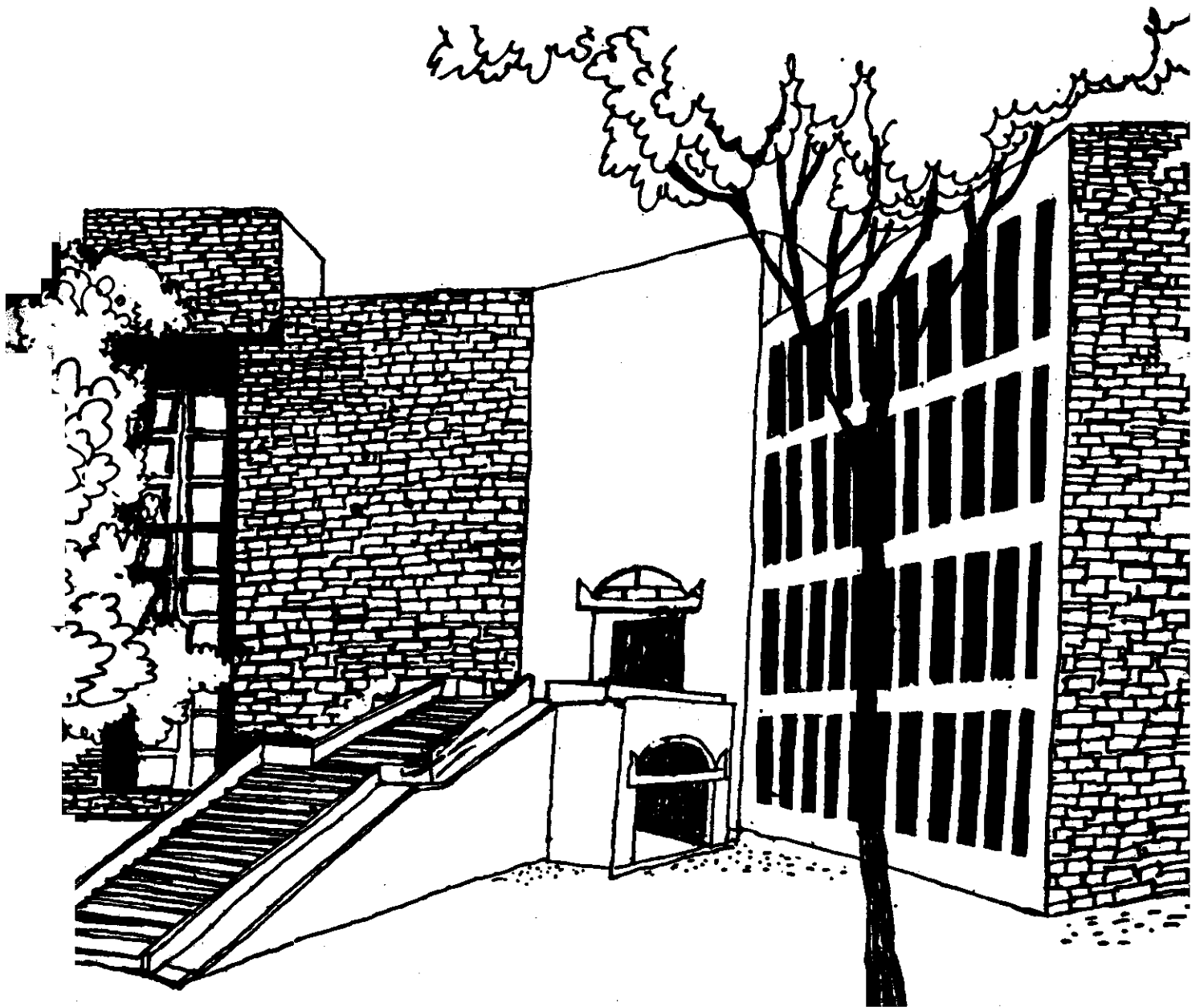




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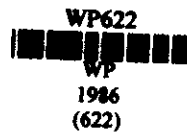
Working Paper



ENERGY AND DEVELOPMENT OPTIONS:
THE CASE OF INDIA

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ENERGY AND DEVELOPMENT OPTIONS: THE CASE OF INDIA

Energy is at the heart of modern industrial society. Energy could also be an effective fuel in the battle against poverty. Although the links between energy prices, energy demand and economic growth are becoming increasingly complex, there is a close correlation between the level of economic development and energy consumption. The standard of living is found to rise with increase in per capita consumption of energy. Thus, the two major determinants of energy policy for India are: first, the life style and a general development model the country desires to achieve. The crucial question that arises is: "Do we wish to go the Western consumerist way of high levels of energy consumption or should we prefer an appropriate level of energy consumption suited to our conditions? What is that appropriate level? Secondly, closely related to the first, the options we exercise in production technology in the energy consuming sectors would materially influence the order of energy demand.

In this paper, I plan to review the historical processes of evolution of energy policies in India in relation to her development plans since independence. Based on the review, I also attempt to assess the probable scenarios of India's development options in relation to energy parameters. For the sake of convenience as well as historical importance, the paper is structured into three distinct time periods:

First, from the Indian Independence in 1947 until the first oil crisis in 1973

Second, from 1973 to 1986 epitomizing the reactions and responses to the three oil shocks (1973, 1979 and 1986).

Third, the prospects in the future beyond 2000 AD.

TOWARDS EVOLUTION OF INDIA'S ENERGY POLICY:
1947-1973

Even though India gained independence on 15 August 1947, the planning for her development and exercising the options for development directions actually started with the First Five Year Plan (1951-56) in the fifties. In fact, the real planning for development options with a definite ideology, goals and world-view started in India with the Second Five Year Plan (1956-61). For, the First Plan was merely a continuation of programmes initiated earlier under post-war development schemes. It was conceived as a modest effort with the emphasis on correcting and controlling inflationary pressures and on restoring the economy to a position of balance.

Before going into the details of the Five Year Plans, it may be worthwhile to look into India's general economic conditions on the eve of the starting year of the First Five Year Plan (1950-51) (See Table 1).

The extremely narrow base of the Indian economy on the eve of launching the First Five Year Plan is strikingly clear. The First Plan could not but be a modest one, even if the planners and leaders would have wanted it to be ambitious.

However, it was interesting to note that even though no energy policy issues received any particular attention or considerations during the First Plan period, some specific energy problems have received unusually serious considerations from the Government and influential political leaders even before 1947. Among the energy related issues

Table 1: General Economic Situation of India in 1950-51:
Some Indicators

Item	Unit	Status in 1950-51
1	Population	Millions 361.8
2	National income at 1948-49 prices	Rs 10 million 8850
3	Per Capita income at 1948-49 prices	Rs 10 million 246
4	Public Expenditure:	" 960
	(i) Developmental	" 455
	(ii) Non-developmental	" 505
5	Balance of payments (current a/c net)	" +38.9
6	Agricultural production	1949-50=100 95.6
	(i) Food crops	" 90.5
	(ii) Other crops	" 105.9
7	Foodgrains	Million tonnes 50.0
8	Finished Steel	" 1.03
9	Cement	" 2.7
10	Electricity generated	Million Kwh 6577
11	Mineral Production (value)	Rs 10 Million 83
12	Availability of	
	(i) Foodgrains	ozs/per/adult/day 12.9
	(ii) Cloth	yds/per capita/year 11.7
	(iii) Electricity	Kwh/per capita/year 13.1
13	Railway traffic	
	(i) Route mileage	1000 miles 31.0
	(ii) Passenger train miles	Millions 95.5
	(iii) Freight carried	Million tonnes 91.4
14	Roads (National highways)	'00 miles 123
15	Aviation - miles flown	Lakhs 189
16	Shipping	'000 GRT 391
17	Total value of imports:	10 million 650.8
	(i) capital goods	" 132.1
	(ii) intermediate goods	" 332.7
	(iii) consumer goods	" 153.9
18	Total value of exports (excluding reexports)	" 596.1
	(i) capital goods	" 0.8
	(ii) intermediate goods	" 268.8
	(iii) consumer goods	" 315.2

Source: Basic Statistics relating to Indian Economy - 1950-51 to 1958-59, Planning Commission, Delhi.

popular with the Indian national leaders was the wasteful use of cattle dung as a fuel and the rapid rate of deforestation. In fact, contrary to customary talk of the energy crisis as if it was born in October 1973 with OPEC-initiated hike in crude oil prices, the energy crisis in India, like in many other Third World countries, started brewing much earlier. The factors that was leading to an energy crisis were:

- (i) Firewood shortage,
- (ii) Electricity shortages, and
- (iii) Scarcity of capital

The Indian national government, out of their concern about the two above-mentioned energy problems (cattle dung and deforestation) did examine these issues on several occasions in 1947 but no effective or sustained action was followed. After independence, the resolution of the Ministry of Food and Agriculture on National Forest Policy was presented to the nation in 1952. One of the six vital national needs identified in the resolution was the need for ensuring progressively increasing supplies of grazing, small wood for agricultural implements, and in particular of firewood to release the cattle dung for manure to step up food production. A nationwide campaign called the "festival of woods" or Vanamahotsava was started, which soon deteriorated to a mere ritual - a sad example of misuse of public funds for a good cause.

