

## CHAPTER 7.3

# ENERGY

7.3.1 India ranks sixth in the world in terms of energy demand accounting for 3.5 per cent of world commercial energy demand in 2001. With a gross domestic product (GDP) growth of 8 per cent set for the Tenth Five-Year Plan, the energy demand is expected to grow at 5.2 per cent. Although, the commercial energy consumption has grown rapidly over the last two decades, a large part of India's population does not have access to it. At 479 kg of oil equivalent (kgoe), the per capita energy consumption is also low even compared to some of the developing countries.

7.3.2 India is fortunate to be endowed with both exhaustible (particularly coal) and renewable energy resources. Despite the resource potential and the significant rate of growth in energy supply over the last few decades, India faces serious energy shortages. This has led to reliance on increasing imports for meeting the demand of oil and coal. As per current projections, India's dependence on oil imports is expected to increase. The demand of natural gas also outpaces supply and efforts are being made to import natural gas in the form of liquefied natural gas (LNG) and piped gas. The power sector has also been experiencing severe shortages.

7.3.3 The Tenth Plan strategy for the sector includes increasing the production of coal and electricity, accelerated exploration for hydrocarbons, equity oil abroad, introduction of reforms through restructuring/deregulation of the energy sector to increase efficiency, demand management through introduction of energy efficient technologies/processes and appliances. The process of producing, transporting and consuming energy has a significant impact on the environment. Pollution abatement processes would form an important part of the development of energy sector.

7.3.4 In order to have an integrated energy approach and to meet the policy goals of economic efficiency, energy security, energy access and environment, the establishment of institutional links and coordinating mechanisms has been proposed.

### Energy Scenario

7.3.5 Primary commercial energy demand grew almost three-fold at an annual rate of 6 per cent between 1981 and 2001, to reach 314.7 million tonnes of oil equivalent (MTOE). In the case of China, primary commercial energy consumption has grown at an annual rate of 5.4 percent in the same period, even though its primary commercial energy consumption is at least twice as much as that of India. India's incremental energy demand for the next decade is projected to be among the highest in the world, spurred by sustained economic growth, rise in income levels and increased availability of goods and services.

7.3.6 India's commercial energy demand is expected to grow even more rapidly than in the past as it goes down the reform path in order to raise standards of living. A large part of India's population does not have access to commercial energy. The 479 kgoe per capita total energy consumption is only about 20 per cent of the global average in 1997 and compared poorly with the per capita consumption of Thailand (1,319 kgoe), Brazil (1,051 kgoe) and China (907 kgoe).

### Non-Commercial Energy Resources

7.3.7 More than 60 per cent of Indian households depend on traditional sources of energy like fuel wood, dung and crop residues for meeting their cooking and heating needs. Out of the total rural energy consumption, about 65 per cent is met from fuel wood. Fuel wood consumption during 2001-02 is estimated at 223 million tonnes, 180 million tonnes

of which is for household consumption and the balance for cottage industry, big hotels etc. The consumption of animal dung and agro-waste is estimated at 130 million tonnes, which does not include the wet dung used for biogas plants. It is assumed that the wet dung used as manure is being diverted to biogas plants as these plants, in addition to providing a cleaner fuel, also supply enriched manure.

7.3.8 Even though there has been an impressive increase in the availability of the two petroleum based domestic fuels - liquefied petroleum gas (LPG) and kerosene (SKO), they do not appear to have made any significant dent in the pattern of fuel consumption in the rural areas. To some extent, the biogas programme has made progress in rural areas and it is estimated that about 3.2 million plants have already been installed as on August 2001. The National Council for Applied Economic Research (NCAER), Delhi, has estimated the likely availability of gas from these plants during 2001-02 at 1,360 million cubic meters.

### Trends of Economic Growth and Energy Use

7.3.9 The average annual world economic growth in the 1997-2020 period is projected at

3.2 per cent, while the energy growth rate is estimated at 2.1 per cent per annum. This yields an elasticity of energy consumption at about 0.68 per cent. In India's case, the elasticity was more than unity for the 1953-2001 period. However, the elasticity for primary commercial energy consumption for the 1991-2000 period is less than unity. This could be attributed to several factors such as the improvement in efficiency of energy use and the consequent lowering of the overall energy intensity of the economy and the higher share of hydrocarbons in the overall energy mix. The projected requirement of commercial energy is estimated at about 412 MTOE and 554 MTOE in the terminal years of the Tenth and Eleventh Plans respectively. Based on the inputs of various working groups, the commercial energy demand during the Tenth Plan and Eleventh Plan is estimated to grow at an average rate of 6.6 per cent and 6.1 per cent respectively. Table 7.3.1 indicates the estimated energy demand in the terminal years of the Tenth and Eleventh Plans. However, the demand may be less by 5 per cent and 10 per cent during 2006-07 and 2011-12 respectively due to increasing use of information technology (IT) and prevalence of e-commerce, which will mainly affect the demand of energy in transport sector.

**Table 7.3.1**  
**Estimated Energy Demand**

Primary Fuel	Unit	Demand (in Original Units)		Demand (MTOE)	
		2006-07	2011-12	2006-07	2011-12
Coal	mt	460.50	620.00	190.00	254.93
Lignite	mt	57.79	81.54	15.51	22.05
Oil	mt	134.50	172.47	144.58	185.40
Natural gas	BCM	47.45	64.00	42.70	57.60
Hydro Power	BKwh	148.08	215.66	12.73	18.54
Nuclear Power	BKwh	23.15	54.74	6.04	14.16
Wind Power	BKwh	4.00	11.62	0.35	1.00
Total Commercial Energy				411.91	553.68
Non-Commercial Energy				151.30	170.25
Total Energy Demand				563.21	723.93

mt : Million Tonnes; BCM : Billion Cubic Meter; Bkwh : Billion kilo watt hour

## International Experiences

### Energy Policy Focus and Current Energy Policy Framework and Objectives for China :

#### ENERGY POLICY FOCUS IN CHINA

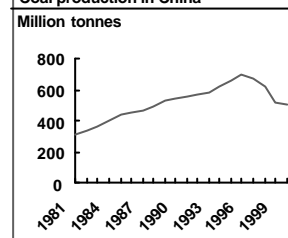
1980s

- Rapid increase in coal production to address severe shortage of energy supply driven by reform-led economic growth
- Large number of township and village-run coal mines were set up

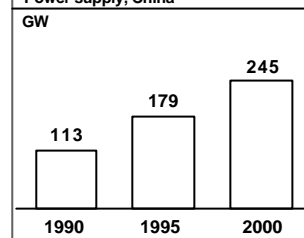
1990s

- Coal liberalisation initiated:
  - Reduction in government subsidies
  - Price liberalisation/de-regulation
- Electricity sector reforms lead to capacity additions
  - Entry of non-state sector via build-operate-transfer
  - Electricity supply meets demand in most regions, with surplus in some areas

