectors.[10] During their visit to Yongbyon in March 1994 IAEA inspectors reportedly found evidence of ongoing construction activity at a reprocessing facility that chemically separates plutonium from

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9 The evolution of this confrontation s described in more detail in CRS issue brief IB91141, North Korea's Nuclear Weapons Program (Periodically Updated) [By Larry A. Niksch]

10 Washington Post, May 7, 1994:A20.

spent uranium fuel.[11] The US Secretary of Defense William Perry indicated that North Korea was also constructing a 200-Megawatt reactor that theoretically could yield enough plutonium for as many as 10-12 nuclear weapons annually.[12] The Clinton Administration offered conditionally to hold the long-deferred third series of high-level talks to consider the whole range of Korean Peninsula issues, including economic, diplomatic and security benefits that North Korea might obtain if it agreed to place its nuclear program under international inspection and safeguards.[13]

During a series of negotiations with senior State Department officials in June, and July 1993, North Korea agreed to "suspend" its withdrawal from the NPT in exchange for the US. "assurance against the use of force, including Nuclear Weapons," and an American commitment not to interfere in North Korea's "internal affairs." Subsequent negotiations between Senior State Department Officials and North Korean representatives in December 1993 and early January 1994 appeared to have open the way for a one-time inspection of Pyongyang's seven declared sites to replace film and batteries in cameras and reestablish the continuity of the inspections regime.

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11 Far Eastern Economic Review, Mar.31, 1994, pp. 14-15

12 Thomas W. Lippman, Perry Offers Dire Picture of Failure to Block North Korean Nuclear Weapons, Washington Post, May 4, 1994, A29

13 Stewart Stogel, US, North Korea set to begin talks on Nuclear Dispute. *Washington Times*, May 24, 1994, A13.

It was viewed that the US Administration began to measure the pros and cons of pressuring and precaution in dealing with North Korea. The Clinton Administration indicated a 'Comprehensive Settlement" of the issue By which North Korea could restructure its relations with the US in a holistic manner that also addresses all the pending issues. The US government encouraged former President Jimmy Carter to visit North Korea for a discussion with Kim Il Sung in June 1994. Never before such a high ranking American dignitary had visited North Korean and held discussion with Kim Il Sung. It was also significant that North korea by acceding to the request of Jimmy Carter for a discussion demonstrated political and diplomatic tact in resolving an extremely sensitive and explosive situation. What was more surprising was that an agreement was reached between Kim Il Sung and Jimmy Carter to resolve the nuclear issue in a peaceful and phased manner. An announcement was also made that there will be a summit meeting between Kim Il Sung and Kin young Sam in Pyongyang towards the end of July 1994.

This visit provided two solid break-through in the resolutions of nuclear issue and prospects of improvement in inter-Korean relations. A package deal was discussed in Selig Harrison's proposal were pronounced by Carter.[14] On 8

[14] In this proposal Harrison had pointed out that North Korea would freeze its nuclear program in exchange for diplomatic recognition and a binding commitment to provide long-term credits for the purchase of light water reactors.

July 1994 North Korean leader Kim Il Sung died of heart Failure and it was feared that his death could this could jeopardize all the tentative agreements and good will created by Jimmy Carter during his meetings with the Kim Il Sung.

Contrary to the general assessments North Korea and the US began to take serious measures to give a concrete shape to the understanding that was arrived at between Kim Il Sung and Jimmy Carter in June 1994. Following a third round of talks in July 1994 the United States and North Korea reached a understanding and signed a historic agreement known as "1994 Geneva Accord" or commonly known as "Agreed Framework", which was signed in Geneva October,1994. The Geneva Accord was a landmark development in the peninsular politics and changing security scenario, as it determined the future course not only the US-North Korean Relations but also overall equation among the countries of the region. The Salient features of this agreement are discussed below-

I. Both sides will cooperate to replace the North Korea's graphite-moderated reactors and related facilities with light-water reactor (LWR) power plants.

II. The two sides will move toward full normalization of political and economic relations.

III. Both sides will work together for peace and security on a nuclear free Korean Peninsula.

IV. Both sides will work together to strengthen the international nuclear nonproliferation regime.

There are several features of the Agreed Framework that have been analyzed in great details. However, we shall be focusing on four features that have distinctive bearings with new approach that led North Korea to open its energy sector. It is first an agreement between two sovereign states that do not have diplomatic relations and have had a bitter and hostile relations for over five decades and yet sought to resume and redefine their relations by diversifying by directly linking external support for energy sector with North Korea's domestic nuclear energy programme. More specially , the US agreed to take the responsibility of helping North Korea its old Graphite Moderated Reactor into new Light water Reactors which were substantially enhance North Korea's energy capabilities and upgrade it to the international standards.

The 1994 Agreed Framework was the result of the US- North Korean rapprochement that became possible by a constructive role played by the both parties with support from other regional players especially South Korea.[15]

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[15] Harrison, Selig S, "Promoting a Soft landing in Korea", *Foreign Policy*, (106) spring 1997,pp.57-75.