About the wasteful use of cattle dung, the problem faced by the policy-makers was lack of reliable quantified data about the level and pattern of consumption of fuels in rural as well as in urban households. In response, a survey was organized as early as in 1953.¹ Interestingly,

¹Domestic Fuels in India, NCAER, 1959, New Delhi.

the survey revealed a much larger dependence on cowdung than had been assumed. The study concluded that the only way of reducing dependence on the use of cowdung and firewood was by producing soft coke from low grade coals and supplying this fuel for cooking at subsidized rates. Although the study evoked lengthy discussions among the concerned implementing agencies in the government, no concrete action followed for two main reasons: first, heavy investment required to manufacture and distribute soft coke straining available transport capabilities. Secondly, while soft coke being a priced commodity, eventhough subsidized, the alternatives available to the rural people are the firewood and cowdung at almost zero private cost and therefore they could not be weaned away towards soft coke. Particularly for the large rural mass of poor, the priced soft coke would remain out of their reach.

Like most of the Third World Countries, India also followed the classical model of development plans, which are basically oriented to achieving a targetted growth in GNP in agricultural or industrial production. A rapid rate of industrialization of the country has been a central theme of the planning model in India from its very inception. Along with industrialization, for various geopolitical compulsions that a big country like India has to face, her development strategy has been overtly geared towards the goal of self-sufficiency and political independence.

Initially, the Indian development strategy was import substitution. The new industries that came in the wake of independence were mostly assembly and packaging plants. However, as mentioned earlier, the Second Five Year Plan (1956-61) first articulated the development model of rapid industrialization. There was deliberate and definite move towards heavy industries. The deliberate shift towards the goal of rapid industrialization as in most Third World Countries irrespective of different models of

development but goal being the same, seemed to inevitably result in a series of consequences each of which inextricably implies increasing consumption of commercial energy. The energy-intensity became woven into the process of development.

Throughout the decade of fifties and during the successive Five Year Plans, increasingly large amounts of public funds were required for investment in the energy sector, especially for increasing the installed capacity for electricity generation and for creating facilities for the transmission of electricity from the generating plants to the consumers, that is, mainly the industrial sector (See Plan outlays in Appendix I and also the table on selected economic indicators in Appendix II).

Though the rate of growth of industries has been moderate, the competition of growth, within the industries sector is worth-noting (see Table 2 and 3). The increasing share of basic and capital goods industries, particularly mining and manufacturing industries, has inevitably led to an increase of energy used in the industries sector. This is clearly evident in the growth of electricity consumption in the industrial sector as shown in Table 3.

Table 2: Indices of Industrial Production in India

Year	Basic Industries	Capital Goods	Intermediate Goods	Consumer Goods	All Industries
1956=100					
1960	166.9	150.1	123.7	114.6	130.6
1965	271.8	299.3	170.3	147.7	180.1
1960=100					
1965	164.3	244.2	140.1	127.5	153.8
1970	221.3	224.6	158.9	154.7	180.8

Sources: Statistical Abstracts, India, 1970, Central Statistical Organization, Delhi.

Table 3: Intensity of Industrial Electricity Consumption

Year	Industrial electricity consumption (TWH)	Industrial Production (1960-61 prices) (in Rs 10 million)	Electricity consumption per rupee of production (KWH)
1950-51	5.05	1192	0.424
1955-56	7.39	1569	0.471
1960-61	12.59	2138	0.589
1965-66	22.37	3041	0.735
1973-74	38.03	4020	0.946

Source: Energy in Indian Economy: A Statistical Profile, Commerce Annual Number 1977, Bombay, pp. 203-216.

It was the necessity for increasing the installed capacity for electricity generation to fuel particularly the growth engine of the industrialization process that led to a recognition that, "for some time that an adequate supply of energy would be a key factor and play an important part in the national development of the country. Any shortage of energy will hold up the national planned economy."²

Consequently, the government appointed the Energy Survey Committee (ESC), 1962 which may be termed as the first attempt in India to deal comprehensively with energy policy. The Survey Committee's task was to report the present and prospective demand and supply of energy, both total and with respect to the constituents of energy, on a national, regional and sectoral basis. Interestingly, the study was done essentially by a group of foreign advisers supported by some Indian staff. The report of the Survey Committee was made available to the Government in 1965.

² MR Sachdev, Chairman, ESC, in the forward to the Report of the Energy Survey Committee, 1965.

The conclusions of ESC studies were based on the fundamental assumption that the demand for total energy as well as the demand for specific fuel forms would be determined by the rate and pattern of economic growth and that the energy coefficients for different activities would change, if at all, only marginally over time. The only exception ESC made in its demand forecasting was in relation to the household sector indicating that, "the sources from which these increased demands for energy be met, involve matters of policy at least as much as of forecasting". Following the trend of the earlier years, 1953 to 1961, the ESC assumed that the demand for commercial energy in the household sector would double in each ten-year period, while the remainder of the energy needs of the households would be met by non-commercial energy.

Three alternative levels of demand projection were made by the ESC with varying assumptions of growth rate of GNP and industrial projections as follows:

<u>Case I:</u>	5% per year national income growth 7% per year industrial production growth
<u>Case II:</u>	6% per year national income growth 8.5% per year industrial production growth
<u>Case III:</u>	7% per year national income growth 10% per year industrial production growth.

Since the actual growth rate of GNP (3.5%) in the period 1960-61 to 1975-76 was below even the lowest rate assumed (5%), the ESC forecast for fuel consumption made in case I should be compared only with the realized consumption in 1975-76, as shown in Table 4.

Table 4: ESC Forecast and Fulfillment in Fuel Consumption

Item/Fuel	Coal (in mts)	Oil Products (in mts.)	Electricity (TWH or 10^9 KWH)
<u>End of Second Five Year Plan (1960-61)</u>			
Target of consumption	59.77	4.30	16.60
Actual consumption	55.70	5.70	15.60
<u>End of Third Five Year Plan (1965-1966)</u>			
Targets of consumption	97.00	11.72	38.70
Actual consumption	66.70	12.35	30.36
<u>End of Fourth Five Year Plan</u>			
Targets of consumption	93.50	26.00	70.50
Actual consumption	79.99	21.84	59.04

The ESC forecast of energy demand was proved to be vastly different from the actual. In consequence, the ESC's energy supply plan was also adversely affected. However, the evaluation of the ESC recommendations should be done in the following context:

Firstly, the ESC study was not to evolve an energy policy integrated into alternative development options. On the contrary, it was merely an exercise to forecast energy demand and supply sources given a particular development plan. In other words, it was an exercise for "demand accommodation" in the sense to find energy resources in order to meet a given energy demand arising out of a particular development plan. Thus, a given development plan affected the energy demand forecasts and energy

supply issues, rather than energy resource situations leading to a particular development model. To illustrate, ESC fully accepted the plans for the development of the steel industry and projected the demand for coking coal on the basis of the industry producing 14.7 million metric tons of finished steel in 1975. The actual level of production of steel in 1975-76 was only 7.65 million metric tons. This simple acceptance of steel production plan-target led ESC to recommend that almost the entire increase in demand for coal for power generation during 1965-75 should be met from coal washery by-products, which can be obtained during beneficiation of coking coal for use in the steel industry. In fact, the ESC concluded that almost all the thermal plants in the country should adapt themselves gradually to the use of washery by-products (See Table 5).

Table 5: ESC Forecast of Coal Supply for Thermal Power Generation
(Million Metric Tonnes)

	1960-61	1970-71	1975-76	1980-81
Non-coking	-	5.0	3.0	1.0
By-product	-	11.5	23.2	38.3
Total	9.1	16.5	26.2	39.3

Let us now examine the fate of some of the specific recommendations made by the ESC:

- (i) In order to reduce the costs of by-product coal, the ESC suggested that a two-product washery would be better than a three-product washery.
- (ii) The Committee suggested the use of closed circuit trains to transport coal to the power plants located at long distances at load centres from the washeries as against producing power at pit mouth.

