



**REPORT**  
**OF THE**  
**FUEL POLICY COMMITTEE**

**INDIA**  
**1974**

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PROFESSOR S. CHAKRAVARTI,  
Member, Planning Commission and  
Chairman, Fuel Policy Committee.

PLANNING COMMISSION,  
NEW DELHI,  
August 22, 1974.

Dear Shri Malaviya,

The Fuel Policy Committee has authorised me to submit to you this Report dealing with the policy issues in regard to fuels, covering the period upto 1990-91. You may recall that Part I of the Report (Fuel Policy for the Seventies), submitted to the Government on May 16, 1972, dealt with the Fifth Five Year Plan period only. Subsequent to the submission of Part I of the Report, there have been several changes in the economic situation within the country and in the international situation in regard to the supply and price of oil. The perspective of growth of the economy outlined in the earlier Government documents has been changed to some extent in the Draft Fifth Five Year Plan. The Committee had, therefore, to re-examine several of its previous conclusions and revise its recommendations appropriately. The present Report is based on a comprehensive re-examination of all issues and should be taken as the final Report of the Committee and not as a sequel to Part I.

2. In order to properly plan for meeting the energy demand, it is essential that we assess and forecast the future demand as accurately as possible. The fact that sectors producing energy in primary or secondary forms involve very long gestation periods extending over 5 to 10 years or even longer makes it imperative that we project demand over a 15 to 20 year period for evolving an appropriate energy production plan. In the nature of the case, such a forecast involves that a number of assumptions be made about the rate and pattern of growth of the economy, the technology of energy production and energy utilization and about possible directional changes in consumer preferences. While in regard to the rate and pattern of economic growth the Committee was guided by the perspective growth of the economy given in the Draft Fifth Five Year Plan, in regard to other factors, the Committee had to make its own judgement based on the study of the past trends in our country, information relating to similarly placed countries and from various published materials regarding possible technological shifts in future.

3. The Committee has given several demand forecasts for different forms of fuels, which take into account feasible inter-fuel substitution possibilities even when the aggregate energy requirement may remain constant. The projection of aggregate energy requirements as well as those pertaining to specific fuel forms must be judged as *dimensional hypotheses* rather than as rigid numbers. The main thrust of the Report and of the deliberations of the Committee has been to evolve an *appropriate policy mix* for the energy sectors for the period upto 1990-91. We are of the opinion that our policy conclusions are likely to remain invariant with respect to a fairly wide range of alternative growth rates, even though specific numerical projections may need to be kept under constant review.

4. In forecasting energy consumption in terms of different fuel forms, it is necessary to take into account possible shifts in technology in different sectors of the economy as well as in the relative costs of different fuels over time. While submitting Part I of the Fuel Policy Committee Report in May 1972, we drew the attention of the Government to the fact that crude oil prices which were once predicted to come down significantly had in fact hardened a great deal during the early seventies. In view of the desire of the oil exporting countries to make the most out of their exhausting assets, it was anticipated that the prices would

r harden unless major new discoveries come up and possibilities of substituting oil by other fuels materialise on a substantial scale. We noted that while there are definite indications in this direction, they were not likely to be decisive in the seventies. As there were strong reasons to believe that energy would pose a serious problem from the balance of payments angle if certain hard decisions were not adopted at the right time, we argued that the maximum effective utilisation of domestic energy resources should form a basic desideratum in designing a national fuel policy. On this basis the Committee suggested various means for substituting coal for oil in areas where on techno-economic grounds substitution was justifiable.

5. These recommendations were kept in view in preparing the Draft Fifth Five Year Plan. The Draft Fifth Five Year Plan indicates a directional change in the pattern of utilisation of different fuel resources, by economically acceptable curbs on the rate of growth of oil consumption while planning for expanded production of coal and electric power.