The Agreement was the first document of its kind, where an effort had been made to link the issue of development of a major energy project in North Korea and that too, a nuclear energy project with a Framework for re-defining and re-structuring the relationship between North Korea and the US. One of the most striking feature of this agreement, the duration set by the both parties that would provide enough room and duration to understand and cooperate. It is only the initial phase of the agreement, if things turned well, it could work as a catalyst in opening other areas in the future and full diplomatic cooperation and interaction. Above all, for the first time in history , a country's nuclear programme was opened not by force but by the mutual cooperation and confidence-building measures.

North Korean facilities subject to the freeze included an operational 5 MWe experimental graphite-moderated reactor, a partially complete reprocessing facility, and a 50 MW power reactor under construction, all at the Yongbyon Nuclear Research center, as well as a 200 MWe power reactor under construction at Taechon, in North Korea. In return for North Korea agreeing to freeze and ultimately dismantle its nuclear program, the United States agreed to:

1) Finance and construct in the North Korea two Light Water Reactors (LWR) of the Korean standard nuclear power plant model.

2) Provide the North Korea with an alternative source of energy in the form of 500,000 metric tons of Heavy Fuel each year for heating and electricity production until the first of those reactors is completed. The LWR plant, consisting of the two LWR units, will be the first of its kind to be built and operated in the North Korea.

3) Conduct its activities in a manner that meets or exceeds international standards of nuclear safety and environmental protection.

4) Provides for the implementation of any other measures deemed necessary to accomplish the foregoing or otherwise to carry out the objective of the Agreed framework.

In support of these goals, KEDO was established on March 15,1995, when Japan, South Korea and the United states unanimously decided to implement the key provisions of the Agreed Framework and signed the agreement on the establishment of the Korean Peninsula Energy Development

Organization (KEDO). As KEDO's founding's members, these three countries constituted the Organization's Executive Board. However, KEDO's charter allowed for additional states and international organizations that support the purposes of the organization and offer assistance, such as providing funds, agreement also allows for expansion of the Executive Board on the basis of the substantial and sustained support to the organization.[16]

Its multilateral dimensions can be seen by the impressive list of its member nations In 1995, New Zealand, Australia and Canada joined KEDO by accepting the principles within the organization's character and in 1996 Indonesia, Chile and Argentina joined the organization. On September 19, 1997, the European Atomic Energy Community (EAEC) joined KEDO with representation on KEDO's Executive Board for a term to coincide with their substantial and sustained support. Later that year Poland joined. The Czech Republic and Uzbekistan became member in 1999 and 2000, respectively. In addition to its member states, KEDO has received material and financial support from nineteen other non-member contributing states.

Korean Peninsula Energy Development Organization (KEDO) was the implementation part of the 1994 Agreed Framework. The agreement is

[16] For the full text of the KEDO Charter and Supply, see Khil, Young Whan and Peter Hayes (Eds.) Peace and Security in Northeast Asia: The Nuclear Issue and the Korean Peninsula, (New York, M.E., Sharps, 1997), pp. 443-466.

structured in such a way that each step is sequential to the completion of the previous one and linked to strict adherence by the both sides. It was also set an example that how a cooperative and targeted international diplomatic effort can lead to the resolution of regional security and political crises, at the same time providing a model of how multinational staff can work harmoniously to accomplish organizational, professional and personals goals.

The Korean Peninsula Energy Development Organization (KEDO) is a unique in terms of the decisions and activities which are taken on the basis of international agreements and guided by political, technical and economic considerations these decisions are heavily depends on consensus, compromise, and confidence building according to the KEDO's charter, nationals of the executive board members are fairly represented among the professional staff with due regard to the important of securing the highest standards of integrity, efficiency and technical competence.

KEDO has a staff of approximately forty-eight people who are based in New York city with a representative office at the LWR construction site at Kumho, North Korea and it has foreign national from its founding members Government of Japan, South Korea and the United States with the European Atomic Energy Community. These four KEDO members constitute KEDO's Executive Board.

Seven Divisions and a Senior Policy Advisor operates under the direction of the Executive Director and Deputy Executive Directors: Policy and North Korea Affairs, Project Operations, Nuclear Safety and Quality Assurance, Financing and Heavy Fuel Oil, Geneva Affairs, Legal Affairs, and Public and External Promotion and Support.

The nature of the KEDO and its subsidiaries indicated that it was a very planned and crafted project. The Policy and North Koreas Affairs Division has the responsibility of coordinating of protocol negotiations and other contracts with the North Korea. The Project Operations Division is assigned responsibility for the design and construction of the light-water reactor (LWR) plants, while the Nuclear Safety and Quality Assurance Division manages all nuclear safety and quality assurance matters related to the LWR project. The financing and heavy fuel oil division was responsible for arrangement for the financing of the LWR project and provided the supply of heavy fuel oil (HFO). It was also responsible to ensure for delivery of HFO to North Korea. The General Affairs Division was to provide administrative support for the organization, in handling of non-LWR contracts, and budgetary matters. The Legal Affairs Division was to provide advise on issues of public and private international and domestic laws and direct the work of outside counsel. The Public and External Promotion and Support Division was responsible for the

efforts to build understanding and support for the LWR and HFO projects that also included relations with media. The US architecture/ Engineering firm, Duke Engineering and Services (DE&S) was to assist KEDO in implementation of the LWR project as a Technical Support Consultant (TSC).