- (iii) About oil supply, ESC's findings were that while kerosene and diesel oil demand would increase due to the demand from the transport sector, naphtha and motor gas would be in surplus, even if naphtha-based fertilizer plants were commissioned as proposed by the government. It was therefore recommended that the duties and taxes on motor gas be reduced to increase the level of its use.
- (iv) The Committee recommended the exploitation of hydroelectric resources as the cheapest method. About nuclear energy, the Committee considered the economic method of using thorium would determine its importance as a long term objective.

In each of the five-year plans that followed ESC report, most of its recommendations were hardly considered with any seriousness, if not, treated with shocking indifference. On the other hand, ESC seemed to have grossly underestimated the practical problems of using two-stage washery byproduct in thermal power stations, an idea which was ultimately rejected.³

On the other hand, while ESC strongly recommended the case for stepping up coal production, the government concluded in drafting the Fourth Five Year Plan (1969-73) in 1970, that transporting coal by rail over long distances would pose grave problems under the prevailing political conditions. The government therefore, approved the use of furnace oil instead of coal in southern and western India.

Similarly, in regard to ESC's recommendation for use of naphtha as the feedstock for fertilizer production, the government accepted the use of coal as feedstock for three large urea plants as suggested by the Fertilizer Corporation of India. Likewise, inspite of the strong recommendation for hydroelectric power, the share of thermal power has been increased on the ground that the gestation period for hydro-power was long.

³ Report of the Technical Committee on Coal Washeries (KSR Chari Ministry of Energy, 1973).

The most striking was the government's decision about the transport sector about which ESC gave much importance to railways. The draft Fourth Five Year Plan, without any explanation, projected a big increase in the share of road transport with a substantial fall in the share of railways.

The ESC report was submitted almost by the end of Third Five Year Plan (1961-66). It was during this period, following the Second Plan, two interesting politico-economic development took place in India. Firstly, the Second Five Year Plan with its obvious investment emphasis on industrialization attracted criticisms of neglect of agriculture and rural sector from many critics and politicians. The industrial development during this period could hardly absorb the rising rates of unemployment, the most nagging problem of the poverty stricken India. Coupled with this was the food problem for which India was increasingly becoming dependent on foreign food-aid.

On the other hand, India, like most of the developing economies, was inevitably committed to process of industrialization due to a number of politico-economic consideration. Firstly, with increasing rural-urban migration the search of jobs in the cities, industries were seen to be the best ways to absorb these millions of unemployed, which eventually proved to be totally erroneous expectations. Secondly, in order to check the inflationary impact as well as to meet the rising expectations for consumer goods partly through "international demonstration effect", it was felt necessary to produce more industrial/consumer goods to mop up the additional purchasing power. Thirdly, industry was perceived to have more export potential than agriculture in order to meet the increasing costs of imported energy. Lastly, but perhaps the most important, was the

fact that there existed a strong linkage between industry and governments tax revenue. Industry was seen as much higher revenue earner for the government as compared to agriculture, which, in fact, had been a poor tax gatherer. As a result, the government was expectedly interested in industrialization inspite of the fact that it was energy-intensive per unit of output and not a solution for unemployment and poverty in the immediate future. In India, for example, agriculture contributes 35 per cent of the GDP but consumes only 17 per cent of electricity, whereas industry contributes 19 per cent of GDP but consumes 60 per cent of electricity.

While the government was trapped by the compulsions of industrialization with concomitant increase in consumption of commercial energy, the food problem became serious in 1960s due to severe drought conditions. Up until early sixties, there was no agency charged with specific responsibility of looking after the problems of rural energy requirements in India. Although rural electrification was started with the launching of the First Plan (1951-56), it was the severe drought conditions and the consequent food scarcity which led to significant increase in plan outlay on rural electrification during the Third Five Year Plan (1961-66). It should also be noted here that it was towards the end of the Third Plan, precisely in 1966-67, we see the beginning of the intensive agriculture programme which ultimately led to the energy-input-intensive high yielding varieties programme, commonly known as "green revolution". In fact, it was in 1966-67 (Annual Plan), we see a major shift in national plan on rural electrification when the need to attain self-sufficiency in foodgrains production through coordinated rural development

programmes was given top-most priority. "Green Revolution" technology needing irrigation as one of the most essential inputs, the approach to electrifying rural areas was particularly directed towards pumpset energisation. Finally, at the inception of the Fourth Five Year Plan (1969-74), Rural Electrification Corporation (REC) was set up in 1969. With the setting up of REC, as many as 0.148 million villages were electrified and 2.435 million electric pumpsets were in operation by the end of Fourth Plan (1973-74).⁴ However, it must be noted that the increase in the consumption of commercial energy in agriculture with rapid expansion of high-energy input-intensive technology would continue to be well under comparable figure for industry.

Be that as it may, the impact of the development model pursued in India through successive five-year plans on energy consumption patterns in India over the two decades can be seen in the following three tables:

Table 6: Consumption of Commercial and Non-Commercial Energy (1953-54 to 1975-76)

Source	(in million tonnes of coal replacement)				
	1953-54	1960-61	1965-66	1970-71	1975-76
a Total Commercial Energy	60.4 (32.4)	101.2 (41.0)	147.0 (47.9)	197.3 (53.4)	252.7 (56.5)
b Total Non-Commercial Energy*	125.9 (67.6)	145.5 (59.0)	159.6 (52.1)	172.2 (46.6)	194.6 (43.5)
c Total	186.3	246.7	306.6	309.5	447.3

Figures in brackets are relative percentage shares.

*Excluding energy from draught animals.

Source: Fuel Policy Committee (FPC) Report, Planning Commission, Govt. of India, 1974.

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More than 80% of the electricity supplied to the rural areas is used for lift-irrigation through energised pumpsets. In fact, electrification of a village most often benefits a small number of large farm families, while for the majority of rural households the cost of electricity is beyond their reach.

Table 7: Share of Different Sectors in the Consumption of Commercial Energy (1953-54 to 1975-76)

Sector	(in percentage)				
	1953-54	1960-61	1965-66	1970-71	1975-76
Household	21.3	20.6	18.0	18.0	14.8
Agriculture	3.0	3.6	4.3	4.6	7.2
Industries	37.3	39.2	41.4	38.7	40.3
Transport	35.8	33.8	33.8	32.7	33.8
Others	2.8	2.8	2.5	6.0	3.9

Source: FPC Report, 1974

Table 8: Rate of Growth of Commercial Energy Consumption 1953-54 to 1978-79

Period	Average Annual Compound rate of Growth (%)			
	Coal	Oil	Electricity	Total Commercial Energy
1953-54 to 1960-61	5.0	9.1	12.1	7.7
1960-61 to 1965-66	5.1	8.0	12.6	7.8
1965-66 to 1970-71	(-) 0.2	8.3	9.7	6.1
1970-71 to 1975-76	6.3	3.5	6.3	5.1

Source: FPC Report, 1974.

Taking together the data on commercial and non-commercial energy consumption, some crucial observations about India's energy situation can be made. In 1953-54, more than half of the total energy consumed in India is from the so-called "non-commercial sources", mainly firewood, animal dung and crop residues. It is significant that the relative share of non-commercial energy in the total energy consumption has gradually diminished to the level of only 43.5%, in 1975-76 meaning substitution of non-commercial fuels with commercial fuels. However, over the two decades, there has been an increase in the absolute quantity of non-commercial energy consumed, growing at the rate of only 1 per cent per annum.

This means that during the two decades, the commercial energy consumption grew faster at 5.1 per cent per annum accounting an increase in relative share of total energy consumption from 32.4 per cent in 1953-54 to as high as 56.5 per cent in 1975-76.

In the period 1960-73, almost half (49.6%) of India's GDP originated in agriculture, while mining and manufacturing accounted for 14.7%. The remainder went to trade (12.1%), transportation (4.5%) and other services. Commercial energy was consumed largely in the industrial (mining and manufacturing) and transportation sectors. Interestingly, the share of commercial energy consumption in agriculture, even though accounting major fraction of GDP remained extremely meagre (rose from 3% in 1953-54 to 7.2% in 1975-76) over the two decades in spite of "green revolution".

As shown in the tables above, over the two decades of development path, the industrial sector (mining and manufacturing) has grown to be the major commercial energy consuming sector. The decade of the 1960's was the time when each one of the energy intensive industries was either established or was growing. The first petrochemical complex, for example, was commissioned at Bombay in 1966 by Union Carbide India Ltd. Two more petrochemical complexes started production in 1967 and 1968. The remainder of the plants began production after 1970. On the other hand, the fertilizer industry developed substantially only in 1973, almost in consonance with the 'green revolution'. The production of nitrogenous fertilizers in 1973-74 was 106,000 tons against only 9000 tons in 1950. Similarly, the paper and paper board industry expanded production only in 1961. Aluminium started its growth after 1965, while iron and steel production doubled from 1961-65. Along with the industrialization,

came the expansion of urban settlements and transportation sector resulting ever-increasing demand on commercial energy consumption.