Coal production in China



Power supply, China



- Coal accounts for 65-70 per cent of primary energy requirements
- Highest level of SO<sub>2</sub> emission in the world (~25 million tonnes in 2000)
- Energy consumption/GDP four times that of US (1.2 toe/000 US\$ versus 0.3 toe/000 US\$ for US)
- Low import dependence – only 6% of total primary energy comes from non-indigenous sources

#### CHINA'S CURRENT ENERGY POLICY FRAMEWORK AND OBJECTIVES

Highlights of energy policy in tenth five-year plan (2001-05) in China

Guiding principles

Structural adjustment of the energy industry

Key features/policies

- Increase share of clean energy (including natural gas and clean coal)
- Set up 40-50 nuclear power plants – to account for 5% of total primary energy in 10-15 years
- Promote renewable energy (solar, wind, hydro) sources
- Reduce/close number of small sub-scale loss making energy (power generation, coal mining, oil refining) units

Energy efficiency

- Strictly enforce energy consumption standards and technologies for new industrial capacities
- Build a more efficient national power grid (as-opposed to transporting coal from North to South/East)
- More market oriented reforms in the power sector
  - Separate power gencos from grid companies
  - Free competition in power generation

Energy security

- Continue to pursue policy of self-reliance in energy supply, based primarily on domestic coal production, without sacrificing economic efficiency
- Increase the number of suppliers in oil to meet increased import requirements

Two schools of thought on energy security

1. Upto 30% of primary energy from imports is manageable
2. Imports should not be greater than 10% of primary energy needs

### Availability of Commercial Primary Energy Resources

7.3.10 India's energy use is mostly based on fossil fuels. Although the country has significant coal and hydro resource potential, it is relatively poor in oil and gas resources. As a result it has to depend on imports to meet its energy supplies.

The geographical distribution of available primary commercial energy sources in the country is quite skewed, with 77 per cent of the hydro potential located in the northern and north-eastern region of the country. Similarly, about 70 per cent of the total coal reserves are located in the eastern region while most of the hydrocarbon reserves lie in the west.

**Table 7.3.2**  
**Regional Distribution of Primary Commercial Energy Resources**

Region	Coal (bt)	Lignite (bt)	Crude Oil (mt)	Natural Gas (BCM)	Hydro Power (TWH)
Northern	1.06	2.51	0.03	0.0	225.00
Western	56.90	1.87	519.47	516.42	31.40
Southern	15.46	30.38	45.84	80.94	61.80
Eastern	146.67	0	2.19	0.29	42.50
North-Eastern	0.89	0	166.17	152.00	239.30
Total	220.98	34.76	733.70	749.65	600.00

bt : Billion Tonnes

BCM : Billion Cubic meters

TWH : Trillion Watt Hours

mt : Million Tonnes

## Coal

7.3.11 The geological coal reserves of the country are estimated at 220.98 billion tonnes (bt) as on January 2001. Out of this, proven reserves are 84.41 bt, while 98.55 bt are indicated reserves and 38.02 bt are inferred reserves. Coal continues to remain the principal source of commercial energy accounting for nearly 50 per cent of the total supplies. About 70 per cent of the power generated is coal and lignite based and this trend is likely to continue in the foreseeable future.

7.3.12 India has an estimated 1000 billion cubic meters of Coal Bed Methane (CBM), which is likely to emerge as a new source of commercial energy in the country. A demonstration project is under implementation with financial support from the Global Environment Facility (GEF) and the United Nations Development Programme (UNDP). In April 2001, the Government announced a programme for exploration and production of CBM. Under the first round of bidding, five CBM blocks have been awarded to private companies. Apart from this, exploration work in two blocks has been awarded to two public sector undertakings (PSUs) on nomination basis. The successful implementation of these projects will facilitate exploitation of this clean source of energy.

## Lignite

7.3.13 The current estimates of geological lignite reserves in India are 34.76 bt spread over Tamil Nadu and Pondicherry (87.5 per cent), Rajasthan (6.9 per cent), Gujarat (4.9 per cent), Kerala (0.31 per cent) and Jammu and Kashmir

(0.37 per cent). The lignite deposits in the southern and western regions have emerged as an important source of fuel supply for states like Tamil Nadu, Rajasthan and Gujarat. Over the years, considerable emphasis has been placed on the development of lignite for power generation. Lignite production is likely to increase from 24.3 million tonnes in 2001-02 to 55.96 million tonnes in 2006-07.

## Oil and Natural Gas

7.3.14 The latest estimates indicate that India has around 0.4 per cent of the world's proven reserves of crude oil. As against this, the domestic crude consumption is estimated at 2.8 per cent of the world's consumption. The balance of recoverable reserves as estimated in the beginning of 2001 is placed at 733.70 million tonnes (mt) of crude and 749.65 billion cubic meters (BCM) of natural gas. The share of hydrocarbons in the primary commercial energy consumption of the country has been increasing over the years and is presently estimated at 44.9 per cent (36.0 per cent for oil and 8.9 per cent for natural gas). The demand for oil is likely to increase further during the next two decades. The transportation sector will be the main driver for the projected increase in oil demand. Consequently import dependence for oil, which is presently about 70 per cent, is likely to increase further during the Tenth and Eleventh Plans.

7.3.15 India has about 0.4 per cent of world's natural gas reserves. Initially the gas reserves had been developed largely for use as petrochemical feedstock and in the production of fertilisers, but gas is increasingly being used for power generation,

industrial applications and more recently in the transport sector. Presently the share of power generation capacity based on gas is about 10 per cent of the total installed capacity. The India Hydrocarbon Vision 2025 of the Government identifies natural gas as the preferred fuel for the future and several options are being explored to increase its supply capacity including building facilities to handle imports of liquefied natural gas (LNG) and setting up of pipelines from major gas producing countries. India is also reported to have significant deposits of gas hydrates. However, the true extent of this resource and its potential for commercial exploitation is still being evaluated.

### Hydro Electric Potential

7.3.16 The key advantage of hydroelectric power is the ability to store energy and the flexibility of its use during peak load periods. India is endowed with economically viable hydro potential. The Central Electricity Authority (CEA) has assessed India's hydro potential to be about 148,700 MW of installed capacity. The hydroelectric capacity currently under operation is about 26,000 MW and 16,083 MW is under various stages of development. The CEA has also identified 56 sites for pumped storage schemes with an estimated aggregate installed capacity of 94,000 MW. In addition, a potential of 15,000 MW in terms of installed capacity is estimated from small, mini and micro hydel schemes.

