

CHAPTER 3

INFRASTRUCTURE

The performance of key infrastructure sectors has been generally satisfactory during the year 1984-85 (April—December). Notable increases have been recorded in the production of crude petroleum, coal and electricity. Thermal generation maintained the high growth rates of the recent years, while the increase of 10 per cent in hydel generation is in

refreshing contrast to the decline of 2.6 per cent in 1982-83 and the small increase of 3.3 per cent in 1983-84. Growth in the output of crude oil has been high, though not as impressive as in the preceding three years. Overall performance of the railways has been better than in the last year. Cargo handled at major ports is anticipated to increase by 5.5 per cent.

TABLE 3.1

Performance of the Infrastructure Sectors

Item	Unit	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85*	Per cent increase over the preceding year				
								1980-81	1981-82	1982-83	1983-84	1984-85*
1	2	3	4	5	6	7	8	9	10	11	12	13
<i>Coal</i>												
(i) Production . . .	Mn. Tonnes	104.0	114.0	124.2	130.5	138.2	101.6	9.7	8.9	5.2	5.8	6.9
(ii) Pit-head stocks (year-end) . . .	-do-	14.0	18.3	21.1	23.3	23.0	22.0	30.7	15.3	10.4	-1.3	31.0
<i>Electricity (utilities only)</i>												
(i) Installed Capacity '000' MW.		28.4	30.2	32.3	35.4	39.4	41.3	6.3	7.0	9.6	11.3	10.4
(ii) Generation . . .	Bn. Kwh.	104.6	110.8	122.1	130.2	139.9	116.1	5.9	10.2	6.6	7.6	13.5
(a) Hydel . . .	-do-	45.5	45.5	49.6	48.3	49.9	41.8	2.2	6.6	-2.6	3.3	10.0
(b) Thermal (incl. nuclear) . . .	-do-	59.1	64.3	72.5	81.9	90.0	74.3	8.8	12.8	13.0	10.2	15.6
<i>Petroleum</i>												
(i) Crude oil production . . .	Mn. Tonnes	11.8	10.5	16.2	21.1	26.0	21.1	-10.0	54.3	30.2	23.2	10.2
(ii) Refinery throughput . . .	-do-	27.5	25.8	30.1	33.2	35.3	25.9	-6.2	16.7	10.3	6.3	-0.5
<i>Railways</i>												
(i) Revenue-earning goods (originating traffic) . . .	-do-	193.1	195.9	221.2	228.8	230.1	171.4	1.5	12.9	3.4	0.6	3.2
(ii) Revenue-earning coal (originating traffic) . . .	-do-	62.0	64.1	75.8	82.4	89.0	66.9	3.4	18.3	8.7	8.0	3.9
(iii) Coal traffic for thermal plants . . .	-do-	18.4	21.9	27.5	37.1	40.7	31.8	19.0	25.6	34.9	9.7	8.2
<i>Cargo handled at major ports</i> . . .	-do-	78.5	81.3	88.0	98.1	100.5	106.0£	3.6	8.2	11.5	2.4	5.5£

*Data for 1984-85, relate to the period April-December, 1984 and the percentage increase is over the corresponding period of the preceding year.

Anticipated for the full year.

Coal

3.2 Production of coal increased by 5.8 per cent to 138.2 million tonnes in 1983-84. The target for 1984-85 was set at 152 million tonnes, marking an increase of 10 per cent over the actual production in the preceding year. Production during April—December, 1984 was 101.6 million tonnes, showing an increase of 6.9 per cent over the corresponding period of 1983.

TABLE 3.2
Trends in the Coal Sector

	(Million Tonnes)				
	1980-81	1981-82	1982-83	1983-84	1984-85
Target of Production	113.5	121.0	133.0	142.0	152.0
Production of Coal	114.0	124.2	130.5	138.2	101.6*
(a) Coal India Ltd.	100.9	108.9	114.8	121.4	89.6*
(b) Singareni	10.1	12.1	12.3	12.7	9.0*
Year-end pit-head stocks	18.1	20.4	23.3	22.9	22.0£
Public Sector outlay on Coal (Rs. crores)	381	620	784	894	1049 (B.E.)

*During April—December, 1984.

£At the end of December, 1984.