In the years the commercial energy was available cheap and abundant, its increasing consumption helped usher in the very process of development path and life style that made increasingly the economy energy-intensive. Normally, it should not have bothered the planners and the government when commercial energy was extremely cheap and abundantly available. But what alarmed the government was the fact that from 1965 to 1969 coal consumption by direct use stagnated at almost the same level with only marginal increases in certain years, but oil consumption increased by over 50 per cent.

Coal being a major energy resource indigenously available in India, the planning exercises done in India was with the assumption that coal should be the principal source of commercial energy in the country. In actual practice, however, the pattern of fuel utilization in the economy indicated that it was developing in a manner inconsistent with the endowment of resources. In response, the Government set up the Fuel Policy Committee of India (FPC) in 1970 with the following terms of reference:

- (a) to undertake a survey of fuel resources and the original pattern of the distribution of fuels,
- (b) to study the present trend in the exploitation of fuels,
- (c) to forecast the perspective of demand by sectors and by regions and to study efficiency in the use of fuel and to recommends
 - (i) the outline of a national policy for the next 15 years,
 - (ii) a pattern of consumption and measures, fiscal and otherwise, that would help the best use of available resources, and
 - (iii) the measures and agencies to promote optimal efficiency in the use of fuels.

Interestingly, unlike ESC, the FPC and its technical staff were entirely comprised of Indian experts. The Committee submitted its interim report in May 1972, which covered the forecast of energy demand for the Fifth Five Year Plan period (1973-78) and a short-term policy prescription. The final FPC report was submitted in August 1974.

But even before the final FPC report was available to the Government, something epochal and drastic happened to the World energy situation, which is now commonly referred to as "energy crisis". It was born in October 1973 when OPEC-countries sharply increased the crude oil prices. This "energy crisis" created convulsions which in the first round were disastrous for India.

1973-1986: RESPONSE TO OIL-PRICE SHOCKS

At the time of the birth of oil-crisis in 1973 October, India's Fourth Plan was coming to an end. A draft of Fifth Five Year Plan (1974-79) was prepared and published and was to be launched in April 1974. But the oil price hike and its effects upset the basis of all calculations including FPC forecasts on which the plan was prepared. The full impact of this first oil shock became clear in 1974-75. There was a sudden increase in the deficits in India's current account balance, from \$ 486 million in 1973 to \$ 1458 million in 1974, \$ 1570 million in 1975. India imports almost two-thirds of its oil requirements, and the import bill for oil rose from \$ 447 million in 1973 to \$ 1300 million in 1974 and \$ 1350 million in 1975. This was paralleled by an almost similar rise in the fertilizer import bill, from \$ 205 million in 1973 to \$ 450 million in 1974 and 1975. While oil and fertilizer accounted to 21% of

all Indian imports by value in 1973, this figure jumped to 35% in 1974. The Indian industry met with recessionary phase beginning from latter part of 1974, in which the after effects of oil price hike had some definite share. As a result, many industries fell sick. The increase in oil price also imposed severe strains on the transport sector, particularly railways and truck transports. Railway passenger fares had to be raised by 20 to 33 per cent in 1974-75 and freight rates by 5 to 11 per cent. The worst was the price hike of kerosene - the fuel for the poor, kerosene price went up by 27 per cent. The large mass of poor had no option but to revert back to consuming more of firewood, dung and crop wastes for direct burning, aggravating further the firewood crisis.

India's second attempt to evolve a national energy policy through the Fuel Policy Committee (1970) should be examined in view of 1973's 'energy crunch' and its after-effects. Like ESC, the FPC also relied primarily on the data generated by the surveys carried out by NCAER in 1958 and 1962. Similarly, like ESC, the FPC's forecast of energy demand, was essentially determined exogenously in relation to specified pattern of development plan and growth targets. However, there were three distinct differences between the approaches of ESC and FPC. Firstly, the FPC also referred to the data of the 18th and 28th rounds of National Sample Surveys in addition to NCAER surveys, which gave very important insights into the trends of energy consumption in the domestic sector. Secondly, FPC showed more concern for altering the pattern of fuel demand in future with reference to the resource endowments. This means that even though FPC assumed energy demand as the derivative from the given plan of economic development, it made the first attempt in India to project different patterns of fuel consumption that could sustain a

given level and pattern of growth. To this extent, FPC recommendations were not merely an exercise for "demand accommodation" but to a limited extent a "demand management".

Thus, the FPC like ESC considered coal as a principal source of commercial energy in the country, and its all recommendations were oriented towards maximum exploitation and utilization of coal for meeting the energy demand. In order to achieve this goal, all fiscal and administrative measures suggested by the FPC were mostly aimed at a reduction in the use of oil products. The reduction was suggested to be obtained by:

- (a) price elasticity of demand with respect of certain oil products, such as motor gas;
- (b) increased efficiency in the utilization of oil products resulting from fiscal and administrative proposals, and
- (c) substitution of other energy forms in place of oil.

Taking into the possible energy saving due to various suggested feasible substitution and conservation programmes, the FPC made an Optimum Level Forecast (OLF). Thus, by the year 1992-93, India could hope to reduce the consumption of commercial energy to the tune of 108MTCR representing about 14.2 per cent (See Table 9). The savings of 14.2 per cent did appear to be significant, but certainly not easy to achieve.

The FPC recommendations seemed to be more pragmatic and sensitive to the "energy crunch". It certainly acted as the precursor for future energy policy directions in India. Such being the case, it is significant to note that for the first time the vital importance and role of renewable energy sources have been incorporated in an official policy document with due emphasis. The FPC report did not envisage any

Table 9: Energy Demand Forecasts

(in million tonnes of Coal Replacement i.e. MTCR)

Energy Sources	Forecasts*						Savings in %
	1982-83		1987-88		1992-93		
	RLF	OLF	RLF	OLF	RLF	OLF	
1 Coal	96.8	96.8	131.5	128.0	186.6	170.0	8.9
2 Oil**	165.1	163.8	217.1	197.6	290.6	290.5	17.2
3 Electricity	128.3	128.3	191.2	173.6	282.0	241.0	14.5
<u>Total Commercial Energy</u>	390.2	388.9	539.8	499.2	759.2	651.5	14.2
4 Firewood	132.7	132.7	131.8	131.4	127.3	124.4	
5 Agricl.Waste	40.8	40.8	40.6	40.8	39.2	40.8	
6 Animal dung	30.6	30.6	30.4	30.6	29.3	30.6	
<u>Total Non-Commercial Energy</u>	204.1	204.1	202.8	202.8	195.8	195.8	

Source: FPC Report (1974)

* RLF - Reference Level Forecasts following past trends without any cogent energy conservation policy.

OLF - Optimum Level Forecasts following implementation of suggested conservation, and substitution programmes.

**Includes only quantities used directly for energy use.

substantial change in energy consumption in the domestic sector, particularly in rural India, a large part of which was projected and continued to be met by renewable energy sources. In this regard, the FPC made a number of suggestions such as, popularizing biogas plants, setting up of social forests (also recommended by National Commission on Agriculture in 1977), and increasing the efficiency of cooking appliances in the household sector.

Apart from energy supply and demand issues; the FPC suggested a number of fiscal, administrative and organizational interventions, which influenced a number of future policy decisions in India, about which we would discuss later in the paper.

Perhaps at this stage it must be asserted that the above analysis of FPC report should not mean to suggest that it was a document of energy policy in India which gave an alternative development plan other than the given five year plans. In other words, as a rational energy policy, the FPC report did not produce an alternative plan for various energy consuming sectors as a demand-management strategy given the level of energy-resource endowment. The FPC was fully aware of its shortcomings and limitations and therefore recommended that the energy policy be reviewed periodically at least once in every three years. The government approved the general recommendations of the FPC and the broad outline of a national energy policy for India as suggested in the report.

In a strict logical sense, the ultimate consumers of energy are the individuals of families. Consumption of energy by other sectors like

industry, transport etc. is also in fulfilment of demands by the final consumers. Thus, the pattern of energy consumption is what a development model of the government in power wants to provide to the final consumers, for political reasons or otherwise. In the Third World Countries like India, it is the Government itself which is the conscience-keeper of the consumer. For, it is the government through various means of fiscal or monetary measures and by direct physical controls and subsidies, try to safeguard the interests of the consumers. Hence, when far too important a matter like the energy crisis arises, it is only to be expected that the Government of India would respond with policy-packages calculated to mitigate its adverse impact. The acceptance of the FPC recommendations and policy outline by the government of India was perhaps the timely and expected immediate response.