### Nuclear Resources

7.3.17 Nuclear energy has the potential to meet the future needs of electricity demand in the country. The country has developed the capability to build and operate nuclear power plants observing

international standards of safety. The current installed capacity of nuclear power plants is 2,860 MW accounting for 2.8 per cent of the total installed capacity of the country. The Nuclear Power Corporation of India Ltd. (NPCIL) proposes to increase the installed capacity to 9,935 MW by 2011-12. The future strategies focus on a three-stage nuclear power programme for the optimal utilisation of the available nuclear energy resources. The first stage of 10,000 MW is based on pressurised heavy water reactor (PHWR) using indigenous natural uranium resources. The second stage is proposed to be based on fast breeder reactor (FBR) technology using plutonium extracted by reprocessing of the spent fuel from the first stage. In the third stage, the country's vast thorium resources will be utilised for power generation.

### Renewable Sources of Energy

7.3.18 India is endowed with abundant natural and renewable resources of energy viz., sun, wind and biomass. The country has been able to achieve significant capacity addition of 1,367 MW through wind farms and ranks fifth in the world after Germany, United States, Spain and Denmark in the generation of wind energy. The available renewable resources need to be exploited by giving a commercial orientation, wherever possible. It may be necessary to continue with subsidies in the case of socially oriented programmes to meet the energy requirements of rural areas, particularly, remote villages, which may be difficult to service through the conventional power grid in the near future. Table 7.3.3 gives the available potential and the actual potential exploited till August 2001 for various renewable sources of energy.

**Table 7.3.3**  
**Renewable Energy Sources Potential**

Source/Technology	Units	Potential/Availability	Potential Exploited
Biogas Plants	Million	12	3.22
Biomass-based power	MW	19,500	384
Efficient wood stoves	Million	120	33.86
Solar Energy	MW/Sq. Km	20	1.74
Small Hydro	MW	15,000	1,398
Wind Energy	MW	45,000	1,367
Energy Recovery from Wastes	MW	1,700	16.2

7.3.19 Apart from these resources, the country has significant potential for ocean thermal, sea wave power and tidal power.

### TRENDS IN COMMERCIAL ENERGY PRODUCTION

7.3.20 The country has seen an expansion in total energy use during the last five decades, with a shift from non-commercial to commercial sources of energy. Accordingly, the production of commercial sources of energy has increased significantly. Table 7.3.4 indicates the trends in production of various primary commercial energy resources.

7.3.21 Coal production is likely to grow at an annual rate of 4.46 per cent in the Tenth Plan period (compared to 2.4 per cent annual growth rate during the Ninth Plan period) to touch 405 mt in the terminal year, 2007. As against this, the coal demand in that year is estimated at 460.50 mt. Part of the gap is proposed to be met through import of both coking and non-coking coal. About 70 per cent of the projected demand is for public sector utilities. A substantial expansion in the domestic coal production is, therefore, needed to meet the requirements of the targeted generating capacity additions envisaged during the Tenth and Eleventh Plans.

7.3.22 The current domestic production of crude oil caters to nearly 30 per cent of the demand and is likely to marginally increase from 32.03 mt in 2001-02 to 33.97 mt in 2006-07. As against this, the demand for petroleum products, projected as

99.13 mt in 2001-02, is estimated to grow at the rate of 5.7 per cent a year to touch 134.6 mt in the terminal year of the Tenth Plan and 172.5 mt in the terminal year of Eleventh Plan.

7.3.23 India's natural gas production reached a level of 29.69 BCM in 2001-02. The projected domestic production of natural gas in 2007 is 37.62 BCM. The country has been able to meet the demand with the available domestic production till recently. However, the demand is likely to grow rapidly in the near future. A number of projects for setting up of LNG terminals have been approved by the Government to bridge the demand-supply gap. Four LNG terminals at Dabhol, Dahej, Hazira and Cochin are in advanced stages of development and are likely to be completed by the end of the Tenth Plan.

7.3.24 Significant hydro and nuclear generation capacity is likely to be added during the Tenth Plan period. The capacity addition programme includes 16,083 MW from hydel power plants and 1,300 MW from nuclear power plants. In addition, 2,000 MW of energy is planned to be harnessed from wind farms.

7.3.25 Table 7.3.5 indicates the trends in primary commercial energy supply from various sources between 1953-54 and 2001-02. Though coal production increased about three times from 114 mt in 1980-81 to 325 mt in 2001-02, the share of coal in total energy supplies has declined from a level of 58.9 per cent to 51.1 per cent. This could be partly due to the increase in the share of inferior

**Table 7.3.4**  
**Trends in Commercial Energy Production**

	Units	Production					
		1960-61	1970-71	1980-81	1990-91	2001-02*	2006-07**
Coal	mt	55.67	72.95	114.01	211.73	325.65	405.00
Lignite	mt	0.05	3.39	4.80	14.07	24.30	55.96
Crude Oil	mt	0.45	6.82	10.51	33.02	32.03	33.97
Natural Gas	BCM	-	1.44	2.35	1.79	29.69	37.62
Hydro Power	Bkwh	7.84	25.25	46.54	71.66	82.80	103.49
Nuclear Power	Bkwh	-	2.42	3.00	6.14	16.92	19.30
Wind Power	Bkwh	-	-	-	0.03	1.70	4.00

\* Anticipated, \*\* Projections for the terminal year of the Tenth Plan

**Table 7.3.5**  
**Trends in Supply of Primary Commercial Energy**

(MTOE)

	Supply					
	1953-54	1960-61	1970-71	1980-81	1990-91	2001-02*
Coal	23.62	35.64	36.48	56.96	94.68	133.89
Lignite	-	0.01	0.81	1.23	3.34	6.52
Crude Oil	0.19	0.46	7.01	10.79	33.92	32.03
Natural gas	-	-	0.60	1.41	11.73	26.72
Hydro Power	0.24	0.67	2.17	4.00	6.16	6.37
Nuclear Power	-	-	0.63	0.78	1.60	5.15
Wind Power	-	-	-	-	-	0.14
Total	24.05	36.78	47.67	75.19	151.43	210.82
Net Imports	2.20	6.04	12.66	24.63	31.69	87.85
Commercial Energy Supply	26.25	42.82	60.33	99.82	183.12	298.67
Primary Non-Commercial Energy Supply	64.13	74.38	86.72	108.48	122.07	139.02
Total Primary Energy Supply	90.38	117.20	147.05	208.30	305.19	437.69

\* Provisional

grade coal in over-all coal production. The primary reason, however, is that the share of hydrocarbons in the total energy consumption of the country has been increasing over the years and is currently estimated at 44.9 per cent as compared to 37.2 per cent in 1980-81. Net energy related imports of 87.85 MTOE in 2001-02 include the import of 75.43 mt of crude and petroleum products, 19.60 mt of coal and 1.4 BKwh of electricity from Bhutan. The share of non-commercial sources in the total primary energy supply is 31.8 per cent in 2001-02, down from 53.1 per cent in 1980-81.