B.E. : Budget Estimates

3.3 The level of coal production had remained stagnant around 100 million tonnes for several years prior to 1980-81. As a result of measures initiated to increase production, there was a distinct spurt in coal production in 1980-81 to 114.0 million tonnes. The tempo of increasing production has been maintained since then. In 1984-85, upto December, production has increased by 6.9 per cent but the growth rate is still below what would be required to meet the target. Nearly 90 per cent of coal production in the country is accounted for by the collieries controlled by Coal India Limited. There has been a shortfall in Coal India's production mainly on account of the unsatisfactory performance of Eastern Coalfields Limited and Bharat Coking Coal Limited. This is of particular concern as the production set-back in these units affects despatches of coking coal to SAIL steel plants and of superior grade

non-coking coal to industries. The slow progress in the recovery of mines flooded in the eastern India which witnessed unprecedented rain in June, 1984 affected production in BCCL. Coal India's production loss of washed coal on account of power cuts was also reported to be substantial. Coal despatches have been about 5.3 per cent higher during the first 8 months of 1984-85 than in the corresponding period of 1983-84. However, the increase in despatches have not kept pace with the increase in production. This is a matter of concern. The Department of Coal and the Ministry of Railways are looking into this problem to identify measures for evacuation of pit-head stocks, consistent with available rail facilities.

3.4 An important factor impeding the growth of coal production is the low productivity of labour. Coal output per manshift in India (0.8 tonne) is poor by international standards. Low productivity is partly due to the low level of mechanisation in the coal industry. But the performance has been below par even in areas where mechanisation has been introduced, indicating the persistence of surplus labour. The country has a long way to go to realise the full potential of the long-wall faces that have been introduced in some collieries. Similarly, in open cast mining, the utilisation of equipment like dumpers and excavators leaves room for considerable improvement.

3.5 Largely because of the rising wage bill, pit head prices of coal had to be raised in May, 1982, and again in January, 1984. Nevertheless, the economies of the use of coal vis-a-vis oil continued to be favourable to the former. Major factors impeding greater inter-fuel substitution include instability in the supply of coal and problems of quality.

3.6 Problems in the quality of coal supplies relate mainly to the large proportion of over-sized coal and extraneous matter, and low calorific value. Various measures have been taken in recent years to tackle the situation such as the following :

- (i) A programme for construction of coal handling plants CPHs, with facilities for screening and crushing of over-sized coal has been taken up in all mines. Currently, 50 major coal handling plants and 100 mini CHPs are in operation in the subsidiary companies of Coal India. About 47 per cent of the total production of coal is handled by these plants. More coal handling

plants are planned to be set up and, by 1986-87, 88 per cent of coal produced is expected to be handled by these plants.

- (ii) Practically all the entire coal going to the steel plants is now washed before despatch except for a small quantity of direct feed coal.
- (iii) The coal companies, as suppliers of coal, and the major consumers like Electricity Boards have been asked to enter into formal agreements providing for the terms of conditions for the coal supplies, which would provide, *inter alia*, for joint sampling of coal supplies and payment of bonus/penalty with reference to the quality of coal supplied.
- (iv) The Coal Controller has been authorised to take samples and arrange for the testing of coal grades, *suo motto*, or in the event of any dispute in this regard. Consumers having doubts about the grade of coal being supplied by the coal companies can seek redressal by filing complaints to the Coal Controller.

3.7 Public sector outlay on coal mining, including lignite, has been stepped up considerably during the past few years. With a view to meeting the increasing demand for coal by various sectors of the economy, 28 coal mining projects, 2 washeries and one non-mining project were sanctioned in 1983-84. Of the 28 mining projects, 15 were new projects, 2 advance action proposals, and 11 revised project reports/revised cost estimates. The total sanctioned capacity of these projects was 43.89 million tonnes. For the year 1984-85, the total capacity of sanctioned and existing mines adds up to about 210 MT.

Electricity

3.8 Generation of electricity increased by 7.6 per cent in 1983-84, largely because of the step-up of 10.2 per cent in the generation of thermal power (incl. nuclear). The power generation target for 1984-85 is 154 billion units, representing an increase of 10 per cent over last year's achievement (139.9 billion units). Actual generation showed an increase of 13.5 per cent during April—December, 1984. There was a significant recovery in the generation of hydel power, which increased by

10 per cent over the corresponding period of the preceding year.