However, for India, it took almost a full year of 1974-75 to regain the balance to some manageable extent after the October 1973 oil crisis. Some of the policies and programmes in response to the oil crisis in 1973 that were set in motion in India in order to regain the balance would be worthwhile to note:

- (1) Cheap oil dissuaded Government of India from research and development and explorations of new oil fields which was not found to be economic. The oil price hike in 1973 made the whole operation a highly desirable and economic activity, given the country's thrust on self-reliance in oil requirements. The case of Bombay High off-shore oil field is the striking example in this regard. The presence of oil in Bombay off-shore was clearly indicated as early as in 1963 through geo-physical surveys. It had to wait another seven years for detailed seismic surveys to confirm the oil availability. Work began in real earnest only after OPEC-oil price hike. The Bombay High started yielding an output at the rate of 7.2 million tonnes in 1973 and increased to 12.5 million tonnes in 1978-79. Since then India has been pursuing an intensive search and oil exploration programme and the plan outlays for such programme has been substantially increased in the successive five year plans.

- (2) Another obvious response of the Government of India was to boost her export earnings in order to meet the foreign exchange requirements mainly to import oil and oil products. The development programmes and increased consumer expenditure in the OPEC-countries helped in the process. During the period 1974-75 to 1976-77, India's exports continued to grow at rates higher than the growth rates of world exports. Exports to OPEC-countries rose by 261 per cent from \$ 216 million in 1973-74 to \$ 782 million in 1976-77. Apart from exporting goods, India also took the advantage of her technical manpower and industrial experience in providing consultancy services to a number of valuable projects in the OPEC-countries, such as, Tripoli Power Project in Libya (\$ 113 million), a housing complex in Dubai (\$64 million), and a water filtration and treatment plant in Iraq (\$ 10 million). In fact, by 1980 India was reported to emerge as the second largest supplier (next only to Japan) of goods and services to Middle East, in the face of stiff international competition from many developed countries.
- (3) The Government of India cultivated a very congenial relationship with OPEC-countries, as a result of which these countries started providing financial assistance to establish in India industrial projects. Output of these projects were to be exported back to OPEC-countries. A typical example was the Kudremukh Iron Ore Project for which Iran extended a credit of \$ 630.
- (4) Another coincidental development was the increasing number of Indians working abroad. Again, the development process in OPEC-countries was the main contributory factor. The remittances from the Indians working abroad increased manifold. In fact, the exchange reserves of India have been dramatically increasing from the low of \$ 0.8 billion in 1975 to \$ 2.6 billion in 1976, \$ 4.7 billion in 1977, and over \$ 7.0 billion in 1980.

With all these coincidental and some deliberate processes coupled with four successive good monsoons from 1975 to 1978 resulting good agricultural yields helped India consolidate her position and saw the end of the tunnel of energy crisis of 1973. Given the high energy-intensive development path of industrial growth and 'green revolution' agriculture that was set in motion for the past two decades, it was almost impossible, both politically as well as economically, to cut down the commercial energy consumption drastically.

In fact, India's response has been to maintain the same level of energy consumption if not to increase. The choice was simply between disaster with drastic slowing down of growth and maintaining the same level of growth (if not higher level) at any cost. The Government of India apparently chose the latter path and it was greatly helped in the process by the development process in OPEC-countries. This does not, however, mean that there were no changes in policies and programmes on energy supply and demand within the country. A number of significant changes and policy steps were initiated in the domestic scene as well. Some of the critical policy measures are described below.

Firstly, the oil shock of 1973 and its after-effects did make people of all walks of life greatly aware of the importance of 'energy management'. This was particularly true for the industrial consumers who had to live with a sanctioned overall load and power cuts. Hence, without conservation or power management, expansion of industrial output was not possible. However, one of the common responses of the industrial consumers was to install captive diesel-power generating sets. Since these captive generating units were fossil fuel based and less fuel-efficient, the policy makers in India discouraged this development. However, seeing no prospect of relief in the power front, the Government had to accept self-generation as a practical compromise and even offered to give incentives. Such was the compulsion of the urban-industrial growth model of development!

Secondly, the Government took certain important policy decisions regarding transport sector. Prior to the energy crisis dieselisation of railways was clearly the trend favoured. With the oil price hike, the life of the coal-fired locomotives was extended where possible along with a definite

move towards electrification, which could be supported by inferior-grade coals or hydro-electric resources. In regard to passenger cars, motor-spirit prices were increased three-fold along with various incentives, disincentives and at times physical restrictions. As a result, there was a substantial savings in the consumption of furnace oil (due to substitution of coal) and motor-spirit (as shown in Table 10 below).

Table 10: Conservation of Furnace Oil and Motor Spirit

(in million tonnes)

Year	FURNACE OIL			MOTOR SPIRIT		
	Trend Consumption	Actual Consumption	Saving (per cent)	Trend Consumption	Actual Consumption	Saving (per cent)
1974	4.8	4.3	10.7	1.7	1.3	25.4
1975	5.1	4.3	15.8	1.8	1.3	28.8
1976	5.4	4.2	21.6	1.9	1.3	29.6
1977	5.7	4.0	29.2	2.0	1.4	29.8
Total	21.0	16.8	19.8	7.4	5.3	28.5

Source: "Energy in Indian Economy", Commerce, Bombay, Annual Number, 1977

Lastly, but a very significant response of the Government of India was to vigorously push for research and development and promotion of alternative renewable energy sources, such as, biomass, solar, wind etc. Following FPC recommendations, there was a specific provision in the Fifth Five Year Plan outlays for research and development of new and renewable sources of energy under the head of Scientific Research (see Appendix I). The Department of Science and Technology, Government of India, initiated a number of coordinated research programme on renewable

energy technologies. As regards promotion of renewable energy technologies, a big boost was given to the popularization of biogas plants in rural India. Although initiated as an official scheme in early sixties, the biogas promotion gained momentum only after the energy crisis set in 1973. During the Fifth Plan (1975-80) itself, a national project for biogas development (NPBD) was launched with a target to set up 1.5 million plants by 2001, as against the existing 45,000 plants set up during the past two decades. The emphasis and importance given to renewable energy technologies as additional sources of energy was perhaps one of the most positive and determined response of the Government of India in relation to the first oil shock of 1973, which carried the seeds of alternative development modal with a long term socio-political and economic impact.

However, it should be noted that prior to 1978, India's attempts to formulate a national energy policy have generally been reactive in the sense that it was in response to some specific issues or problems. It was only in 1978, the Government of India began a series review of its energy policy - a process strongly recommended by the FPC.⁵ Some of the issues that received special attention in this review were the questions of rural energy supply, conservation of energy resources and the administrative arrangements required for effective implementation of policies in the energy sector. The report of the review studies was submitted to the Government by the end of 1979. During the course of the review, two important development took place which had significant bearings on

⁵ Report of the Working Group on Energy Policy, Govt. of India, Planning Commission, New Delhi, 1979.

the outcome or recommendations of the review report. Internationally there was a major dose of oil price hike administered since January 1979 - the so called "Second Oil Shock". Domestically, the Fifth Plan was coming to an end and the draft Sixth Five Year Plan (1975-80) was under preparation. India's response to the "Second Oil Shock" should therefore be analyzed in relation to its approach to the Sixth Plan.

It seemed that the "Second Oil Shock" of 1979 was indeed a rude shock to the Indian planners and policy makers. Energy became a critical determining factor for the kind of development path that the Sixth Plan to follow. In spite of all politico-economic compulsions that the last two and half decades of development strategies had imposed on India, some significant aspects of the economic policy frame in the Sixth Plan were clearly oriented towards energy conservation rather than "demand accommodation". Thus the draft of the Sixth Five Year Plan (1980-85) stated:⁶

"The energy crisis precipitated by the sharp increase in oil prices in 1973-74 brought to the fore the imperative need to formulate an energy policy framework within which the rate of growth and pattern of energy consumption that could be regulated, the fossil-fuel reserves of energy conserved and measures taken to develop replenishable sources of energy. The demand for energy cannot, it is obvious, be allowed to grow in an unrestricted manner. The new industrial strategy of shift from the capital intensive to employment-oriented technologies and decentralisation of production, wherever feasible, is designed to achieve, as one of its objectives, a restraint on further increase in the intensity of energy consumption in industry. While the overall objective will be to maintain a low energy profile, special endeavour will be made to ensure that the energy requirements of the agricultural sector are fully met".

⁶ Draft Five Year Plan, 1978-83, Govt. of India, Planning Commission, New Delhi, Chapter 10, Energy, p. 162.