KEDO was to play the crucial role of identifying the light eater reactor on terms of cost, latest technology, installation, training etc. even when it was agreed that the US would find ways and means to finance the project i.e. two light water reactors estimated to cost 4.5 billion dollars and the US was responsible to provide 500,000 tons of Heavy Fuel oil to North Korea till the first phase of the Light project is completed. It appears that the North Korean energy needs were considered before the finalization of this project. It gained international support and assistance which became instrumental in providing an opportunity multilateral involvement that led to the involvement of high stakes on part of the US and North Korea.[17]

Despite delays and setbacks the KEDO project was started. It appeared that the US-North Korean relations would take new shape in the coming years and North Korean energy sector would be restructured with the new technology and assistance. However, the US-North Korean relations began to

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[17] Kim, Sung-Han, 'Exploring Confidence-Building Measures in Northeast Asia; A Korean Perspective", *Korea and World Affairs*, Vol.21, No.3, Fall 1997.

deteriorated with the Union of States address on January 29,2002, President George W. Bush announced that as a part of its post-September 11 security agenda, The United States would seek to prevent terrorist groups such as al-Qaeda from establishing links with three regimes- North Korea, Iraq and Iran—that together form an "axis of evil." Bush declared that these regimes are intent on acquiring weapons of mass destruction (WMD) with which to threaten the United States and its allies.[18] The President Bush statement indicated a change in the US policies in the Northeast Asian. Unlike the Clinton Administration policy of engaging North Korea, Bush Administration emphasis on the tough measures to deal with North Korea.

Bush Administration has divisions and on the policies regarding North Korea. Bush Administration sees 1994 Agreed framework as blackmailing chip and wants tough talks with North Korea on its nuclear program. This evident after the events of 11 September 2001, when Bush Administration outlines new US Security Posture in 2001 *Quadrennial Defense Review (QDR).*

The problem started when the Bush Administration disclosed on October 16, 2002, that North Korea had revealed to U.S. Assistant Secretary of State James Kelly in Pyongyang that it was conducting a secret nuclear weapons program based on the process of uranium enrichment. North Korea

[18] The full text is available at http://www.whitehouse.gov/news/realeases/2002/01/2002012911.html.

admitted the program in response to U.S. evidence presented by James A. Kelly. New twist in the US-North Korean relations came when Senior American Diplomat James A. Kelly confronted North Korean counterparts with American intelligence data suggesting a secret project was under way and called North Korea to comply with all of its commitments under 1994 Geneva Accord.[19] By contrast North Korea not only acknowledged the existence of a nuclear program but also said it possesses "more Power Weapons as well". On 19th Oct. 2002, The US indicated that if North Korea doesn't follow the commitments it might scrap the 1994 deal.[20] North Korean Official said our country faced an immediate problem of in electric generation because the US has virtually abandoned its obligations and said that North Korea is reactivating its nuclear power plants closed under 1994 Agreement with the US.[21] The crisis deepened when North Korea Decided to reopen its nuclear facilities and ordered IAEA's staff to leave the country. Later North Korea also removed seals and other surveillance equipment placed by the IAEA. All this events cast their shadow on the future of North Korea- US relations and the future of KEDO. There are many explanation for the chain of events.

The Bush Administration's policy response to North Korean actions since October 2002 is based on two factors within the Administration. First,

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19 N Korea is building n- bombs, Hindustan Times, 17 Oct., 2002.

20 "US to scrap n-deal with N Korea", The New York Times, October 20,2002.

21 "N Korea Fires Up nuclear reactors", Hindustan Times, 13 December 2002.

President Bush has voiced profound distrust of North Korea and its leader, Kim Jong-Il. Second, there are divisions over policy toward North Korea among factions within the Bush Administration. New Bush Administration views 1994 Geneva Accord as compromise and North Korean nuclear program as blackmailing chips. The division in the Bush Administration over the question of North Korean nuclear program between conservatives supporting tough talks with North Korea and conservative pragmatists supporting engagement with North Korea.[22] The Bush Administration views Pyongyang as Washington's most dangerous immediate threat and Beijing as the most serious long-term threat. The US policies in the Northeast Asia lacks of consistency, on one front it is negotiating and engaging North Korea at the same time it is trying to containing it through strengthening its own and its allies military capabilities in the region.[23] Although containment and engagement has mixed, created confusion that has resulted in counterproductive outcomes. The US also showing duality in its foreign policies towards Northeast Asia as it appears self-contradictory position at one hand it guarantees, under the Agreed frame work, not to use or threaten to use nuclear weapons against North Korea on the other hand it is maintaining its

22 Scobell, Andrew, Crouching Korea, and Hidden China: Bush Administration Policy towards Pyongyang and Beijing, Asian Survey, Vol.42, No.2, March/April 2002.