TABLE 3.3
Trends in the Power Sector

	1980-81	1981-82	1982-83	1983-84	1984-85*
Additional capacity commissioned / rolled (MW)@ .	1,823	2,175	3,060	4,088	1,668
Power generation (Bn. kwh)	110.8	122.1	130.2	139.9	116.1
Hydel	46.5	49.6	48.3	49.8	41.8
Thermal (including nuclear)	64.3	72.5	81.9	90.1	74.3
PLF of Thermal plants (per cent)	44.6	46.8	49.4	47.9	48.0
Estimated deficit (per cent)	12.7	10.8	9.3	10.8	5.6

*During April—December, 1984.

@Excludes plants with 20 MW and less capacity.

3.9 The substantial step-up in power generation notwithstanding, there has been an acute shortage of power in the country. The overall shortfall in power supply against requirements during 1983-84 was estimated at 10.8 per cent compared to 9.3 per cent in 1982-83. In specific sectors, the shortfall was much higher. Rourkela steel plant, in particular, and steel plants and coal mines in the eastern region, generally, suffered production losses for want of adequate power in the States of Tamil Nadu, Karnataka, Rajasthan and in the States of Tamil Nadu, Karnataka, Rajasthan and Andhra Pradesh, as well as fertiliser plants in Tamil Nadu, Karnataka, Kerala, Orissa, and Punjab also suffered loss of production due to power cuts. The power supply situation (in relation to demand) during 1984-85 has shown considerable improvement and the overall shortfall for the year is estimated at 6.1 per cent.

3.10 Additional capacity for power generation commissioned during the years 1976-77 to 1980-81 averaged 2,122 MW per year. During 1980-81 to 1982-83 the average was 2,353 MW per year. Commissioning of new capacity was stepped up to 4,088 MW in 1983-84. The target for 1984-85 is 3,399 MW out of which 1,668 MW were added during April-December, 1984. Commissioning of several power projects during the current financial year has slipped, upsetting the programme contemplated for the year. This may result in a shortfall of about 605 MW from the Plan target. At least 11 projects scheduled to be commissioned during the first half of the current year have been carried over to the second half. In addition, six of the 13

projects scheduled to be commissioned during the second half of the year, have been delayed. Some of these projects are expected to spill over to the next year.

3.11 An important factor affecting the utilisation of power is the availability of the transmission line infrastructure. There have been serious shortfalls in this area. Line losses, which now constitute about 21 per cent of generation, are partly a consequence of inadequate investment in transmission and distribution.

3.12 The Plant Load Factor (PLF), which is the ratio of the actual energy generated from a unit during a given period to the energy that could have been generated if the unit operated continuously at its maximum rating throughout the period, is a commonly used performance indicator of thermal units. The maximum PLF, however, is not the same as the rated capacity, since allowance has to be made for factors which preclude continuous full capacity utilisation, such as planned maintenance and the need for meeting fluctuations in demand (on seasonal and hourly basis). Some spinning reserve has also to be maintained to compensate for accidental loss of generation, restore load-generation balance and reduce the system's voltage and frequency fluctuations to the minimum. In an ideal arrangement, thermal stations should be run to meet a constant base load and peaks should be met by hydro-electric stations. The strength of the transmission system and the extent of interlinkages are important factors determining the scope of raising the PLF. With a good transmission system, even when demand in one region or State is low, it may be possible to run the units in that region or State at full capacity and pass on the available power to State/regions where demand is high.

3.13 Thermal PLF in the country is low. Even the target of PLF for 1984-85 is only 50 per cent. The PLF achieved during April—December, 1984, is estimated at 48 per cent. Plant availability of units is adversely affected by four major factors; equipment defects, defective maintenance and operation, declining quality of coal and manpower management deficiencies. Several thermal units in the country require to be re-vamped as they suffer from design deficiencies and old age. With this end in view, centrally sponsored renovation and modernisation programme has been devised for implementation from 1984-85. This will cover 36 thermal stations in the country and is estimated to cost Rs. 500 crores.