6. The dramatic increase in the price of oil in October 1973 made it imperative that we re-examine our earlier studies. Studies done by the Fuel Policy Committee in the middle of 1973 on the substitution of coal for oil in different sectors of the economy were made on the assumption that the price of oil would be around \$ 5 per barrel by the end of the seventies. This was in keeping with the projections made by noted international authorities with the exception of Professor Adelman, who went to the extent of predicting a fall in prices. It is clear from Adelman's recent study that if the rules of the game in the world oil industry conformed to standard economic criteria as discussed in standard text books, his conclusions could be defended without violence to data. But it is a major act of abstraction and a somewhat unwarranted one to assume that the oil industry could be treated in isolation from a whole set of socio-political factors. The present energy crisis arises out of a very sudden increase in the price of oil products to levels which were not predicted in any study by any country. The movement of oil prices in the international market itself is an interesting study. Given the dizzy heights to which oil prices have soared today, there is a common tendency to lose sight of a certain perspective. Oil represents one commodity whose price went down steadily over a period of 15 years. For example the market price of light Arabian crude was \$ 1.93 per barrel in 1955 and it was \$ 1.30 per barrel in 1970. Even in January 1972, it was still lower than the 1955 price. But from then on, it has increased today to over \$ 11 per barrel within a period of 24 months. The price upto October 15, 1973, was around \$ 3 per barrel only. Can this movement in prices be explained by a sudden spurt of demand or a sudden fall in production? At this stage, it is extremely hazardous to make any guesses in this respect since the problem, as mentioned previously, possesses important characteristics which are not purely economic in nature.

7. While the direction of the change in the energy substitution policies suggested in Part I of the Report is invariant to the likely changes in the price of oil products, the pace of inter-fuel substitution has to be determined with reference to the relative price of fuels. At prices of \$ 12 per barrel of oil delivered at Indian ports we find that all the uses of oil except those in the transport sector can be substituted for by indigenous fuel, namely, coal or coal-based energy forms. For example, in the household sector the use of kerosene for lighting can be replaced by electricity. The use of kerosene for cooking can be replaced by coal gas in the case of densely populated urban areas and soft coke in small towns and some rural areas. In industry for all heating requirements coal becomes the preferred fuel. For lifting water, electricity becomes more advantageous relative to diesel oil. In the case of transport, the movement of bulk commodities over long distances by rail becomes preferable to road movement even if the expected volume of traffic is low. But it will not be realistic to assume that oil prices will continue at the present level upto 1990-91 as possibilities of producing oil at a very low cost ranging from 15 Cents a barrel to \$ 4 a barrel are available in a large number of countries in the world, given the time to explore for oil and develop the oil fields. It would, therefore, appear that while directionally oil will have to be replaced by other fuel forms, which are more abundant in this country, we have to be extremely careful regarding the type and

extent of substitution that we adopt, especially those involving very major investment outlays.

8. Given the uncertainty regarding the level of oil prices in the future, the areas and extent of substitution of oil by coal will have to be limited to those options whose worthwhileness remains largely unaltered for any probable variation in prices. We believe that the recommendations of the Committee contained in this Report satisfy this criterion. The pace of inter-fuel substitution recommended by the Committee is based on our judgement regarding the gestation periods involved in converting oil using facilities to those using alternate fuels to satisfy the substitution requirements and the organisational constraints in effecting the inter-fuel shifts. The recommendations made are mostly invariant to possible changes in the oil price and are feasible of implementation if they are implemented as a whole, taking note of their inter dependence. The directions in which a coherent fuel policy should move are clearer now than ever before and it will not be prudent to delay the implementation of any of these recommendations, if they are otherwise acceptable, in the hope of possible changes in the supply and price of oil.

9. Our analysis contained in the Report establishes beyond any reasonable doubt that coal should be considered the primary source of energy to the country. The coal resources of India, inspite of the quality being poor and their unevenness in geographical dispersal represent the most valuable and reliable source of energy to the economy. In order that this potential advantage is fully exploited several actions are urgently called for. While the primary knowledge about our coal resources is adequate, detailed information on the nature of the deposits is inadequate and this is proving to be a hindrance to expanding coal production quickly. The arrangements for the transportation of coal have proved to be very much short of our needs and unless an integrated plan for production and its transport are drawn up and synchronised investments are made in coal and transport sectors, there is likely to be severe strains on the energy sector. While several suggestions such as pit head generation of power and production of fertilizer in the midst of coal fields have been made to economize on coal transport, there will still be large demand for coal in places away from the centres of coal production. Transportation by rail by increasing quantities of coal will be unavoidable upto the end of the period considered in the Report. It is, therefore, necessary to examine the techniques and procedures of coal transport and devise ways which will enable the transportation of adequate quantities in the most economic manner. Coal mining methods which will lead to extraction of a larger share of coal in the ground than what is being done now will have to be devised. The methods of beneficiating coal to improve the quality and facilitate their economic utilization will have to be devised. In view of the importance of coal in the energy plans of the country, we have given very detailed consideration to the issues connected with coal production, transport and utilisation and a large number of recommendations have been made in these areas.