23 Suh, Jae-Jung, The Two-War Doctrine and the Regional Arms race, Critical Asian Studies, Vol.35, No.1, March 2003.

military, under its defense treaty with south Korea, a nuclear umbrella over the South, threatening nuclear retaliation against the North Korea.[24]

At talks in Beijing among the United States, North Korea, and China, North Korea reportedly admitted that it possesses nuclear weapons. Pyongyang has aggressively defended its stance raising concerns that North Korea could join Iraq as the next targets in the United States war on terrorism and its sponsors.[25] It is Widely accepted that North Korean brinkmanship is to get permanent security guarantee from the Bush Administration along with economic aid as North Korea for many years demanding permanent peace treaty on place of truce agreement of 1953.

The US- North Korean relations have witnessed many ups and down over the years, the central issue is no doubt is North Korean nuclear program but North Korean demand of peace treaty, shows that there is a air distrust and suspicion between the US and North Korea. All these imponderables has put hurdles in the way of confidence building and peace efforts. These constrains resulted in the temporary halt to the Ongoing KEDO project which was to fullfill immediate North Korean energy demands. Unless, the security dilemma of the region is addressed seriously and some permanent solution is worked

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24 ibid.p.18.

25 Hiebert,Murray and John Larkin, "Consequences of Confession", Far Eastern Economic Review, October 31,2002, pp.14-19.

out, new constructive approaches would face diffulcties like KEDO. Confidence building and Peace initiatives may take some time but economic involvement such as KEDO should continue to address present energy and economic needs.

Summary & Conclusion

Summary And Conclusion

In the preceding pages an attempt has been made to examine the domestic and international dimensions of North Korea's efforts to develop its various energy resources especially its nuclear energy. It was felt appropriate to highlight some of the salient features of the pattern of domestic and international interaction as the energy sector evolved.

North Korea has assigned the highest priority and utmost significance to the development of its energy sector during the last five decades. Energy is the key to raise productivity in all economic activities. To sustain the economic development of a country, a regular and reliable source of energy is essential. The existing and expected sources of energy are an important determinant in formulating the economic policy of a country. The development of energy sector have formed the core of industrial development and its contribution to the overall development of North Korea.

In the preceding pages an attempt has been made to examine the energy sector of North Korea from 1945 to 1990. The period covers energy situation during Japanese colonial rule, Korean war and post-war period with various economic plans to understand the significance of North Korean energy sector.

This study has been divided into three chapters. The opening chapter presents an historical overview of energy sector development during the Japanese colonial rule in the first section of this chapter. The Japanese colonial rule from 1910 to 1945 was no different from the western colonial powers in terms of exploiting the human and material resources of the subjugated people. There was a shift in the Japanese policy in the early 1930s, the industrial growth in 1930s was based upon minerals resources and hydro-electric power. The development of electric power stations

which were in operation in Korea during the colonial era indicates that electric power was increased by fifteen times between 1910 and 1923, and by 1938 it increased to twenty five times in just 15 years. Another source indicates that "in 1929, Korea's electric power capacity was slightly below 48,000 kW and 72 percent of total energy was produced by thermal power plants. By 1938, electric power generating capacity reached 868,000 kWh, and of which 83 percent was hydroelectric. According to one source in 1940, the North Korean share of heavy industry production was 86 percent of the total for Korea. By 1944, it was producing 92 percent of total electric power, 88 percent of the total metallurgical output and 82 percent of chemical output.

In the second section of this chapter an attempt has been made to examine the damages caused by the Japanese to Korean industrial establishment and reconstruction in the post colonial era from 1945 to 1950. Korea inherited a deformed and destroyed economy as Japanese destroyed or damaged some industrial facilities, the list of damaged or destroyed, include 64 mines completely flooded, 174 mines partially flooded, six factories including the Sup'ung hydroelectric power plant completely destroyed and 47 factories partially destroyed. There was also some sort of technological vacuum, which unabled Korean to repair and restart those facilities as Japanese took away all the plans and other documents regarding these facility with them.

In February 1946, a North Korean Interim People's committee was formed to establish a Socialist economic system and the first priority was to implement land reforms and nationalization of industries. It is estimated that about 90 percent industrial enterprises were nationalized in 1946 and central economic planning was initiated. The main goal of the first two one year plans of 1947 and 1948 and two year plan of 1949-50 were the

restoration of the destroyed Japanese industrial facilities and expansion of the state's control over the commercial and transport sector

The place and role of energy in the North Korean national emblem is indicative of its economic priorities and their ideological stand. The national emblem adopted by North Korea bears the design of a grand hydroelectric power station that symbolizes "modern, independent industry resting on powerful heavy industry and working class". Economic grants and loans of total of 546 million US dollar and technical assistance in terms of dispatching and stationing a considerable number of technical advisors with expertise in different industries, was a crucial factor in North Korea's rapid restoration of its industrial capabilities. The volume of electric power generated in the North Korea had fallen to 3,934 million kWh in 1946 from 8,137 million kWh in 1944, it was soon restored in 1949 to 75 percent of its pre-liberation volume, or 6,131 million kWh.