3.14 A major factor which has reduced the PLF of thermal plants is the deterioration in the quality of coal. Extraneous material can damage power plant equipment and lead to stoppages. The presence of lumpy coal leads to thermal plants going out of operation since there is blockage at the handling end. Supply of sized coal in accord with plant requirements can contribute significantly to the improvement in PLF.

3.15 Only about 16 per cent of the total hydro-electric potential available in the country has so far been harnessed. The proportion of hydel capacity in the total power capacity was 40 per cent at the beginning of the Sixth Plan and declined to about 36 per cent by the end of March, 1984. If this trend is allowed to continue, it could have an adverse impact on the operation of the power system, leading to a drop in capacity utilisation of thermal stations also. The scope for enlarging power generation capacity through small hydro-electric units needs to be fully explored, as they offer considerable savings in transmission costs and their benefits can reach the people in remote areas. While in many cases electricity generation may not be the primary purpose of setting up small hydro projects, their economic benefits can be enhanced through better exploitation of their power potential. Local community participation in the planning, execution and operation of small hydel projects should be encouraged. A major R & D effort has to be initiated to reduce the costs of small hydel projects, by investigating the feasibility of using local material, and standardized equipment.

Petroleum

3.16 Development of the petroleum sector assumed critical importance with the successive oil shocks of 1973 and 1979. Fortunately, considerable groundwork had already been undertaken prior to 1973 so that the Indian economy was able to weather the storm, when confronted with the crisis. Significant progress has been achieved in the recent years in the areas of crude production, refining and utilisation of natural gas.

3.17 Following the second oil crisis in 1979, the Oil & Natural Gas Commission (ONGC) undertook a scheme of accelerated production from the off-shore areas, and the original Sixth Plan targets of crude production were stepped up. Crude production in the Seventies (1970-71 to 1980-81) had increased by 55 per cent, from 6.8 million tonnes to 10.51 million

tonnes. In the next two years, output doubled to 21.06 million tonnes. A further 24 per cent increase was achieved in 1983-84 and production reached 26.02 million tonnes. The target for crude production in 1984-85, is 29.63 million tonnes and the achievement is likely to be 29.02 million tonnes.

TABLE 3.4
Trends in the Petroleum Sector

	(Million Tonnes)				
	1980-81	1981-82	1982-83	1983-84	1984-85*
Crude Production	10.51	16.19	21.06	26.02	29.02
Gas Production :					
(i) Bill. Cub. metre	2.36	3.85	4.94	5.96	6.55
(ii) Oil equivalent	2.14	3.50	4.49	5.42	5.96
Total hydrocarbon production	12.65	19.69	25.55	31.49	34.98
Refining throughput	25.84	30.14	33.16	35.25	35.23
Utilisation of gas down stream users (Bill. cub. metre)	1.55	2.15	2.74	2.82	3.09
Imports of crude oil	16.25	15.30	16.95	15.97	14.15
Exports of crude oil	..	0.84	4.55	5.52	7.04

*Anticipated.

3.18 Total initial recoverable crude oil resources are currently estimated at 709 million tonnes of crude and 477 million tonnes of gas in terms of oil-equivalent. Exploratory drilling has been intensified in recent years, and the metreage drilled has been raised from 121 thousand metres in 1979-80 to an estimated 355 thousand metres in 1984-85. The emphasis so far has been on proven petroliferous basins. In order to stabilise the present reserves/production ratio, it is necessary to widen the area of exploratory drilling to cover the sedimentary basins with known occurrence of hydrocarbons, but from which no commercial production has yet been obtained.

3.19 Refining capacity has also been expanded along with the increase in domestic crude production. Capacity has increased from 31.8 million tonnes (throughput) in 1980-81 to 45.55 million tonnes by the end of 1984-85 (estimated). Near self-sufficiency in refining would be achieved with the completion of the current expansion proposals in 1984-85/1985-86. Firm commitment has so far been made in respect of a 6 million tonnes per annum refinery at Karnal, another 6 million tonnes p.a. refinery is proposed to be established at Mangalore. Expansion of the Koyali

refinery and the refineries in the north-east region to absorb the increased production of north-Gujarat and Assam crudes have also been planned. The grade composition of domestic crude and the equipment of Indian refineries, however, did not fully match the domestic demand pattern for petroleum products. This necessitated export of a part of Bombay High crude production. However, the entire domestic crude production is expected to be processed indigenously by the end of 1985-86.