Thus the Sixth Plan outlays with emphasis on employment-oriented labour intensive technologies, small-scale decentralized cottage industries and with high priority on agriculture and rural development were clearly intended to have energy conservation effect (See Appendix I for Sixth Plan Outlays). In fact, so compelling was the shock of the Second Energy Crisis of 1979 that even when there was a change in Government at the Centre⁷, there hardly was any change in the plan approach. The new Government's Presidential opening address to the Joint Session of Parliament on January 23, 1980 declared:

"We are entering a period of rising energy costs and likely shortages of supplies. The Government proposes to evolve a comprehensive national policy on energy with emphasis on fuller utilization of renewable energy sources, traditional and non-traditional".

The Sixth Plan was significantly noteworthy for its official emphasis on renewable energy sources on a permanent footing. There was a separate head on new and renewable energy sources of energy in the Plan outlay under the broad head of Energy - a feature to be continued to the Seventh Five Year Plan (1985-90) (See Appendix I). The renewable energy with much enhanced targets became an integral part of the Prime Minister's 20-point development programme announced in 1981. At the same time, in order to provide an organization identity, a Commission of Additional Sources of Energy was created in 1981 followed by setting up in 1982 an exclusive administrative unit, the Department of Non-Conventional Energy Sources (DNES) under the Ministry of Energy. Like the national programme on biogas development (1975-80) programme, a massive national

⁷ Mrs. Gandhi's Congress (I) came to power in place of Janata Party Government.

programme on social forestry and improved cooking stove were initiated. On the other hand, there were mass demonstrations and experimentations on other renewable energy sources, like wind, solar, and biomass, tidal etc.

Of particular importance to note was India's response to fuelwood crisis. With the second oil shock of 1979, the fuelwood crisis became extremely acute and environmentally disastrous. A Fuelwood Study Committee of the Government of India was set up in 1982.⁸ The Committee observed in its report that against the present requirement of 133 million tonnes fuelwood per annum, the recorded annual production from forest lands was only around 15 million tonnes. With all the current production taken into account, there still remained a gap of about 94 million tonnes in the annual requirement of fuelwood. The gap could jump to 120 million tonnes by the year 2000 AD. The accelerated afforestation programme through social forestry schemes was recommended to be the answer to bridge the demand gap.

Meanwhile, following the recommendations of FPC (1974), reiterated by the Working Group on Energy Policy (1979), which felt that energy planning and policies were matters requiring continuous attention and therefore should have distinct organization identity, the Advisory Board on Energy was set up in 1984 to make energy demand and supply projections for the next twenty years.⁹

⁸ Report of the Fuelwood Study Committee, Govt. of India, Planning Commission, Delhi, March 1982.

⁹ For details of these projections, see, "Towards a Perspective on Energy Demand and Supply in India in 2000/05", Advisory Board on Energy, Govt. of India, Delhi, May 1985.

Given the growth-oriented high-energy-intensive development model that India had been pursuing for the last two and half decades, the policy responses towards 1979 oil shock as reflected in the Sixth Plan, seemed to be in the right direction, even though moderate and often halting. The question was how adequate were these responses and the policy frame in the context of prevailing socio-economic and political situations. Caught between the trap of compelling inevitability of an increase in energy consumption in the immediate future on the one hand and the need for conservation and shift on the other, it was indeed a difficult task to make choices in either directions. In fact, India had to borrow, for the first time, a huge loan from IMF at a commercial rate, largely to fuel the economy towards a desired growth rate.

During the last 2-3 years of the Sixth Plan period, India was passing through a serious political crisis,¹⁰ which diverted a large part of governmental attention and efforts towards its solution rather than developmental efforts. Ultimately the crisis culminated into a tragic demise of the Prime Minister, Mrs. Indira Gandhi.¹¹ However, even in the midst of the prevailing political situation, the process for the preparation of the Seventh Five Year Plan (1985-90) was initiated. The Approach Paper to the Seventh Plan, which set out the policy thrusts for the five-year period (1985-90) was approved by the National Development Council, presided over by the Prime Minister (Mrs. Indira Gandhi) in July 1984.

¹⁰The so-called Punjab crisis and Khalistan movement which still continues to be an extremely politically dangerous problem.

¹¹She was assassinated on 30 September, 1984.

However, the development challenges and the direction envisaged in the Seventh Five Year Plan (1985-90) was finally approved not under Mrs. Gandhi, but under the Prime Ministership of her son Rajiv Gandhi. The Seventh Plan began with a very comfortable level of food stocks due to impressive growth rates of agriculture in the Sixth Plan. This provided a robust confidence and perhaps a bit more than usual exuberance to the young Prime Minister and his team of advisers and colleagues. The Prime Minister has been consistently pushing the idea of India ushering into 21st Century technologies and a higher growth rate with particular emphasis on industry. Thus, the general thrust of the economy and the development plan was a renewed process of modernization and industrialization with much vigour and supported by a process of "liberalization" and opening-up of the economy. In brief, a sensitive author outlines the broad contours of the economic strategy of the Seventh Plan as articulated in the presentation of the 1985-86 budget:¹²

"A reduction of controls and regulations, a lowering of corporate tax-rates, more liberal imports of components and technology in certain areas, a restriction of public investment to levels considered essential for the provision of key infrastructural inputs like energy, and are awakening of latent demand, as well as its stimulation through further tax-concessions, for a number of what were hitherto considered luxury goods....."

The same author continues:

"certain points about this strategy, which for convenience may be labelled as one of 'luxury consumption-led growth', are clear enough. Firstly, no matter what protestations there are to the contrary, it is fundamentally a deliberate anti-egalitarian strategy. It should not be concluded that only a shibboleth (of socialism) has been dropped, that a phoney

¹²P Patnaik, "New Turn in Economic Policy: Context and Prospects", Economic and Political Weekly, Vol.21, No.23, June 7, 1986.

commitment to egalitarianism has been merely replaced by a pragmatic recognition of inequality. Stibboloths do after all represent something, and a transition from shamefaced inequality to open inequality cannot but increase the quantum of inequality".

In other words, while in earlier years, there has been at least official policies - whatever their actual effectiveness - to restrict monopoly, conserve foreign exchange for essential productive imports and prevent the penetration of foreign capital, there started a process of piecemeal shift away from these priorities in official policy since 1980. The decisive break with the past has come undoubtedly with the 1985-86 Budget in the beginning of the Seventh Plan. A range of new policies including on monopolies and on foreign capital, clearly amount to an entirely and unambiguously private capitalist strategy of development promoting elite consumption. In fact, the distribution of effective demand has shifted markedly towards the labour-hiring classes and upper salariat urban middle class whose burgeoning demand for energy and import intensive consumer durables - television, VCR, electronic products, motor cars and motor cycles - initiated an adverse impact in the energy balance and the balance of payments, making the country increasingly more dependent upon multinational banks.

While India has been pushing forward with its Seventh Plan goals as discussed above, there came the Third Oil Shock - a shock in a reverse direction. World Oil Price declined from \$ 28 a barrel towards the end of November 1985 to \$ 10 a barrel in the last week of April 1986. India seemed to be in for another spell of luck. The softening of oil prices promised to save India's import bill to the extent of Rs 1000 crores during the next 12 months. However, the policy of import liberalization, tax concessions and other development processes that

were implemented in 1985-86 budget had already initiated a number of adverse effects on the economy.

Firstly, the consumption of petroleum products increased by 7.9 per cent during 1985-86 (see Table 11) as compared to the rate of 5 per cent annually between 1979-80 and 1984-85. In fact, most disturbing was the high rate of increase in consumption (8 per cent and above) of high speed diesel and kerosene. As a result, despite an increase in domestic production and decline in oil price, India had to bear a large bill of petroleum imports. This only reflected a near lack of success in efforts so far to contain consumption through price restraints and failure to mount effective conservation measures.

In fact, the experience after the two oil shocks clearly indicated that the demand for petrogoods in India was not really price elastic. The impact of luxury-consumption-led growth strategy was strikingly evidenced when even after increased domestic price of oil products in 1985, the consumption grew by more than the expected rate. In other words, the economy and especially the upper and middle-income 'elite' sector of the population comprising about 200 million people have increasingly been conditioned to increasing consumption of petrogoods. The political power of this group was obvious when the Government had to reverse the decision of further hiking the domestic oil price at the time of 1985-86 budget session in the face of stiff opposition from this consumer group.

Table 11: Consumption of Petroleum Products

(Million Tonnes)

Items	1984-85 (Provisional)	1985-86 (estimated)	Percentage Change	
			$\frac{1984-85}{1983-84}$	$\frac{1985-86}{1984-85}$
1 Light Distillates	6.3	6.9	12.3	9.9
of which:				
Naptha	3.1	3.2	11.1	2.9
2 Middle Distillates	22.4	24.4	8.2	9.2
of which:				
Kerosene	5.9	6.4	7.4	7.9
High Speed Diesel Oil	13.6	15.1	8.2	10.7
3 Heavy Ends of which	9.9	10.2	2.8	3.9
Fuel oil	7.8	8.0	3.0	2.7
Total	38.5	41.6	7.4	7.9

Source: Economic Survey 1985-86, Ministry of Finance, Govt. of India, New Delhi 1986.