The third section of this chapter deals with the destruction caused by the Korean war to the North Korean economy in general and energy sector in particular. Korean Peninsula witnessed a three year long devastating war, which started in June, 1950 and ended on July 27,1953. The war was a disaster for North Korea as, it suffered major destruction due to heavy bombing on its major cities, industries, agriculture, railways transport and all other spheres of national economy as well as educational, cultural and public health establishments. It was estimated that Power production in 1953 was 26 percent of the 1949, fuel 11 percent, metallurgical output 10 percent and chemical production 22 percent. The total industrial output in 1953 was only 64 percent of the 1949 amount. In 1944, the total electricity production for Korea, mainly from power stations in the north was about 5,800 million kWh and power stations were primary targets of the US bombing during the Korean War.

In the third section of this chapter, the main focus is on the economic plans covering a period from 1954 to the 1993 with the emphasis on the development of energy sector in various economic plans. The principle of "Juche" or self reliance sought to develop heavy industry and agriculture with indigenous resources. Energy sector was one of the key areas, where North Korea tried to focus from its beginning. It is clearly visible in their various economic plans. The three-year Plan (1954-56) was drawn for the rehabilitation and development of national economy and to restore the pre-war level in all spheres and to strengthen foundations of industrialization, that included major power plants which were destroyed or damaged during Korean war. The thrust area of the five-year Plan (1957-61) was to improve industrial output and an increase in the industries was achieved by building more than 1000 local factories with various capacities and major hydroelectric generating plants.

In the first seven-year plan (1961-67), the primary task for this period was to build heavy industry by developing the machine-building, chemical, fuel, power and ferrous metallurgical industries. By 1970, North Korea already achieved the mark of 16,500 kWh million of electricity that is clearly visible in the electrification of the countryside in North Korea. In 1958 it was 49 percent, by 1963, it reached to 71 percent and it achieved 100 percent by the end of 1970. The Six-Year Plan (1971-76) was carried to mass-produce large equipment for the high-capacity power-generating equipment, large-sized excavators for the coal mining and produced 28,000 million kWh of electricity (1975) at the ratio of five to five between hydroelectricity and thermoelectricity, 50 million tons of coal (1975). The growth rate between 1961 and 1975 remarkable in the gross output of electrical machines as it became 4.1 times, Generators increased to 13.5 times, Transformers 3.9 times, electric motors to 2 times and number of

technicians rose to 4.3 times. During these years innovation proposals were introduced in 23,320 items.

The Second Seven-Year Plan(1978-1984) was aimed to produce annually 56,000-60,000 kWh of electricity, 78-80 million tons of coal and to expand and consolidate the fuel and power bases in particular, for regular and reliable source of energy, thermal power stations were given more priority as they are cheap and also guarantee regular supply of energy during the dry season. During this period many hydro-electric and thermal power facilities were completed or planned.

North Korea has good reserves of different kind of coal like anthracite, brown coal, peat, low-calory and sapropelic coal. Coal is the major source of primary energy in North Korea, which holds 81 percent share of the total primary energy and 83 percent of the final consumption. North Korea has good number of rivers and lakes for the hydro-electric generation. There are no oil wells in North Korea. Oil and petroleum products have increased North Korean dependency on the outside world. All crude oil and some petroleum products are imported from China, Iran, and Libya. According to one estimate transport sector consumes a major fraction of oil products used in North Korea, around 70% of its petroleum, which is much higher than South Korea's 32 percent and Philippine's 58 percent. North Korea had considerable resources of Uranium. Starting in the mid-1960s, and with the technology assistance from the Soviet Union, North Korea built a research reactor (initially 2 kWt, later upgraded to 8 kWt) at Yongbyong. In the 1980s, it constructed its 30 MW Gas-cooled reactor, which is graphite-moderated and capable of using natural uranium. It was able to avoid relying on foreign suppliers for uranium enrichment technologies. It constructed a reprocessing facility at Yongbyong.

Electricity generation is primarily coal-fired and hydroelectric, in about equal proportions, with a small amount of oil-fired electricity

generation capacity associated with the oil refinery at Sonbong and in two other plants. According to an estimate there are 500 electricity generation facilities in North Korea, this includes 62 major power plants that operate as part of the interconnected transmission and distribution grid.

The problems in the energy sector cannot be seen, excluding other sectors of the North Korean economy. North Korean economy is facing a serious problem of stagnation or slow down in its performance in some sectors in the beginning of 1990s. There are many reasons responsible for this situation both, internal and external, North Korean GNP (Gross National Product) gradually increased gradually until 1990 to $23.1 billion but declined continuously to $21.2 by 1994, while its per capita income declined from $1,064 to $923 in corresponding years. There is also decline in North Korea's trade volume, it was $5.24 billion in1988 and declined to $2.11 billion in 1994. The termination of close trade relations with the former Soviet Union, fall of Eastern Europe allies and Chinese demands for transaction in hard currency, reducing crude oil supplies and refusing to write off debts had other implications for North Korea. North korea purchased 400,000 tons of crude oil 1990 and by 1991, it came down to 40,000 tons. The supply of crude oil has fallen to an annual average of 65 percent during the past five years. The oil shortage has severely hit the North Korean energy sector as whole but the entire economy.