3.20 Middle distillates constitute the major proportion of the total consumption of petroleum products. Their share in consumption has increased from 49.4 per cent in 1972-73 to 57.6 per cent in 1983-84. In order to meet this demand pattern it is necessary to instal more of hydrocracker units instead of fluid catalytic crackers. Till such hydro crackers come up, import of middle distillates may have to continue even though there may be a surplus in some of the petroleum products like naphtha and bitumen.

3.21 With the increased availability of natural gas, a comparatively new area has opened up for exploitation. The balance recoverable reserves of gas have increased from 344 billion cubic metres, equivalent to 313 million tonnes of oil (t.o.e.) on January 1, 1979 to 475 billion cubic metres (433 million t.o.e.) on January 1, 1983. The Government has set up a Gas Authority of India Ltd., charged with the responsibility of transportation and distribution of natural gas. The present policy is to utilise gas as feedstock for fertiliser plants after extraction of LPG and C₂/C₃. A number of gas-based fertiliser plants have been planned, and are at various stages of construction. The policy in regard to gas utilisation may be reviewed if significant additional gas reserves are discovered. In fact even now there may be a case for utilising natural gas for power generation in certain locations. Expeditious installation of additional compressor and dehydration capacity can obviate the necessity of flaring in Bombay High.

Railways

3.22 For the year 1983-84, initially, a target for movement of 241 million tonnes of revenue-earning goods traffic was set, representing an increase of over 5 per cent over 1982-83. Actual rail freight was limited to about 230 million tonnes of revenue-earning traffic in 1983-84. This was largely due to the shortfall in the traffic from steel plants, iron ore for exports, and fertilisers. Loadings of coal for thermal

power stations, however, recorded a growth of 9.7 per cent in terms of originating tonnage and helped in maintaining a growth rate of over 10 per cent in the generation of thermal power during the year. Total originating coal traffic (revenue-earning) increased by 8 per cent. Originating cement traffic increased by 21.8 per cent during the year. Apart from these two items-coal and cement-and a small increase of 3.5 per cent in the movement of P.O.L., rail freight movement declined for all other commodity groups in 1983-84. There has been some improvement in the performance of the railways in 1984-85. During April—December, 1984 revenue-earning originating goods traffic increased by 3.2 per cent over the corresponding period of the preceding year.

TABLE 3.5
Performance of the Railway Sector

	1980-81	1981-82	1982-83	1983-84	1984-85**
1. Total revenue earning originating traffic (Mn. Tonnes)	195.9	221.2	228.8	230.1	171.35
(i) Coal	64.1	75.8	82.4	89.0	66.90
(ii) Raw material for steel plants (excl. Coal)	20.2	24.1	23.5	21.7	16.87
(iii) Cement	9.6	10.8	12.8	15.5	12.40
(iv) Foodgrains	18.3	21.5	24.7	24.6	15.01
(v) Mineral Oil	15.0	16.6	17.3	17.9	13.28
2. Revenue earned through goods traffic (Rs. crores)	1,618	2,357	2,972	3,354	2,673
3. Net tonne-kilometres (in billion)	147.7	164.3	167.8	168.8	125.1
4. Earning per tonne kilometre (paise)	10.5	13.7	17.1	19.2	N.A.
5. Wagon turn-round (days) (Broad Gauge)	15.2	13.3	12.8	13.0	13.4@
6. Wagons procured (Nos.)*	12,064	17,362	14,088	17,141	N.A.
7. Wagons condemned (Nos.)*	11,807	19,442	19,831	19,265	N.A.

*In terms of 4-wheelers.

**April—December, 1984.

@ April—September, 1984.

N.A. Not available.

3.23 Given the objective of energy conservation, every encouragement needs to be given to the movement of goods, particularly bulk goods, by the railways. Unfortunately, the share of railways in the transport of goods appears to have declined. Reasons for the shift in traffic away from railways need to be investigated. Decline in the miscellaneous goods traffic (described as 'balance other goods') should

be of particular concern, as the railways' per tonne kilometre realisation from such traffic is attractive. In the case of some commodities the railways might have outpriced themselves. Non-price factors could also be responsible for the shift in goods traffic away from the railways.