Secondly, India's non-petroleum imports, including capital goods and intermediates and components and certain bulk imports like vegetable oil and fertilizers have expanded considerably. Much of these increases are the result of a process of import liberalization initiated over the years.

Thirdly, while the import bill has grown bigger, the rate of growth of exports has been below expectations or even declining. The protectionism of the international market and the low momentum and shrinkage of market in the OPEC countries due to 1986's oil shock of drastic decline in oil price had contributed to the tight export situation. As a result, "the external payments situation, which had improved in 1984-85,

weakened in the first half of 1985-86. According to preliminary data, the trade deficit during the first six months of the current financial year (1985-86) is estimated at Rs 4124 crores. The available partial data show that while imports have grown by nearly 25 per cent in the first half of 1985-86, the rate of growth of exports has been below expectations. Furthermore, overall foreign exchange reserves have declined by Rs 324 crores by the end of January 1986. These developments indicate a significant deterioration in the external payment situation during the year".¹³

Fourthly, India's balance of payment became precarious due to: (a) the hump in debt service payments on account of the repayments of the IMF borrowing to be started during the year and (b) the stagnation of Indian remittances from abroad, particularly from the migrant Indian labour in the OPEC countries which is affected by 1986 oil price cut.

Thus, India's new liberalized open-door development options have led to a large trade deficits and considerable drawal of foreign exchange reserves. What is more important to note is the fact that unlike earlier years, the trade deficit of India does not seem to any more enjoy the cushion of invisible surplus (yielded largely by remittances) and therefore, will have to be entirely financed by foreign borrowings. The situation facing India, to many thinking people, seems to point towards the possible Brazil situation of debt-trap, unless there is drastic reversal of development thrust.

¹³ Economic Survey, 1985-86, Ministry of Finance, Govt. of India, Delhi, 1986, p. 85.

Meanwhile, the extreme tight revenue situation has adversely affected many development programmes. One of the programmes which was affected by a big cut (almost 1/5th of the proposed plan) in the Plan Outlay (See Seventh Plan Outlays in Appendix I) is the programme on renewable energy sources. However, there is in one direction India has to lay emphasis in her development plan inspite of tight revenue situation and that is the afforestation programme. In the wake of the large-scale threat to the ecological balance and severe fuelwood crisis, a National Wastelands Development Board was set up in 1985 for the reclamation of ambitious 5 million hectares of wasteland every year by planting fuelwood and fodder. How ambitious is the target and how far such a programme can be made successful are still being fiercely debated in India.

FUTURE PROSPECTS: BEYOND 1990s

The foregoing analysis gives us a clear picture about the close relationship between the development goals pursued in India over the decades and the increasingly higher commercial energy consumption and demand. The very process of development in India as followed over the three decades has been energy-intensive. Like most of the developing countries, India had chosen the path of development associated inevitably with rapid increase in energy consumption have already started a journey in the same direction that the industrial world followed at the time of cheap-oil era. She might have travelled not a great distance on the same road as the industrial world, but there is no mistaking that the road is the same. In fact, India perhaps travelled sufficiently longer on this road which gathered speed in recent years. Along with this speed, there obviously developed a number of strong political and economic compulsions which would ultimately determine the future course of actions and development programmes.

Let us briefly examine some of these compulsions. Unlike China, which chose her development strategy linked to self-sufficient, independent, decentralized and mutually competitive communes with considerably less energy-intensive programmes, India from the beginning has opted for an energy-intensive centralized development strategy. It was shown earlier how such a development strategy is inevitably woven into high rates of energy consumption from all sectors. The inertia and the very process of these development trends over the three decades will have their own economic and political compulsions in the sense that a certain minimum growth rates in all sectors have to be achieved in order to increase the existing pitifully low levels of energy consumption and to supply basic human needs and gainful employment to a large mass of poverty-stricken population.¹⁴ It is extremely difficult, if not impossible, to reverse the direction of the development strategy drastically. There seems to be no escape from the increasing consumptions of commercial energy even to maintain a necessary minimum economic growth rate.

The second compulsion is purely political. Having nursed and often even pampering an energy-intensive life style and culture for such a long period, it would be suicidal for any politician to preach for further belt-tightening for already half-hungry millions constituting the voting constituencies in a democracy. Understandably, the politicians are

¹⁴ Official record (Seventh Plan) shows about 37 per cent of India's population is below the poverty line and hence the urgency of the poverty removal programme. However, the official figure seems to be a gross under-estimate. The population below poverty line should not be anywhere below 45 per cent.

shroud enough to give priorities to policies directed to a quick increase in supply of goods and services in order to satisfy the voters' desire for ever increasing energy-intensive life styles. The risk involved in not espousing these populist priorities is the sure defeat in election. In this, we have seen earlier, how egalitarianism could give way to unambiguous inequality in the face of vocal elite demand.

Given these compulsions, what then could be India's future prospect and preferences? Clearly, there seems to be two alternatives:

(1) hard-path meaning increasing production and supply of commercial non-renewable energy to match the trends of consumption; and (ii) the soft-path meaning conservation in the use of commercial energy and gradually shift to the renewable sources of energy. The choice, however, cannot be mutually exclusive, particularly, in view of the present state of development of renewable energy technologies and the compulsion of the ongoing development processes and directions. The choice therefore has to be a mixed one encompassing both the paths, with relatively more emphasis on one or the other given the political ideology of the ruling power.

India seems to be following the mixed path, but with clear emphasis on the hard-path solutions, particularly in the recent years (Seventh Plan). India's policy-makers and planners have correctly sensed the long-term perspective and the need to reduce consumption of non-renewable fossil-fuel energy. Still, important policy documents plead, rather paradoxically, for more production of energy from all possible sources. Accelerated exploitation of domestic, conventional

energy resources - oil, coal, and nuclear power - becomes the first element of the energy strategy. The renewable energy programme takes only the back-seat. The apparent paradox could be largely understood from the intensity of the short-term and medium-term political overriding considerations on the one hand and the long-term need for changes on the other.

As a result, there are increasing investments on domestic oil explorations, thermal power stations and even on nuclear energy projects (inspite of Russian Chernobyl crisis). The theory of "demand accommodation" as explained earlier has even made the Indian planners and politicians to seriously consider an economy with "electricity or power-must-be-surplus" as followed in most of the industrialized countries. This means the maintenance of a comfortable reserve-ratio by ensuring that generating capability is always sufficiently in excess of the firm peak load demand. The result, inevitably, will be a manifold increase in commercial energy consumption, ignoring the costs and environmental damage.

As if to keep a balance as well as due to other economic and extra-economic compulsions, India is perhaps one of the first developing countries with an official renewable energy promotion programme on a permanent footing. The renewable energy exports in India are optimistic to produce 5000 megawatt of power during the Seventh Plan given the financial and politico-administrative support. It has been argued by these exports that by harnessing adequately the sources like firewood, wind power, solar energy, tidal power, biogas, improved cooking stove, and geo-thermal energy, the shift of energy consumption in India could be of a magnitude that will not only take care of all

the increase in consumption in future, but also should help in actual reduction of consumption of non-renewable energy sources. This is commonly known as the 'soft-path', which does not mean any reduction in the energy consumption. The planners, policy-makers and the political power in India does not seem to be yet fully convinced of these claims of the experts. Hence, the relatively low priority and emphasis on the renewable energy programme in favour of the conventional commercial energy sources.

The future perspective of India's energy strategy and development options would depend on the performance of the Seventh Plan programmes including renewable energy programmes and the politics in power. The choice seems to be between the unavoidable and the disaster. The unambiguous 'oligist consumption'-led growth initiated in the Seventh Plan would tend to increase the gap between the haves and have-nots. The rate of unemployment and lack of growth in rural agricultural sector may create tensions and turmoils of serious political consequences, unless the emphasis is changed more towards soft-path on a long-term perspective. Meanwhile, the renewable energy technologies have to be adequately developed to take up the challenges involved in the soft-path development option.

APPENDIX I.

PLAN OUTLAY BY HEADS OF DEVELOPMENT (FIRST AND SECOND FIVE YEAR PLANS, 1951-1961)

Heads of Development	Amount (Rs crores)			
	First Plan (1951-56) Actuals	% of total outlay (actuals)	Second Plan (1956-61) (Provision)	% of the total
1 Agriculture and Community Develop- ment.	299	15	510	11
2 Irrigation and Power	585	29	820	18
3 Industry and Mining	100	5	950	21
4 Transport and Communication	532	26	1340	30
5 Social Services	423	21	810	18
6 Miscellaneous	74	4	70	2
Total	2013	100	4500	100

Source: Selected Plan Statistics, Planning Commission, Govt. of India, Delhi, December 1959.