Some of the internal factors that has affected energy sector inefficient infrastructure, poor maintenance, outdated technology, Equipment problems has affected North Korean energy sector to a great extent in the early 1990s. According to an estimate North Korea's 85 percent of hydroelectric facilities had been affected due to the floods in 1990s. There are many hydroelectric facilities in North Korea are reported to be of the "run-of-river" variety at thermal power plants The unified electrical grid in North Korea established in 1958. North Korean T&D

(Transmission and Distribution) system runs a fairly complex grid of 62 power plants, 58 substations, and 11 regional transmission and dispatching centers. According to a North Korean official estimate, losses in transmission and distribution system 16 percent of total power generation, where as the Ministry of Unification in South Korea estimates it to 50 percent .

It was therefore, not surprising that North Korea began to pay greater attention to developing its nuclear energy sector to develop its energy sector, meet the oil requirements especially during short and medium term and upgrade its technology was to work an frame work that would restructure its energy sector and simultaneously restructure its relations with the United States and other advanced countries. How to work out an acceptable equation between mutual interest and mutual cooperation of North Korea and the United States became the major concern of North Korea in the early 1990s.

The second chapter deals with two main aspects of the study. More particularly its focus is on the US-North Korean relations in the changed political and strategic environment, in other words this chapter examines the context and characteristics of the new paradigm or the changing equation between the US and North Korea and the development of the North Korean energy sector. The prolonged, bitter and hostile relation between North Korea and the United States have hardly any parallel in history. Many have found it difficult to comprehend the basis of the persistence and intensity of confrontation between two unequal states like North Korea and the United States. Until the 1980's the only official contact between North Korea and the United States was at the meetings of the Military Armistice Commission in Panmunjom inside the Demilitarized Zone.

The end of cold war tilted the balance of world heavily in favour of the United States. The deepening crisis in the Soviet union and East Europe led many countries including Non-Aligned countries to reformulate and restructure their foreign policy and priorities. Korean Peninsula was no exception to these changes. Towards the end of 1980s some measures were initiated to facilitate North Korean and the US rapprochement. The first notable change in the U.S.- North Korea relationship came in the late 1980s, when in October 1988, the Reagan Administration slightly relaxed restrictions on trade and people to people exchanges with North Korea, and allowed US diplomats to meet with their North Korean counterparts in third world countries. From December 1988 to September 1993, North Korean and US officials at the political councilor level met in Beijing no less than thirty-forty times to discuss issues of mutual interest. A series of meeting between the Prime Minister's of South and North Korea took place in alternatively in Seoul and Pyongyang during 1990.

It came against the backdrop of significant political changes in South Korea and announcement of a new Nord politik of President Roh Tae Woo. The new policy sought to achieve diplomatic cross-recognition. South Korea would establish relations with communist states while encouraging non-communist states, especially the United States and Japan to improve relations with North Korea. The policy seemed to have encouraged North Korea to re-structure North–South Korean relations. Three major aspects of what came to be described as "Basic Agreement" of June 1991 may be mentioned. The 25 article agreement could be described as a comprehensive document which took realistic view of the bilateral problems and suggested concrete measures to simultaneously improve political, systemic, economic, military, humanitarian aspects of inter Korean relations. Not less significant was the conclusion of the six point

North-South Joint Declaration on the De-Nuclearization of the Korean Peninsula concluded on 31 December 1991.

With the collapse of the Soviet Union and disintegration of the East European communist bloc the US principle concern shifted from containing communism to preventing proliferation of nuclear weapons, preventing the emergence of sixth nuclear weapon state and ensuring that those states that were signatories to the NPT also concluded safeguard agreements and allowed the nuclear sites to be inspected by the IAEA without hindrance. It is these considerations that seemed to have encouraged the US to support the North-South Basic Agreement and more importantly the agreement on the De-Nuclearization of Korean Peninsula.

Following the decision of the US to withdraw its tactical nuclear weapons from all over the world including South Korea and later confirmation by South Korean President that South Korea does not any longer posses nuclear weapons on its soil, North Korea seems to have been persuaded to jointly declare with South Korea de-nuclearization of the Peninsula and in conclusion of the safeguard Agreement. However, after some definite signs of improvement in the relations Between North Korea and the US throughout 1992, doubts and apprehensions were voiced by the South Korea and the US about North Korea's nuclear programme. North Korea repeatedly declared its position that it was developing its nuclear energy for peaceful purposes only. Suddenly, the nuclear issue caused serious strains in North korea-US relations. It appeared that the Korean Peninsula was once again on the verge of a major conflict following North Korea's announcement of its intention of withdraw from NPT with a view to safeguard its national security.

North Korean announcement came as a surprise to the parties that were directly affected and also the larger international community. This

was because never before a country which had signed the NPT and concluded the safeguard agreement threatened to withdraw from the NPT regime. The tension between North Korea and the US began to mount. However, the political leadership in the US and North Korea sought to defuse the tension.