## Energy Imports

7.3.26 India is emerging as a large importer of crude and is planning to import LNG during the Tenth Plan period. If the present trend continues, India's oil import dependency is likely to grow beyond the current level of 70 per cent. Future strategies should focus on increasing exploration activities to enhance the level of recoverable reserves of the country.

7.3.27 Coal imports account for only about 5.6 per cent of the total domestic consumption in the current year. The steel sector has been importing

coking coal mainly for blending with domestic coal to obtain the desired quality for steel production. The cement industry and coastal power stations are importing non-coking coal.

**Table 7.3.6**  
**Share of Net Energy Imports in Primary Commercial Energy Supply**

(%)

Year	Coal	POL*	Electricity	Total
1980-81	0.25	25.45	-	25.70
1990-91	2.22	15.56	0.07	17.85
2001-02	4.12	25.25	0.04	29.41

\* Petroleum oil and lubricants

7.3.28 The share of primary energy imports in the total commercial energy supply is currently estimated at 29.41 per cent (Table 7.3.6) and is likely to increase by the end of the Tenth Plan. This is a matter of concern from the point of view of energy security.

## Energy Conservation

7.3.29 Energy efficiency or energy conservation is a multi-faceted activity involving four major sectors

of the economy - industry, transport, agriculture and domestic sectors. Although, energy conservation measures were initiated a decade back, they have not yielded the desired results due to lack of adequate focus on institutional arrangements to devise suitable incentives and disincentives backed by statutory power of enforcement.

7.3.30 During the Ninth Plan, a need was felt to have an Energy Conservation Act and to establish an apex institution to effectively implement a programme of energy conservation. Accordingly, the Energy Conservation Act, 2001 was passed which mandates the setting up of a Bureau of Energy Efficiency (BEE) that will introduce stringent energy conservation norms for energy generation, supply and consumption. However, the enforcement of penalties stipulated in the Act have been kept in abeyance for five years during which time people would be made aware of the economics and efficacy of the conservation of energy.

7.3.31 Appropriate supply side and demand side management strategies could achieve significant energy savings. Diffusion of new high efficiency technologies in major energy intensive industries, and in energy conversion, transmission and distribution can lead to a reduction in the energy intensity of the economy. For example, Integrated Gas Combined Cycle (IGCC) at 45 per cent efficiency replacing a conventional pulverised coal plant at 36 per cent efficiency will save around 0.5 Giga Joules (GJ) of primary energy for every one GJ of electricity generated. In addition, proper economic pricing of alternative energy sources can greatly influence the pattern of energy consumption and lead to energy efficiency. Efforts would be made to benchmark the efficiency parameters of the energy sub-sectors with the International Standards.

## REFORMS IN THE ENERGY SECTOR

7.3.32 Reforms in the energy sector were initiated to supplement the Government's efforts in the development of the sector and to make it more efficient. The Government has been endeavouring to provide a policy environment that encourages free and fair competition in each element of the energy value chain and attracts capital from all sources - public and private, domestic and foreign.

Encouraging such capital formation is crucial for India to meet its energy needs. Significant progress has been made in establishing independent and transparent regulatory authorities in the power sector to facilitate the rationalisation of electricity tariff as well as to encourage competition while protecting the interests of all stakeholders. The Government also proposes to set up regulatory authorities for the coal and petroleum sector during the Tenth Plan period. There is a need to examine the issue of a single regulatory authority for the energy sector with a view to developing the desired fuel-mix and related issues, in close association with sub-sector regulatory authorities.

7.3.33 The thrust of the reforms has been to deregulate the prices of commercial energy resources (which, until recently, were entirely administered), increase competition through institutional, legislative and regulatory reforms and reduce subsidies. Although subsidies cannot be completely eliminated, greater transparency can be achieved by transferring all subsidies to central or state budgets and ensuring that the benefits of subsidies reach the targeted beneficiaries. Such an approach will facilitate optimal and economic resource allocation and avoid distorting market based pricing.

## THE PATH AHEAD

- i) Create an Apex Committee on Energy (comprising the Ministers of Power, Coal, Petroleum and Natural Gas, Non-Conventional Energy Sources, Finance, External Affairs, Railways, the Department of Atomic Energy, Planning Commission and others as members) with a secretariat consisting of professionals/experts in energy/economics/finance/management/legal areas to approve policy guidelines and oversee implementation on regular basis. A key role of this committee should be to manage the trade-offs between the divergent objectives that could arise between the different sub-sectors, ensuring, at all times, consistency with the high-level policy goals. These policy goals concern economic efficiency, energy security, access, and the environment.



- ii) Accelerating the reform process in the energy sector through :
  - Restructuring and privatisation of public sector undertakings.
  - Tariff rationalisation in the power sector.
  - Phasing out of subsidies in the energy sector.
  - Moving subsidies that cannot be eliminated explicitly to central/state budgets.
- iii) Focussing on energy efficiency improvement through
  - International benchmarking of energy producing and consuming sectors
  - Demand side management
  - Develop a long-term (25 years) Technology Vision-2025 for identified priority areas and technologies. Actively promote R&D on Fast Breeder Reactor and thorium-based technologies for nuclear power, solar, gas hydrates, clean coal technologies, fuel cells etc.
- iv) Effective strategies to address the concern of energy supply security. Possible options include maximising domestic production, diversifying the fuel mix and the source of supply, investing in equity oil/gas, creating strategic domestic reserves and maintaining a manageable level of import dependence.
- v) Develop a national rehabilitation and resettlement policy to help accelerate the development of the hydro and coal sectors. A large number of hydro and coal projects have been facing implementation delays and cost overruns in the absence of such a policy. Both these sectors are vital to meeting the country's future energy needs.
- vi) Develop environmental standards and enact a transparent regulatory and legislative framework that allows easy enforcement of these standards.
- vii) Concerted efforts to meet the energy requirements of the rural areas at the lowest economic cost. The future policy initiatives, therefore, should focus on the development of the required infrastructure and continue to aim to provide universal access of commercial fuels at affordable prices.
- viii) Emphasis on preparing a time bound plan for people's participation through panchayats, cooperatives, non-government organisations (NGOs) and private entrepreneurs in planning, operation and maintenance, revenue collection and expansion of local energy supply options to ensure success.
- ix) Development of alternative fuels such as Coal Bed Methane, MS-Ethanol blend, HSD - Ethanol blend, gas hydrates and fuel cells.