10. Our oil resources as known today are very insufficient to meet our needs. But there are some indications that we may find more of oil and natural gas particularly the latter. Every effort should be made to step up such production, on shore as well as off shore and appropriate surveys in advance using geophysical and other sensing devices should be undertaken—the policies outlined for reducing the rates of growth of oil consumption in future may not require any major revisions. Even countries which are endowed with abundant oil reserves like Iran are canvassing the view that oil should be used as raw material for high value chemicals instead of being burnt as mere fuel. The use of oil for any purpose in the country will have to be decided in future with reference to the price at which we can get alternative fuels to be used in place of oil. It is, therefore, important that the policy measures suggested in the Report for reduction of the use of oil in several sectors should be given urgent attention. The extent to which the use of oil could be reduced was examined by the Committee carefully. The suggestions made are based on the consensus regarding the extent to which such reductions are feasible. They are based to some extent on the subjective judgement of the members of the Committee, regarding the organisational and technological improvements that can be achieved within the appropriate time span to bring about reduction in the use of oil in

sectors which have become accustomed to the use of convenient fuel. If we are faced with more severe balance of payments difficulties in future, it may become necessary to force the pace of substitution of oil by other fuels to rates higher than those indicated in this Report. The specific estimates given in the Report should be treated as "normal" estimates based on the assumption that the overall rate of growth in the economy is going to be according to anticipation contained here. In the short-run, special measures may, therefore, need to be adopted to tide over exceptionally difficult situations.

11. The Committee has endeavoured to integrate the policies regarding fuel and supply of feedstock for fertilizers as fertilizer production will be a very important activity calling for the use of material which could be used as fuel. We are convinced that in future at the relative price of coal and oil assumed in our studies coal should be the primary feedstock for fertilizers in the country. Oil refineries will always have some residual heavy-end products which could be used as a feedstock. It is also felt that a greater use of secondary processing to convert the heavy-end fractions in a refinery to higher value light products will be more rational for us.

12. We have erred on the side of caution in assessing electricity demand as a shortage of electricity will be difficult to remedy by any short term remedial measures. However, in translating the power requirements into capacity for power generation to be created, the Committee has tried to include in its calculations a factor reflecting increased efficiency in the operation of power generation and transmission systems. Electricity is a highly capital-intensive source of energy. A country like ours with a serious shortage of capital can ill afford to neglect the possibilities of capital saving that may be available in the power sector. Taking note of the relative merits of different methods of generation the Committee has suggested that more attention should be paid to hydel power generation in the Sixth Five Year Plan and that nuclear power generation based on thorium-plutonium cycle should be introduced at least in the Seventh Five Year Plan.

13. The supply of fuels to the domestic sector in our country presents a number of special problems. The percentage of non-commercial fuels used in the domestic sector though large is slowly getting reduced, (it will be about 80 per cent in 1978-79 and 60 per cent in 1990-91). Our calculation show that the quantity of non-commercial fuels used which has been increasing gradually over time, will reach a peak during the early years of the Sixth Five Year Plan and will decrease slowing from then on. But the magnitude of firewood used will continue to be so large compared to the availability of the resources that there is likely to be serious repercussions in regard to the conservation of forests and the consequential ecological problems. Informed judgement suggests that the extraction of about 120 million tonnes of fuels from forests as of today is much beyond the level of fuels that could be extracted without serious impairment to our forest wealth. This fact and the divergence between social and private costs of using forests fuels underline the need to take-up measures for supply of increased quantities of commercial fuels at appropriate prices to the poorer sections of the rural community and for increasing the availability of firewood by taking up well-conceived schemes of low cost afforestation. Though the benefits of using cowdung as a manure are well-recognised today, increasing quantities of dung are being used as a domestic fuel. Gobar Gas Plants provide a means of exploiting the fuel as well as the plant nutrient potential of dung and, therefore, deserve greater attention. Though the total quantitative contribution of gobar gas plants to the fuel needs of the domestic sector, even on very optimistic expectations, is likely to be limited, the contribution of gobar gas plants to other social benefits like nutrient production and pollution abatement have prompted the Committee to strongly recommend an intensified campaign to popularise the use of gobar gas.