3.24 Railways' earnings from goods traffic more than doubled from Rs. 1,618 crores in 1980-81 to Rs. 3,354 crores in 1983-84. Tonne-kilometres of goods traffic over the same period increased by only 14.3 per cent. Freight rates were raised from time to time to cover increased costs of operations, maintenance and for renewing worn-out assets.

3.25 The Indian railway system is more than a century old. The present network seems to have reached a plateau and is no longer in a position to meet the cyclical fluctuations in respect of demand for its services. The system needs a well-planned programme of replacement of aged rolling stock and track renewals in order to maintain an acceptable state of efficiency. Such a programme should, in fact, be the first charge on the resources available for railway investment. Construction of new railway lines and other expansion schemes need to be undertaken only after satisfying the full requirements of replacement of aged rolling stock and track renewals.

Ports

3.26 The total freight traffic handled at the major ports during 1983-84 crossed the level of 100 million tonnes, showing an increase of 2.4 per cent over the preceding year. The traffic handled in 1984-85 is expected to increase to 106 million tonnes. The facilities at the major ports at the end of March, 1984 were considered adequate to handle traffic of 115 million tonnes.

TABLE 3.6
Trends in the Port Traffic

	1980-81	1981-82	1982-83	1983-84	1984-85*
1. Cargo handled at major ports :					
(a) Total	81.30	88.02	98.09	100.45	106.00
(b) POL	33.58	34.20	46.25	47.47	50.00
(c) Iron ore	27.20	25.10	22.23	21.85	25.00
2. Outlay on port facilities (Rs. crores)	66.67	87.02	133.59	117.84	139.00

*Anticipated.

3.27 The major schemes relating to creation of additional port capacities/modernisation completed or likely to be completed during the Sixth Plan period are :

- (i) Construction of general Cargo berths at the ports of Kandla, Mormugao, New Mangalore, Madras, Tuticorin, Visakhapatnam and Paradip.
- (ii) POL handling facilities at the ports of Bombay, Cochin, Kandla and Visakhapatnam.
- (iii) Fertiliser handling facilities at the port of Cochin.
- (iv) Construction of a container terminal at Madras and acquisition of container handling equipment for the ports of Bombay, Madras and Cochin.

3.28 With these schemes cargo handling capacity is expected to increase to 136.7 million tonnes by March, 1985. Some of the Sixth Plan schemes are, however, likely to spill over to the Seventh Plan. These schemes include improvement of drafts in the Hooghly Estuary, creation of a fertiliser berth at Paradip, a second oil jetty at Haldia and a second oil jetty and deepening of outer harbour at Madras. A new major port, Nhava Sheva, on the West Coast is under construction. The port will provide for these fully mechanised container berths, which could handle 2,50,000 TEU's annually, two fully mechanised berths for dry bulk commodities (fertilisers including raw materials) and one service berth. The facility is expected to become operational in 1988.

3.29 A number of major ports have acquired modern facilities for handling container traffic. A modern, fully mechanised container terminal at Madras was taken up and commissioned in December, 1983. This terminal has a capacity to handle about 75,000 TEU's annually. Container-handling facilities are also being developed at Calcutta/Haldia. Besides, container handling equipment has been procured and installed at Bombay Port. For Cochin, the equipment has been ordered and is expected to be installed during 1985-86. As a result, the capacity for handling containers has increased from 1.5 lakh TEU's before the commencement of the Sixth Plan to 2.9 lakh TEU's.

3.30 Projects involving mechanised handling facilities to handle fertiliser raw materials have been taken up at the ports of Cochin and Paradip. These facilities

are expected to become operational during 1985-86. The new port at Nhava-Sheva also provides for mechanised handling facilities for fertilisers. POL handling facilities at the ports of Visakhapatnam and Madras are being designed to handle 1,50,000 DWT oil tankers. In addition, Madras Port is being deepened to handle ore vessels of size upto 1,30,000 DWT.

3.31 The handling equipment at many of the Indian ports old and inefficient and calls for early replacement with modern machinery and equipment. The shallow draft prevents larger ships, including cellular container ships from entering our ports. Urgent remedial steps are necessary, particularly in the context of the need or making the country's exports competitive in the international markets.