## PETROLEUM AND NATURAL GAS SECTOR

4.5.34. The world energy consumption pattern has been changing over the years. Presently, the share of oil in the world energy mix is 40 per cent and that of gas is 23 per cent. The international energy outlook projections indicate that the hydrocarbons will continue to cater to 68 per cent of the total commercial world energy demand over the next two decades. The share of oil may remain the same whereas that of natural gas may go up as the latter is emerging as the preferred feedstock and fuel since it is more environment friendly.

4.5.35 Against a 63 per cent supply of primary commercial energy through hydrocarbons in the world, in the case of India it is 44.9 per cent (36.0 per cent for oil and 8.9 per cent for natural gas). There is limited scope for the increased use of gas in India, unless some large reserves are discovered or there is large-scale import. The demand for oil in the country over the next five years is expected to grow at an annual average rate of 3.6 per cent which will be higher than the average growth of around 2 per cent in the world energy demand.

**Table -7.3.7**  
**Physical Performance**

Programme	Eighth Plan	Ninth Plan	1997	1998	1999	2000	2001	Likely	%
	Actual	Target	-98 Actual	-99 Actual	-2000 Actual	-01 Actual	-02 Actual	achievement 1997-02	of target
Demand / Consumption (mt)	79.16#	104.8 (2001-02)	84.29	90.56	97.09	100.08	100.43	...	...
Reserve Accretion (MTOE)*		865.00	62.8	163.6	176.8	165.8	244.0	813.0	94.0
Crude oil (mt)	154.28	180.82	33.86	32.70	31.93	32.47	32.03	162.99	90.1
Gas production (BCM)	101.71	144.53	26.40	27.43	28.52	28.88	29.69	140.92	97.5
Refining Capacity (mt)	61.55#	113.95@	62.24	95.60	112.54	112.54	116.07	116.07	101.9

# figure for the terminal year (1996-97) @Target in the terminal year of the Ninth Plan

\* Including private/joint venture contribution of 175 MTOE for five years

**Table -7.3.8**  
**Financial Performance (Outlays/Expenditure)**

(Rs. Crore)

Ninth Plan Approved Outlay	1997-98 Actual	1998-99 Actual	1999-00 Actual	2000-01 Actual	2001-02 Actual	Likely investment 1997-02	% utilisation
74014.18	9677.08	11213.14	9948.21	9867.21	8702.13	49407.77	66.75
(74014.18)	(9083.90)	(9660.67)	(8253.72)	(7723.24)	(6456.06)	(41177.60)	(55.6)

Note: Figures in the bracket are at 1996-97 prices.

## REVIEW OF THE NINTH PLAN

7.3.36 The Ninth Plan envisaged acceleration of exploration efforts, acquisition of acreage abroad for equity oil, deregulation/rationalisation of the Administered Pricing Mechanism (APM), import of natural gas in the form of LNG, creation of adequate refining capacity and setting up of regulatory mechanism etc. as the thrust areas.

7.3.37 The physical and financial performance of the energy sector during the Ninth Plan is presented in Tables-7.3.7 and 7.3.8.

### Demand/Consumption of Petroleum Products

7.3.38. The demand for petroleum products was estimated at 104.80 mt during 2001-02 excluding the liquid fuel requirement for power generation. During the first four years of the Ninth Plan, the consumption of petroleum products grew at 5.8 per

cent. The consumption of petroleum products during 2001-02 is 100.43 million tonnes, thereby registering a growth of about 4.9 per cent during the Ninth Plan period as against the target of 5.77 per cent. The lower growth is mainly due to slowdown in the economy, improvement of roads (including construction of bridges and bypasses) and introduction of fuel-efficient vehicles.

### Exploration and Development

7.3.39. Several measures were taken by the Government to intensify exploration and enhance hydrocarbon reserves. These included exploration and development of new fields, additional development of existing fields, implementation of enhanced/improved oil recovery schemes, induction of specialised technology, enlisting the services of international experts and encouraging participation of private and joint venture (JV) companies in the exploration programme, including the New

Exploration Licensing Policy (NELP). The NELP provided attractive incentives and a level playing field to private parties who bid for exploration blocks under an international competitive bidding process. In the first stage (NELP-I, January 1999), 48 blocks were offered for bidding. Out of these, 25 blocks were awarded. The Government has since signed production sharing contracts for 24 out of the 25 blocks with national and private oil companies. In the second round (NELP-II, December 2000) 25 blocks were offered for bidding and 23 blocks awarded to various companies. In the third round (NELP-III, March 2002) bids were invited for 27 blocks - nine in deep water, seven in shallow water and 11 in onland areas.

### Hydrocarbon Reserves Accretion

7.3.40 During the Ninth Plan, considerable progress has been made in the area of exploration of hydrocarbon resources. The physical parameters achieved, such as seismic survey (2D and 3D) and exploratory drilling are higher than the original targets. However, the in-place hydrocarbon reserve for the Ninth Plan is likely to be about 780 MTOE of gas against the target of 865 MTOE. It was observed that the accretion of reserves was mainly from the existing and satellite discoveries. No new major discovery was made.

### Crude Oil and Natural Gas Production

7.3.41 The main reasons for shortfall in oil production by the Oil and Natural Gas Corporation (ONGC) were the rescheduling of additional development plan, non-commensurate drilling results, delay in input mobilisation, and less than anticipated performance in a few fields. In the case of private/JV fields, the shortfall is due to delayed development of a few fields.

### Refining Capacity

7.3.42. The refining capacity in the country was targeted to increase from 69.15 mt at the beginning of the Ninth Plan (1997-98) to 113.95 mt by the terminal year, 2001-02. It has touched 116.07 mt by the end of the Ninth Plan. Thus, the country has achieved self-sufficiency in refining capacity.

### Imports of Crude Oil and Petroleum Products

7.3.43. The import of crude and petroleum products at the beginning of the Ninth Plan (1997-98) was to the tune of 34.49 mt and 18.6 mt respectively. This increased to 39.81 mt of crude and 18.09 mt of petroleum products in 1998-99 and further to 57.80 mt and 16.60 mt respectively during 1999-2000. The increase in crude oil imports is mainly due to the commissioning of a private sector refinery by Reliance Petroleum Ltd. The import of crude oil during 2001-02 was 78.71 mt. The net export of petroleum products in 2001-02 was 3.06 mt.

### Dismantling of Administrative Price Mechanism (APM)

7.3.44 In November 1997, the timetable for the phased dismantling of APM was approved. Effective 1 April 1998, the retention pricing concept for the refineries was abolished and the refinery gate prices were fixed on import parity basis. The refining sector was delicensed in June 1998 and private and joint sector refineries were permitted to import crude oil for their own use.

7.3.45 Customs duty on crude oil was reduced from 27 per cent to 10 per cent and customs duty on products reduced from the maximum rate of 32 per cent to 20 per cent. Import and export of furnace oil and export of naphtha were decanalised in July 1998 and export of petrol, diesel and aviation turbine fuel (ATF) were decanalised in October 1999.