14. The problem of energy supply to rural as well as urban areas has implications for ecology and environmental pollution. Data relating to pollution costs and cost of pollution control are, as yet, meagre in India. The Committee could, therefore, make no specific recommendations in this regard. But it is our hope that as and when the problems of pollution become significant in any area or industry, the specific issues will be examined and appropriate measures taken.

15. We have analysed the possibilities of deriving energy from non-conventional sources like geo-thermal energy, tidal power, solar power, etc. It is felt that the likely contribution of energy from these sources will be insignificant during the period covered by this Report.

16. It is well known that there is a growing imbalance between the resource base of our economy and the drift of modern technological developments in the energy sector as observed so far. The international research and development efforts until recently were directed towards improving the methods of utilisation of fuels and feedstock which were in short supply in the country. In spite of the new thrust in research and development towards the use of coal and other fuels it is necessary that we should ourselves undertake research and development effort, which would enable a more rational use of our resources. A technology plan has, therefore, been suggested in this Report.

17. The Committee has been fully conscious of the fact that energy is one of the several inputs required to ensure the desired rate of economic growth. The availability of energy is a necessary but not a sufficient condition to sustained economic growth. Economic growth can be achieved only when the availability of energy is matched by adequate supply of other inputs. A meaningful energy plan in the economy should be an integral part of the national plan reflecting fully its objectives and strategies. The Committee has endeavoured to draw up the recommendations for a coherent energy policy which it considers to be in consonance with the objectives and policies of the government. We have suggested certain organisational arrangements like the setting up of Energy Board which will ensure the integration of energy plan with the national plan not only at the stage of drafting these plans but at every stage of their implementations.

18. The Committee is conscious of the fact that our recommendations are fairly numerous and amongst themselves cover a very wide range of issues. This is of course only natural since the problems pertaining to energy sector are inevitably complex and are often interdependent. We would, therefore, request that our recommendations should be viewed in a coordinated manner. If they are found acceptable, we hope that necessary actions in these areas will be initiated and pursued with utmost expedition.

19. I would like to take this opportunity of expressing my gratitude to members of the Committee who not merely tendered very valuable suggestions in their own areas of specialization but throughout the deliberations kept in view the overall implications of formulating an appropriate energy policy in consonance with our fundamental objectives and constraints. The Committee throughout received very valuable assistance from the Secretariat. I would, however, like to place on record my deep appreciation of the work done by Shri T. L. Sankar, Secretary of the Committee, who brought to bear on the problems his comprehensive grasp of the empirical and analytical aspects of the issues dealt with in the Report and thus contributed in a very substantial measure to the formulation and completion of this Report.

With kind regards.

Yours sincerely

(S. CHAKRAVARTY)

Shri K. D. Malaviya,  
Minister of Steel & Mines,  
NEW DELHI.

**CHAIRMAN AND MEMBERS OF THE FUEL POLICY COMMITTEE ON  
THE DATE OF FINALISATION OF THE REPORT**

1.	Prof. S Chakravarty	..	..	..	..	..	..	..	Chair man
2.	Dr. M. G. Krishna	..	..	..	..	..	..	..	Member
3.	Dr. A. Lahiri	..	..	..	..	..	..	..	Member
4.	Dr. Kirit S. Parikh	..	..	..	..	..	..	..	Member
5.	Shri V.N. Meekoni	..	..	..	..	..	..	..	Member
6.	Shri B. Lall	..	..	..	..	..	..	..	Member
7.	Shri Basiklal Worah	..	..	..	..	..	..	..	Member
8.	Shri B. G. Mahendru	..	..	..	..	..	..	..	Member
9.	Shri N. Tata Rao]	..	..	..	..	..	..	..	Member (in place of Vice Chairman CWPC)
10.	Shri N. N. Tandon	..	..	..	..	..	..	..	Member
11.	Shri T. L. Sankar	..	..	..	..	..	..	..	Secretary