Energy Substitution

3.32 Energy is a crucial input in production. Historically, energy prices were relatively low, and promoted development of energy-intensive processes, the constraint being the capital cost rather than the cost of energy. With the sharp increase in the cost of energy in recent years there is now a growing awareness of the importers of energy saving in reducing costs. It is further recognised that investment in conservation measures, in the long run, can yield substantial savings. Appropriate pricing policies may help achievement of conservation goals and also provide funds for the large additional investments required for the expansion and modernisation of the energy sector.

3.33 The sharp increase in oil prices has also induced serious consideration of the possibilities of inter-fuel substitution. In India's context it has meant a shift away from oil and gas to coal. In terms of million tonnes of coal replacement (MTCR) the shares of oil, electricity and coal in 1975-76 were 45.8 per cent, 26.1 per cent and 28.1 per cent respectively. The Working Group on Energy Policy had suggested that by 1982-83 we should aim at 42.1 per cent for oil, 33.0 per cent for electricity and 24.9 per cent for coal. In reality, the shares turned out to be 48 per cent for oil, 30.6 per cent for electricity and 21.4 per cent for coal. Thus, over this period the share of oil has actually increased instead of declining.

3.34 In order to induce better inter-fuel substitution, it is insufficient to consider only production costs; what matters more is the effective delivered cost to

the consumer, difference in efficiencies of use and convenience in use. Movement of coal cannot be viewed in isolation from movement of all bulk commodities. But it is clear that there has to be a substantial increase in investment in the rail sector and in the efficiency with which assets and capacities are utilised within the railway system. Rationalisation of movement, use of bottom discharge wagons, creation of coal dumps, movement in blockrakes and a faster pace of electrification will all help in increasing rail capacity for handling a large and ever-growing volume of coal traffic. Rail movement can be supplemented, on specific routes, by alternative modes of transport. These include, *inter alia*, the Damodar Valley Corporation canal, the Ganga-Jamuna system, the Narmada river canal system and the Godavari river. Bulk of the coal movements to the Southern points could be done through coastal shipping.

3.35 Quality deterioration is another cause of concern in the coal sector both in respect of coking coal and non-coking coal. Probably some solution can be found by modernising the existing washeries and expanding their present capacity. Steel industry, too, may have to accept some quantities from the 'C' grade coking coal mines. In regard to the coal for thermal power stations, strict vigilance at the loading stage can bring down the percentage of foreign material, which sometimes causes serious damage to the plants, in addition to reducing overall efficiency. The feasibility of washing raw coal before supplying to power stations particularly those located far away from the coal mines needs to be studied.

3.36 Apart from reducing the overall energy-intensity of the economy and promoting appropriate inter-fuel substitution, it is also essential to enhance efficiency in the use of energy. The drop in the reliability of power supply to rural areas has resulted in the proliferation of relatively costlier diesel pumpsets.

The short-fall in the output and reliability of power supply to industries has resulted in the mushrooming of high cost captive power generating sets based on diesel. There is considerable scope for energy saving in the functioning of industrial boilers, automotive vehicles, cement and paper plants, refineries, power stations, etc.

Energy Conservation

3.37 By making deliberate choices of technology and location in agriculture, industry, and transport, it is possible to reduce the pressure on the energy system. Expanded use of bio-fertilisers in agriculture, adaptive use of electronics and information processing technologies, and conscious implementation of energy conservation will help to reduce the demand for energy, without implying any sacrifice in terms of growth objectives.