7.3.46 Subsidy on kerosene under public distribution system and LPG for domestic cooking was reduced in phases.

7.3.47 With the above-mentioned actions, reforms in the petroleum sector were carried forward as scheduled, which facilitated dismantling of the APM from 31 March 2002, opening the way for the entry of new players into marketing of transportation fuels.

### Restructuring/Disinvestment

7.3.48. The Group on Hydrocarbon Vision -2025 recommended that the oil PSUs be restructured to have the required strength to compete with the

private sector firms, including multi national companies. In line with these recommendations, integration of stand-alone refining companies with the marketing companies was completed by 31 March, 2001 in the following manner:

- Chennai Petroleum Corporation Ltd. (CPCL) and Bongaigaon Refineries and Petrochemicals Ltd. (BRPL) were made subsidiaries of Indian Oil Corporation Ltd. (IOC).
- Kochi Refineries Ltd. (KRL) and Numaligarh Refinery Ltd. (NRL) were made subsidiaries of Bharat Petroleum Corporation Ltd. (BPCL).
- The entire Government shareholding in CPCL, BRPL and KRL, were divested in favour of IOC and BPCL respectively.
- In the case of NRL, the 19 per cent equity holding by IBP Co. Ltd. was divested to BPCL, Oil Industry Development Board (OIDB) and Oil India Limited (OIL) each acquiring 10 per cent.
- The Government completed the strategic sale of 33.58 per cent of equity in IBP Co. Ltd. to IOC.

### Environmental Management

7.3.49. Oil companies have implemented major programmes for the upgradation of auto fuel (petrol and diesel) quality during the Ninth Plan. Lead has been removed from petrol in phases and from 1 February 2000, only unleaded petrol is being supplied in the entire country. Petrol octane number has been increased and sulphur content reduced from 0.20 per cent max. to 0.10 per cent max. in the entire country from 1 April 2000. In addition, the four metro towns and the National Capital Region (NCR) are being supplied petrol of 0.05 per cent max. sulphur content. The sulphur content in diesel has been reduced from 1.0 per cent max. to 0.25 per cent max. in the entire country during the period 1 April 1996 to 1 January 2000. In addition, in the four metro towns, sulphur content in diesel has been reduced to 0.05 per cent max. Diesel Cetane

number has been increased from 45 to 48 from 1 April 2000. Improvements have been done in the distillation specifications of diesel from 1 April 2000. The improvements in petrol and diesel quality has facilitated adoption of India 2000 (Euro-I equivalent) emission norms in the entire country and Bharat Stage-II (Euro-II equivalent) emission norms in the 4 metros. For this purpose, an amount of Rs. 10,000 crore was spent over the Plan period.

### Ninth Plan Performance

- Reforms in petroleum sector were carried forward as scheduled with the dismantling of APM on 31 March 2002.
- Liberalisation of petroleum product marketing in the country was done by notifying guidelines for authorisation to market transportation fuels by private parties.
- Up to 100 per cent foreign direct investment (FDI) was permitted in the refining sector.
- Crude oil and natural gas production was short of target by 10 per cent and 2 per cent respectively.
- Secured equity oil abroad by participating in the oil and gas project in Vietnam and in Sakhalin (Russia) and signing an agreement with Iraq for oil exploration.
- Hydrocarbon reserves accretion was below target by 10 per cent.
- Significant discoveries of natural gas in the Krishna-Godavari deep-water area was made by ONGC and in the Cambay Offshore area by a joint venture consortium.
- Two rounds of offer of exploration blocks under NELP were completed in record time with 47 blocks awarded to parties.
- Under the CBM policy, six blocks were awarded for exploitation.

- Refining capacity targets were surpassed. At the same time, the import targets were exceeded.
- Petroleum products consumption was lower by 6 per cent than the demand forecasts.
- Drive for alternative fuels gathered momentum with the introduction of auto LPG and setting up of ethanol-petrol blending projects in selected states.
- Significant achievement was made in introducing cleaner fuels in major cities in line with international standards.
- Around 3,40,50,000 LPG enrolments were made, thereby liquidating the entire waiting list.
- Year-wise phasing out of subsidies was not in line with the Gazette notification.
- Lower Ninth Plan expenditure of Rs. 49,407.77 crore against the approved outlay of Rs. 74,014.18 crore.

#### Success Story in the Petroleum Sector

1. Dismantling of APM on 31 March, 2002 in line with Gazette notification.
2. Two rounds of NELP completed in record time.
3. Refining capacity targets surpassed.
4. Release of around 3.4 crore LPG connections, thereby liquidating the entire waiting list.
5. Secured equity oil abroad.
6. Introduction of auto LPG and setting up of MS-Ethanol blending projects in selected states.

#### Conservation of Petroleum Products

7.3.50. Upstream oil companies adopted various conservation methods. These include: reduction in

gas flaring by re-injection of gas to underground reservoirs, installation of waste heat recovery system, use of dual fuel/ natural gas engines to achieve substitution of diesel by low pressure associated natural gas, use of solar powered cathodic protection systems for pipelines and use of self loading types of skids for mounting rig equipment etc.

7.3.51. The oil refineries implemented energy conservation projects such as revamping and replacing low efficiency furnaces and boilers, various methods for improved energy efficiency such as enhanced heat transfer system, use of state-of-the-art equipment, pinch technology, gas turbine based co-generation systems, low heat recovery, stock monitoring systems to control flare losses, periodic energy audits, advanced process controls apart from operational improvements and better house-keeping practices.

7.3.52. Refineries produced and sold high-grade lubricants under a phased action plan and constantly upgraded lubricants in line with the international development to increase the life of engines and lower the frequency of lubricants replacement.

7.3.53. At the consumer end, the Petroleum Conservation Research Association (PCRA) undertook various sectoral programmes. These included the adoption of efficient engines and fuel efficient driving habits supplemented by training programmes in the transport sector; carrying out energy audits and fuel oil diagnostic studies in industries and promoting fuel-efficient practices in industry; standardisation of fuel-efficient irrigation pump-sets in the agricultural sector and development of fuel-efficient domestic appliances.

#### Ninth Plan Outlays

7.3.54. The petroleum sector outlay for the Ninth Plan was Rs. 74,014.18 crore. The estimated expenditure up to 2001-02 was Rs. 49,407.77 crore at prevailing prices during the various years and Rs. 41,177.60 crore at 1996-97 prices representing utilisation of 66.75 per cent and 55.6 per cent respectively. The shortfall is mainly on account of delays in taking up the joint venture refinery projects.