PLAN OUTLAY BY HEADS OF DEVELOPMENT: 1961-1980
(CENTRE, STATES AND UNION TERRITORIES)

(Amount (Rs crores))

Heads of Development	Third Plan 1961-66 (Actuals)	% of Total outlay (Actuals)	Fourth Plan 1969-74 (Actuals)	% of Total outlay (actuals)	Fifth Plan 1974-79 (Actuals)	% of Total outlay (actuals)
1 Agriculture and allied sectors	1088.9	12.7	2320.4*	14.7	4864.9	12.3
2 Irrigation and flood control	664.7	7.8	1354.1	8.6	3876.5	9.8
3 Power	1252.3	14.6	2931.7	18.6	7399.5	18.8
4 Village and Small Industries	240.8	2.8	242.6	1.5	592.5	1.5
5 Industry and Minerals	1726.3	20.1	2864.4	18.2	8988.6	22.8
6 Transport and Communications	2111.7	24.6	3080.4	19.5	6870.3	17.4
7 Education	588.7	6.9	774.3	4.9	1710.3	
8 Scientific Research	71.6	0.8	130.8	0.8		4.4
9 Health	225.9	2.6	335.5	2.1	760.8	1.9
10 Family Planning	24.9	0.3	278.0	1.8	491.0	1.3
11 Water Supply and Sanitation	105.7	1.2	458.9	2.9	1091.6	2.8
12 Housing Urban and Regional Development	127.6	1.5	270.2	1.7	1150.0	2.9
13 Welfare of backward classes	99.1	1.2	164.6	1.0	724.0**	1.8
14 Social Welfare	19.4	0.2	64.4	0.4	88.2	0.2
15 Labour Welfare and craftsmen training	55.8	0.7	31.1	0.2	677.2	2.1
16 Other programmes	173.1	2.0	179.8	1.2		
17 Special Schemes:						
(i) Special Welfare Programmes.	-	-	123.6	0.8	-	-
(ii) Crash schemes for educated unemployed	-	-	54.0	0.3	-	-
(iii) Advanced Action for Fifth Plan	-	-	120.0	0.8	-	-
Total	8576.5	100.0	15778.8	100.0	39426.2	100.0

*Includes Buffer Stock: Rs 140 crores for 1960-69, Rs 25 crores for 1969-70; Rs 50 crores for 1972-73 and Rs 24 crores for 1973-74. Thus the figure of buffer stocks during the Fourth Plan works out to Rs 124 crores against the original plan provision of Rs 255 crores.

**Includes Hill and Tribal Areas.

Source: Economic Survey 1985-86, Ministry of Finance, Govt. of India, Delhi 1986.

PLAN OUTLAY BY HEADS OF DEVELOPMENT: 1980-1990
(SIXTH AND SEVENTH FIVE YEAR PLANS)

(Rs. crores)

Heads of Development	Sixth Plan Outlay 1980-85	% of total outlay	Seventh Plan Outlay 1985-90	% of total outlay
1 Agriculture	5695.1	5.0	10573.6	5.9
2 Rural Development	5363.7	5.5	9074.2	5.0
3 Special Area Prog.	1400.0	1.5	3144.7	1.7
4 Irrigation and Flood Control	12160.0	12.5	16970.6	9.4
5 Energy	26535.4	27.2	54021.3	30.5
(i) Power	19265.4	19.8	34273.5	19.1
(ii) New and Renewable sources of energy	100.0	0.1	519.5	0.3
(iii) Petroleum	4300.0	4.4	12627.7	7.0
(iv) Coal	2870.0	2.9	7400.6	4.1
(v) Energy Development	..	..	..	..
6 Industry and Minerals	15017.6	15.4	22460.0	12.5
(i) Village and Small Scale Industries	1700.5	1.0	2752.7	1.5
(ii) Large and Medium Industries	..	..	..	..
(iii) Others	..	..	..	..
7 Transport	12412.0	12.7	22971.0	12.9
(i) Railways	5100.0	5.2	12334.5	6.9
(ii) Others	7312.0	7.5	10636.5	5.9
8 Communications and Informations & Broadcasting	3134.3	3.2	6472.5	3.6
9 Science and Technology	065.2	0.9	2466.0	1.4
10 Social Services	14035.2	14.4	29350.5	16.3
(i) Education	2523.7	2.6	6382.6	3.5
(ii) Health and Family Planning	2031.0	2.9	6449.2	3.7
(iii) Housing and Urban Development	2488.4	2.6	4259.9	2.4
(iv) Other Social Services	6192.1	6.3	12259.2	6.7
11 Others	001.5	0.9	1686.0	0.9
12 Total (1 to 11)	97500.0	100.0	100000.0	100.0

Source: Economic Survey 1985-86, Ministry of Finance, Government of India, Delhi, 1986.

APPENDIX II: SELECTED INDICATORS:1950-51
TO 1984-85

	Unit	1950-51	1955-56	1960-61	1965-66	1970-71	1975-76	1980-81	1981-82	1982-83	1983-84	1984-85 (P)
Gross Domestic Product at factor cost												
(i) At Current Prices	Rs. crores	9,177	9,720	14,071	22,030	36,736	66,630	113,609	130,478	145,565	172,176	189,434
(ii) At 1970-71 Prices	Rs. crores	17,536	20,870	25,534	29,023	36,736	42,890	50,705	53,469	55,032	59,319	61,473
Per capita net national product at 1970-71 prices.	Rupees	466	508	559	559	633	664	700	720	721	761	772
Index of Industrial Production (Base: 1970=100)		28.2%	38.5%	55.8	82.8	100.7	123.4	154.1	167.3	173.8	183.3	193.9
Index of Agricultural Production (Base triennium ending 1969-70=100)		58.5	71.9	86.7	80.8	111.5	125.1	135.3	142.9	137.5	156.4	155.0
Gross domestic capital formation	As % of GDP	10.0	14.3	16.9	18.2	17.8	19.9	24.5	24.8	24.2	23.4	23.4
Gross domestic savings	"	10.2	13.9	13.7	15.7	16.8	20.1	22.8	23.0	22.6	22.1	22.1
Output:												
(a) Foodgrains	M.T.	55.0	69.3	82.0	72.4	108.4	121.0	129.6	133.3	129.5	152.4	146.2
(b) Finished steel	M.T.	1.04	1.30	2.39	4.51	4.64	5.75	6.82	7.75	8.05	6.14	7.8
(c) Cement	M.T.	2.7	4.7	8.0	10.8	14.3	17.2	18.6	20.9	23.3	26.7	29.5
(d) Coal (including lignite)	M.T.	32.8	39.0	55.7	70.3	76.3	102.7	118.8	130.1	136.9	144.9	154.5
(e) Crude oil	M.T.	0.26%	0.35%	0.45	3.47	6.8	8.4	10.5	16.2	21.1	26.0	29.0
(f) Electricity Generated (utilities only)	Billion kwh	5.3	8.8	16.9	33.0	55.8	79.2	110.8	122.1	130.3	140.0	157.0
Wholesale price index (Base: 1970-71 = 100)		47.5	40.8	55.1	72.7	100.0	173.0	257.3	281.3	288.7	316.0	338.4
Consumer price index (Base: 1960=100)		83	79	102	139	106	313	401	451	486	547	582
Plan outlay	Rs. crores	260*	614	1,117	2,332	2,524	6,417	15,023	18,373	21,725	25,314	30,386 (RE)
Centre's budgetary deficit	Rs. crores	(-)33*	160	(-)117	173	285	366	2,576	1,392	1,655	1,417	3,985 (RE)
Foreign Trade: (i) Exports	Rs. crores	600.6	596.3	660.2	805.6	1535.2	4036.3	6710.7	7805.9	8003.3	9872.1	11554.0
(ii) Imports	Rs. crores	650.2	678.8	1139.7	1400.5	1634.2	5264.8	12549.2	13607.6	14292.7	15763.0	16034.0
Foreign exchange reserves (excluding gold and SDRs)	Rs. crores	911.4	704.6	105.0	102.1	430.1	1491.7	4022.1	3354.5	4265.3	5497.9	6816.8

* \$ Relate to the calendar years 1950 and 1955 respectively. P Provisional.

* Relates to 1951-52.

* Partially revised.

* Quick Estimates.

Note: Figures relating to foreign exchange reserves after the year 1965-66 are not comparable with those of the earlier years due to devaluation of the rupee in June, 1966.