## SECRETARIAT OF FUEL POLICY COMMITTEE

1.	Shri T. L. Sankar	..	..	..	..	..	..	..	..	Secretary
2.	Shri G. V. G. Raman	..	..	..	..	..	..	..	..	Under Secretary
3.	Shri Priti Pal	..	..	..	..	..	..	..	..	Senior Research Officer
4.	Shri S. N. Bhagwan	..	..	..	..	..	..	..	..	"
5.	Shri V. Vikraman	..	..	..	..	..	..	..	..	"
6.	Shri Prakash Chandra	..	..	..	..	..	..	..	..	"
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8.	Shri B. R. Bhalla	..	..	..	..	..	..	..	..	"
9.	Shri I. V. Soorma	..	..	..	..	..	..	..	..	Research Assistant
10.	Shri P. Ramaswamy	..	..	..	..	..	..	..	..	"
11.	Miss Parvesh Chawla	..	..	..	..	..	..	..	..	"
12.	Shri K. R. Jain	..	..	..	..	..	..	..	..	"
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14.	Shri R. Chetal	..	..	..	..	..	..	..	..	"
15.	Shri S. N. Bannerjee	..	..	..	..	..	..	..	..	"

## EQUIVALENTS AND ABBREVIATIONS

### EQUIVALENTS

1 lakh	..	..	10 <sup>5</sup>
1 million	..	..	m=10 <sup>6</sup>
1 crore	..	..	10 <sup>7</sup>
1 billion	..	..	b=10 <sup>9</sup>
1 lb	..	..	1 pound=0.454 Kilogram
1 kg	..	..	1 Kilogram=2.205 pounds
1 tonne (metric)	..	..	1t=1000 Kg=2205 pounds
1 Kilometre	..	..	Km =1000 metres=0.621 miles
1 Kilowatt	..	..	KW=1000 watts
1 megawatt	..	..	MW=1 millionwatts=1000 Kilowatts
1 Kilocalorie	..	..	Kcal=4 British thermal units (approx.)
1 KWh	..	..	860 Kcal
1 Kcal/kg	..	..	1.8 BTU /lb

### ABBREVIATIONS

AOC	..	..	Assam Oil Company
BHEL	..	..	Pharat Heavy Electricals Limited
BTU	..	..	British Thermal Unit
C.E.	..	..	Commercial Energy
c.e.	..	..	coal equivalent
CFRI	..	..	Central Fuel Research Institute (Dhanbad, India)
CPRI	..	..	Central Power Research Institute
c.i.f.	..	..	cost including insurance and freight
c.r.	..	..	coal replacement
CW & PC	..	..	Central Water and Power Commission
DAE	..	..	Department of Atomic Energy
DWT	..	..	Dead Weight Tonne
ESC	..	..	Energy Survey Committee
FBR	..	..	Fast Breeder Reactor
f.o.b.	..	..	free on board
HSDO	..	..	High Speed Diesel Oil
HT	..	..	High Tension
Hydel	..	..	Hydro electric
IIP	..	..	Indian Institute of Petroleum (Dehradun)
JBO	..	..	Jute Batching Oil
kWh	..	..	Kilowatthour
LDO	..	..	Light Diesel Oil
LF	..	..	Load Factor
LPG	..	..	Liquified Petroleum Gas
LT	..	..	Low Tension
LTC	..	..	Low Temperature Carbonisation
mcf/d	..	..	million cubic feet per day
mt	..	..	million tonnes
mtcr	..	..	million tonnes of coal replacement
mtce	..	..	million tonnes of coal equivalent
MTO	..	..	Mineral Turpentine Oil
NCAER	..	..	National Council of Applied Economic Research
NCST	..	..	National Committee on Science and Technology
NPC	..	..	National Productivity Council
NSS	..	..	National Sample Survey
OIL	..	..	Oil India Limited
ONGC	..	..	Oil and Natural Gas Commission, Dehradun (India)
OPEC	..	..	Organisation of Petroleum Exporting Countries
R&D	..	..	Research and Development
RRL(H)	..	..	Regional Research Laboratory, Hyderabad (India)