## APPROACH TO TENTH PLAN

7.3.55. India's oil industry will have to play the role of a 'frontline' industry in the country's march towards becoming an economic super power. To successfully fulfill this role, the industry will have to become internationally competitive and endeavour to become a global player. This will ensure the country's sustained prosperity and economic security. The progress achieved so far provides the launching pad for gearing up the hydrocarbon sector to meet the new challenges. The key elements of the comprehensive approach approved by the National Development Council (NDC) for this sector are detailed below.

7.3.56 "India Hydrocarbon Vision-2025" lays down the framework of the approach and policies that shall guide this sector for the next 25 years. India's dependence on imported oil is increasing. It is also likely that the use of gas for power generation will increase rapidly in the coming years. Efforts should be made to increase the indigenous production of oil and gas.

7.3.57 The NDC recognised that arbitrary administrative restrictions on the consumption and imports of petroleum products are not the solution and will only affect economic development. The correct approach would be to allow the scarcity value of such exhaustible natural resources to be reflected in prices. This will create an incentive for conservation and efficient use of petroleum products. It envisaged that the APM for petroleum products would be dismantled and petroleum price determination will shift to market based pricing at the start of the Tenth Plan. Complete price deregulation and operation of efficient markets in the petroleum sector requires the establishment of prudential rules and regulations by a statutory regulatory authority. Therefore, the setting up of regulatory mechanisms needs to be expedited, so as to ensure smooth transition from the APM regime to a market-driven pricing mechanism.

7.3.58 At the same time, there is need to provide for oil security through strategic storage of crude oil and petroleum products, diversification of oil imports and investing in equity oil abroad. In view of the strategic importance of the oil sector in the

economy, oil PSUs need to be restructured so that they can compete with private and multinational companies. Following restructuring, disinvestment in or privatisation of some of these companies through a transparent process should also be undertaken in the course of the Tenth Plan.

## Thrust Areas for Tenth Plan

7.3.59 Keeping in view the above approach, the following thrust areas have been identified for the Tenth Plan:

### i) Oil Security:

- a) Acceleration of exploration efforts, especially in deep offshore and frontier areas
- b) Improved oil recovery (IOR) / Enhanced oil recovery (EOR)
- c) Equity oil and gas abroad
- d) Strategic storage of crude oil
- e) Alternate fuels

### ii) Infrastructure Development:

- a) Refining capacity
- b) Regulatory mechanism to oversee consumer interests
- c) Marketing and distribution facilities commensurate with demand

### iii) Efficiency Improvement:

- a) Benchmarking of the hydrocarbon sector with international standards
- b) Oil conservation
- c) Demand side management

### iv) Environment and Quality Improvement:

### v) Reforms:

- a) Dismantling of APM
- b) Restructuring/disinvestment

### vi) Regulatory Mechanism:

### vii) Plan Outlays:

The action plan for the above thrust areas is detailed below :

## Demand of Petroleum Products

7.3.60. The demand of petroleum products in the terminal year of the Tenth Plan (2006-07), based on a gross domestic product (GDP) growth rate of 8 per cent, was projected by the Working Group on petroleum & Natural Gas as 134.6 mt. However, in view of the low demand of petroleum products in the last two years of Ninth Plan and the increasing share of the service sector especially information technology (IT) in GDP (with e-commerce reducing transportation requirements), the demand target may be 120.4 million tonnes for 2006-07, resulting in a CAGR of 3.7 per cent during the Plan period.

## Production of Crude Oil and Natural Gas

7.3.61 The cumulative production of crude and natural gas are estimated at 169.38 mt and 177.48 BCM during the Tenth Plan. The oil and gas production profile for the Tenth Plan is based on the established reserve base and also considering key issues like the present status of different fields, the input implementation schedules and status of health of the reservoirs. The year-wise break-up is given in the Tables 7.3.9 and 7.3.10.

**Table - 7.3.9**  
**Crude Oil Production**

Organi- sation	2002-03	2003-04	2004-05	2005-06	2006-07	Total
ONGC	25.90	25.99	26.38	26.19	25.56	130.02
OIL	3.50	3.60	3.75	3.85	4.00	18.70
Pvt./JVC	3.68	3.63	4.50	4.44	4.41	20.66
Total	33.08	33.22	34.63	34.48	33.97	169.38

(mt)

**Table - 7.3.10**  
**Natural Gas Production**

Million Standard Cubic Meters per Day (MMSCMD)

Organisation	2002-03	2003-04	2004-05	2005-06	2006-07	Total (BCM)
ONGC	65.5	63.37	62.22	58.83	57.03	112.10
OIL	6.01	6.41	6.61	7.69	7.80	12.61
Pvt./JVC	15.05	20.76	35.01	35.47	38.25	52.77
Total	86.56	90.54	103.84	101.99	103.08	177.48

## Imports of LNG/Natural Gas

7.3.62. Import of LNG is on open general licence (OGL). A number of projects for setting up of LNG terminals have been approved by the Government and three terminals are under construction. The fate of other terminals is uncertain because statutory clearances and other agreements/guarantees are yet to be finalised. Another terminal at Kochi may also mature during the tenth plan. Considering that four terminals will be commissioned during the Tenth Plan, the overall extent of imports by the terminal year could be in the range of 40-50 million standard cubic metres per day (MMSCMD).

7.3.63. Pipeline gas imports are economically superior to LNG imports. However, the success of transnational gas pipeline projects critically hinges on various geo-political considerations involving security of supply, transit and importing countries etc. Initiatives have been taken for pipeline gas imports from various countries and some gas supplies may commence in latter part of the Tenth Plan.

## OIL SECURITY

7.3.64. The increasing imports of crude oil and the proposed LNG imports during the Tenth Plan, high price volatility in the international markets and disruption of supplies due to war etc. raise the issue of oil security. The strategy to address the oil security concerns involves diversification of sources for crude supplies, strategic storage and globalisation measures to bring equity oil and gas/LNG from abroad. In view of this, the following issues would be given priority during the Tenth Plan.

### Acceleration of exploration efforts, especially in deep offshore and frontier areas.

7.3.65. The exploration programme for the Tenth Plan would be targeted to appraise Indian sedimentary basins to the extent of 35 per cent. The target for hydrocarbon in-place reserves accretion is 785-914 mt from domestic activities during the Tenth Plan. Additionally, 320 mt of reserve accretion is planned from overseas activities during this period. Since the present known oil and gas producing fields in the country have already reached the declining stage, new thrust would be given for exploration in deep waters as also in the other frontier areas. Further, the system of open acreage for exploration would be adopted after some NELP rounds.

### Improved oil recovery (IOR)/Enhanced oil recovery (EOR)

7.3.66. The crude oil production target for the Tenth Plan is 169.38 mt consisting of 148.72 mt by the oil PSUs and the balance by private/JV companies. This is almost the same as the Ninth Plan anticipated production. This is mainly due to the absence of any significant new additions from new fields. A number of improved oil recovery projects and enhanced oil recovery projects are proposed to be taken up to maintain the current production level. However, the total investment of ONGC for implementing 19 IOR/EOR projects in their 16 major fields is envisaged to be about Rs. 12,000 crore.