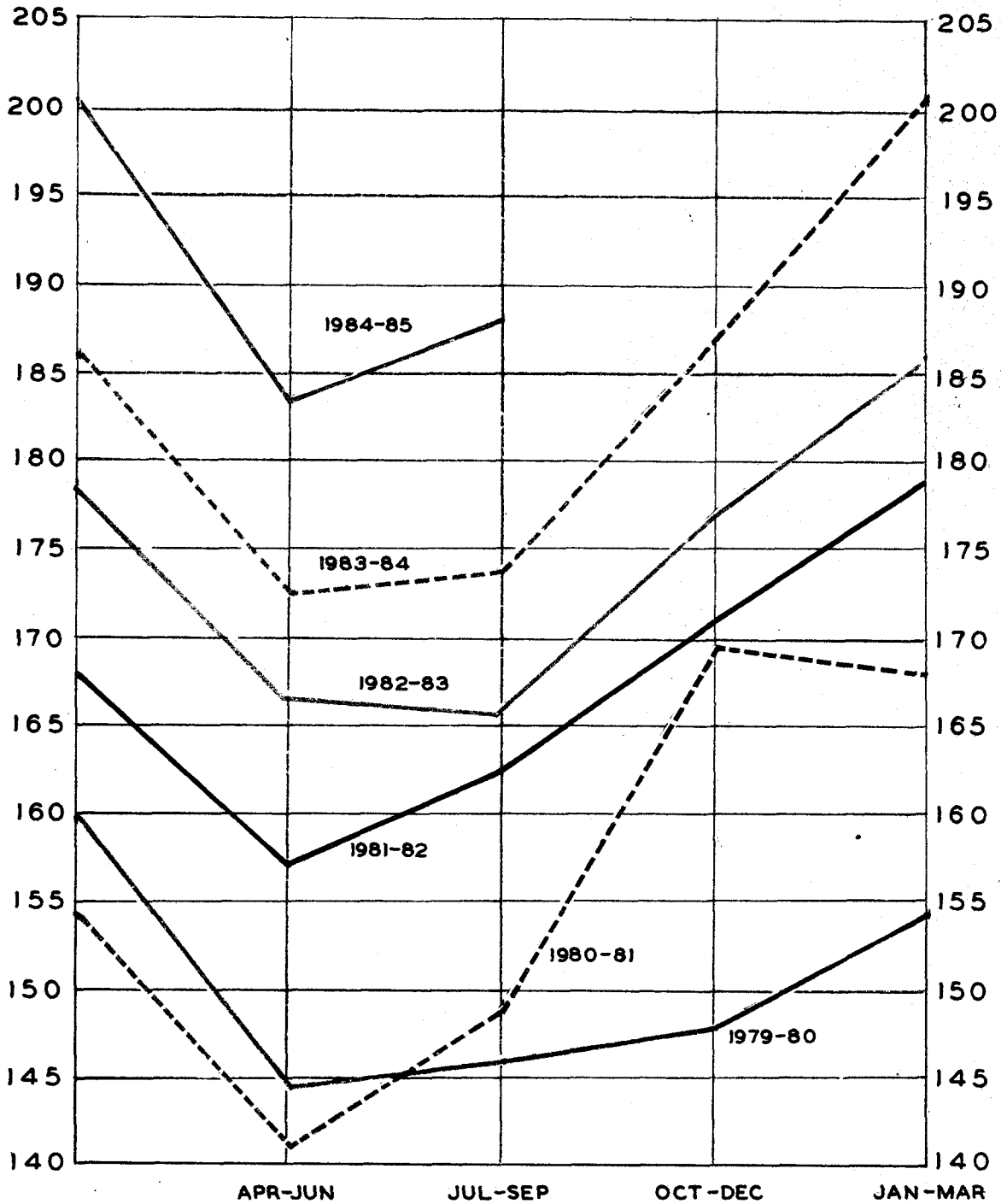
3.38 The policy of establishing new refining capacities also needs a closer look. Reasons of economy and strategic considerations argue for establishing sufficient refining capacity to process domestic crude. The goal of total self-sufficiency to meet the entire requirements of petroleum products is, however, a different matter. The argument that there is security of supply through national refining capacity does not hold good when the crude has to be imported. Currently only 68 per cent of the total refining capacity in the world is being utilised. In many countries the capacity utilisation factor of refineries is even lower. OPEC is also expanding its refining capacity and in the none-too-distant future (by 1990) it is anticipated that at least 30 per cent of its oil exports would be in the form of refined products. Capital costs of new refineries have also gone up more than three-fold in the last five years or so. All these factors indicate the need for careful review of the programme for the creation of additional refining capacity based on imported crude.

INDEX OF INDUSTRIAL PRODUCTION

(CRUDE)

[QUARTERLY AVERAGES]

1970=100



MINISTRY OF FINANCE, ECONOMIC DIVISION.