The US government encouraged former President Jimmy Carter to visit North Korea for a discussion with Kim Il Sung in June 1994. Never before such a high ranking American dignitary had visited North Korean and held discussion with Kim Il Sung. It was also significant that North korea by acceding to the request of Jimmy Carter for a discussion demonstrated political and diplomatic tact in resolving an extremely sensitive and explosive situation. What was more surprising was that an agreement was reached between Kim Il Sung and Jimmy Carter to resolve the nuclear issue in a peaceful and phased manner. An announcement was also made that there will be a summit meeting between Kim Il Sung and Kin young Sam in Pyongyang towards the end of July 1994.

The news of the death of the Kim Il Sung on July 8 1994, raised some serious doubts about the internal politics and external relations of North Korea in the post Kim Il Sung era. Contrary to the general assessments North Korea and the US began to take serious measures to give a concrete shape to the understanding that was arrived at between Kim Il Sung and Jimmy Carter in June 1994. The world came to know of how far North Korea and the US had shown mutual understanding and commitment to resolve the nuclear issue in the "Agreed Framework" between North Korean and the US on 21 October 1994. The Agreed Framework is commonly known as Geneva Accord.

The Agreed Frame Work is structured in a way that "each step is sequential to the completion of the previous one and linked to strict adherence by both sides." North Korea was to be supplied with two Light

Water Nuclear Reactors for electricity generation in exchange for abandoning its existing graphite moderated nuclear research reactors. The two sides were to move toward full normalization of political and economic relations including reducing barriers to trade and investment. Both sides were to work together for peace and security. The Agreed Framework was to help in creating an atmosphere that would promote future dialogue. Both, sides to work together to strengthen the international nuclear non-proliferation regime.

In support of these goals, Korean Peninsula Energy Development organization (KEDO) was established on March 15,1995, when Japan, the South Korea and the US expressed their common desire to implement the key provisions of the Agreed Framework and signed the agreement on the establishment of the Korean Peninsula Energy Development Organization (KEDO). KEDO was to play the crucial role of identifying the light eater reactor on terms of cost, latest technology, installation, training etc. even when it was agreed that the US would find ways and means to finance the project i.e. two light water reactors estimated to cost 4.5 billion dollars and the US was responsible to provide 500,000 tons of Heavy Fuel oil to North Korea till the first phase of the Light project is completed. It appears that the North Korean energy needs were considered before the finalization of this project.

Its multilateral dimensions can be seen by the impressive list of its member nations- Unites States, South Korea, Japan, European Atomic Energy Community, New Zealand, Australia, Canada, Indonesia, Chili, Argentina Poland, Czech Republic and Uzbekistan. There are also nineteen non-member, contributing states giving material and financial support to this project. It is an open project that provides equal opportunity to interested nations.

The US-North Korean relations deteriorated when New bush Administration termed North Korea as "axis of evil" and viewed Agreed Framework as compromise and North Korean Nuclear Programme as bargaining chip. The Bush Administration Appears to view Pyongyang as Washington's most dangerous immediate threat and Beijing as the most serious long-term threat. The work progress of KEDO has been put on a halt as the US has suspended oil supply and assistance to the ongoing project.

The third chapter deals with the North Korea's efforts to open its economy in the past or in other words, it seek to analyse North Korean efforts to open its economy in the past before the emergence of the KEDO with emphasis on the nature of economic reforms and areas in which it sought cooperation and assistance. North korea's efforts to open its economy to include non-communist and advanced countries, began in September 1984, when it establish a Joint Venture Law followed by three implementing laws on the taxes in 1985. It has been argued by some that Kim Il Sung's visit to China in 1982, followed by Kim Jong Il's visit next year, were view to have a closer look at the Chinese pattern of opening its economy, especially the objectives institutional structures, priorities pace etc. and learn appropriate lessons from Chinese experience.

However, North Korea's attempts to open its economy didn't met with the positive response due to many reasons. It was only 1991, it achieved success with establishment of Tuman River and Rajen-Sonbong area as a free economic and trade zone. The indifferent response of outside power prompt North Korea to re-write the "Joint Venture Law" again in 1992, while allowing 100 percent direct foreign investment in North Korea. Since then, it has enacted tens of other laws and enforcement decrees, including the law for foreign enterprises and the land lease law to pave the

way for foreigners to invest in North Korea. One of the major conditions to promote foreign investment and economic activities is the supply of power. North Korea have to ensure that, it had cost-effective, uninterrupted supply of energy and other infrastructure variables, before it made efforts to open its economy to foreign investments for an accelerated diversified pattern of development.

The idea of a special development project in Tumen river region was mooted in 1989, in terms of forming a Northeast Asia economic cooperation bloc. The Tumen River Area Development Project (TRADP) was shaped by North Korea, China, Russia, Mangolia, South Korea and Japan to create free-trade zone in Northeast Asia. The involved countries and the UNDP planned a 20-years project, costing over $30 billion dollars, to transform the Tumen River area into the transportation and trading zones for Northeast Asia. Tumen project was planned to convert an area-from the Chinese town of Yanji to the sea of Japan and Chongjin in North Korea to Vladivostock in Russia, into a trade and transport complex with 11 separate harbours, three international airports and an inland portrail zone. Most of the funding are sought from outside private investors and foreign assistance agencies.

The area around the Tumen has rich resources of oil, minerals, coal, timbers and farmland in large quantity. It also has ample source of fresh water and flat land. The Russian area has large reserves of oil, coal and gas, as good source power, as well as huge mineral resources of gold, tin, diamonds, iron, phosphate, copper and molybdenum. China also has oil and coal reserves with other minerals like, magnesium, magnetite, molybdenum and magnates. Mangolia contributes large amount of coal and North Korea has large ores of tungsten, graphite, gold, brite, mica and iron. One of the main aspects is this project is the availability of raw material especially the source of energy such as oil, coal and natural gas in the

surrounding area of Tumen River, that could ensure energy supply to North Korea and Northeast Asia. For this purpose $2 billion are assigned to the energy development in this project.

Rajin-Sonbong zone was established in 1992 by North Korea with the adoption of wide ranging legislation to boost economic development and investment and transit-trade, primarily through the introduction of foreign investment. This economic and trade zone is a coastal zone at the Northern tip of North Korea. It offers a unique set of comparative advantages over other Asian region. This area has a great importance as it offers competitive transit-trade opportunities to and from Northeast China and Siberia because of its geographical position, recent cross-boarder infrastructure and post development and deep ice free ports, natural resources and tourism opportunities. The zone offers tax incentives and relatively low land lease and labour costs.

It is North Korea's biggest experiment with capitalism, where it has participation of many countries like Russia, China, Mongolia, Japan, South Korea etc. and has active involvement of United Nations Industrial Development Organization (UNIDO), an UN agency. North Korea has setup Rajin Business Institute (RBI) and its Rajin Business Information Centre (BIC) in collaboration with UNIDO to modern business, financial and legal training as well as to provide up-to-date market information and reference services.

Here we have three different aspects of North Korea in terms of its energy sector, North Korea and US relation and North Korea's opening efforts to open its economy. Although, it sounds strange, the main concern is the North Korean energy sector and its development efforts in various forms. North Korean energy sector is viewed on different level to ascertain its energy requirements and its efforts to cope-up with the available resources.

North Korean energy sector in initial phase of the Japanese colonial rule developed according to the colonial needs. In early phase its was mainly based on the conventional source of energy like coal and hydro electricity. The demand for energy rose in the 1930s as the Japanese decided to increase their industrial base by setting heavy industries, Korea provided suitable resources and opportunities to materialized them. Though Korea was one of the Japanese colonies, but the power development was far more better than any other colonies.

The damages and the destruction caused to energy sector by Japanese and Later by the Korean War soon recovered by North Korea with the assistance and technological from its friends and allies during various economic plans. Two decades of 1970s and 1980s were most significant decades for the energy development in the North Korean energy sector. During this time North Korea constructed and planned some of the major thermal and hydro –electric generating facilities. It also decided to use nuclear energy to secure a future needs of energy as it aware of the limited nature of the conventional source of energy.

In early 1990s North Korean energy sector started facing some serious energy problem due to changed political and economic dynamics in the regional and international level like end of cold war, disintegration of Soviet Union and East European allies, Chinese market reforms, which unabled North Korea to purchase oil and energy related equipment. Some internal factor like poor maintenance, lack of equipment, inefficient use of resources and old technology also affected energy sector to a great extent. Therefore, North Korea seemed to increased to pace of its nuclear energy sector, which attracted world attention especially of the US and its allies.

North Korean-US relations had long history of bitterness but in the late 1980s, it appeared that both started giving greater attention to each other. The motives of both appeared to be different but the ultimate goal

was to restructure and reformulate their relation on realistic approaches. North Korean nuclear programme became the prime concern of the US in the early 1990s and both tries to resolved through talks. One of the striking feature of the US-North Korean relations was that there was confrontation but without conflict. In 1994, North Korea opened its nuclear programme to the outside world after the signing of historic Agreed Framework signed between the US and North Korea and a mechanism was shaped to developed nuclear energy sector of North Korea by establishing Korean Peninsula Energy Development Organization.

This is significant in a way that for the first time a sincere efforts were made by the US and its allies South Korea and Japan to cater energy demands of North Korea without having any diplomatic relation. There are number of countries who are member to this project and providing financial and technical support to this project that indicates that its multilateral in nature. In other ward Opening of North Korea was to be seen as a window to look for new areas of opportunities and involvement. However, the air of distrust and lack of sincerity could miss the incoming opportunity and put hurdles to the ongoing project.

It not the first North Korean efforts to open its economy to the out side world, North Korea appeared to be sincere since two major projects i.e. Tumen River Project and Rajin-Songbong clearly demonstrate that North Korea is seeking foreign assistance and cooperation in developing its economy and its energy sector. Even these two Projects ensures some of the gains in its energy sector with the availability of energy resources like coal, natural gas and oil in the Russia , China and Mangolia. Mutual cooperation in development of these projects would also help in securing future energy needs in the Northeast Asian countries.

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