### Equity oil and gas abroad

7.3.67. In view of the stagnating domestic production of crude and the widening gap between demand and supply of oil and gas, there is a need to diversify oil supply sources, and acquire equity oil and gas abroad. This would be an important component of the strategy to achieve oil security. The Government would encourage oil PSUs/private sector companies to tap opportunities available abroad for acquiring exploration acreages, either on their own or through strategic alliances. During the Tenth plan, ONGC envisages 5.2 mt of oil and 4.94 BCM of gas production from Russia (Sakhalin-I) and Vietnam. The year-wise break-up is given below:

	2002 -03	2003 -04	2004 -05	2005 -06	2006 -07	2002-07 (Tenth Plan)
OIL (mt)	-	-	-	1.2	4.0	5.2
GAS (MMSCMD)	0.63	1.64	2.22	3.45	5.60	4.94 (BCM)

### Strategic storage of crude oil

7.3.68. The need for strategic storage arises from the lack of self-sufficiency in meeting the crude oil requirements. Crude oil inventories in the country are low, and are expected to go down further in the competitive market regime.

7.3.69. Under the APM, the storage of crude oil and petroleum products and the strategic requirements were being taken care by the oil PSUs. However, in the deregulated scenario, the oil companies will optimise their inventories to meet their operating requirements in order to take advantage of competitive pricing and enhance their margins. Thus, a mechanism for creating strategic storage would need to be evolved in the Tenth Plan.

### Alternate fuels

7.3.70. Another step towards ensuring oil security is development of non-conventional energy sources such as CBM and gas hydrates. Further, blending of ethanol with motor spirit and diesel is to be pursued.

### Coal bed methane (CBM)

7.3.71. A programme for exploration and production of CBM was announced in April, 2001 under which companies would be required to bid for committed work programme and production-based payment to the Government. Five CBM blocks have been awarded in the first round of bidding and, two blocks already awarded to PSUs on nomination basis. As per the initial assessment, significant production potential for methane production can be expected from these blocks, some of which may materialise during the Tenth Plan period.



### Ethanol - Motor spirit/HSD blend

7.3.72. On the basis of the positive feedback from the three pilot projects - two in Maharashtra and one in Uttar Pradesh, it has been decided to introduce mandatorily ethanol blended petrol (5 per cent gasohol) in the first phase in the eight sugar-producing states of Andhra Pradesh, Gujarat, Karnataka, Punjab, Haryana, Maharashtra, Tamil Nadu and Uttar Pradesh by the end of 2002 and in the rest of the country in the second phase. In addition, an Inter-Ministerial Task Force has been constituted to prepare a roadmap to switch over to Ethanol blending with diesel and also for 10 per cent blending of ethanol with petrol.

### Gas hydrates

7.3.73. The National Gas Hydrate Programme (NGHP) roadmap is being finalised. The draft roadmap envisages a number of activities like geo-scientific works and studies, laboratory studies, formulation of drilling technology and undertaking drilling operations besides brainstorming for working out the most appropriate production technologies of gas from gas hydrates. All the activities connected with the NGHP are planned to be taken up concurrently and pilot studies for the production of gas from gas hydrate, if found feasible, are planned by the end of the Tenth Plan.

## INFRASTRUCTURE DEVELOPMENT

### Refining capacity

7.3.74. Since the refinery sector has been de-licensed, it is not possible to correctly assess the future plans of refining capacity additions. The projection of total refining capacity materialisation during the Tenth Plan would depend upon several factors including domestic demand, duty structure that would affect import and export possibilities and refining margins.

7.3.75. As to the actual materialisation of the refining capacity, based on the present indications, the following two scenarios are likely to emerge:

**Scenario - I.** Keeping in view the competitive environment in the deregulated scenario, current low

refining margins, the slow down of the product demand and the fact that the companies would need to make substantial investments in quality upgradation projects, only expansion projects under implementation may fructify during the Tenth Plan. Under this scenario, the refining capacity will increase to around 138 million tonnes per annum (mtpa).

**Scenario - II.** If the product demand grows at a higher rate, then in addition to the capacity expansion projects under implementation, one or two new grass-root projects may also get completed during the Tenth Plan, taking the refining capacity to around 155 mtpa at the end of the Plan period.

7.3.76. It is expected that the companies, based on the trend in the demand growth, will review the refinery projects and rework the project completion schedules.

### Regulatory mechanism to oversee consumer interests

7.3.77. In the deregulated, market-determined pricing scenario, when private companies (both Indian and foreign) are allowed marketing of transportation fuels, the degree of competition, enhanced efficiency of individual players and the market location (urban, rural or remote) would set the consumer prices. The emergence of differential pricing across different locations based on the cost of storage and distribution would enhance allocation efficiency, and encourage the establishment of refineries in economic consumption zones. However, certain remote and inaccessible areas of the country would require special attention, as the higher prices of petroleum products in remote areas would be detrimental to the overall development of such regions. Hence, the Government would need to monitor the prices of petroleum products in the country in general and in the monopolistic markets in particular. For this purpose an independent statutory regulator for the downstream petroleum sector will be set up.

### Marketing of products and distribution facilities

7.3.78 The Government decided, through a resolution dated 8 March 2002 to authorise the

private sector to market transportation fuels namely motor spirit, high speed diesel, and ATF. So far, only public sector oil marketing companies were having the authorisation to market transportation fuels. The guidelines approved by the Government, inter-alia, provide for authorisation to market transportation fuels, conditional to a company investing or proposing to invest Rs. 2,000 crore in exploration and production, refining of oil and gas, pipelines and terminals. Such investment should work towards additionality of assets, and in the form of equity, equity-like instruments or debt with recourse to the company.

## EFFICIENCY IMPROVEMENT

### Benchmarking of hydrocarbon sector

7.3.79 The hydrocarbon sector would be developed as a globally competitive industry which could be benchmarked against the best in the world through technology upgradation and capacity building in all facets of the industry.

### Oil conservation

7.3.80 Oil conserved through efficient utilisation can be looked upon as a quicker, efficient and economic source of new energy. Any reduction in oil demand due to efficient utilisation would allow the diversion of this scarce resource to other pressing needs and new economic activities.

7.3.81 Pending development of new energy resources and technology, there are tremendous opportunities for improving efficiency by adopting more efficient technologies available around the world and also by using market-driven approaches, which have a powerful impact.

7.3.82 Thus, there is an urgent need to establish a system framework and approach to realise the overall conservation potential. However, the existence of market imperfections limit their effectiveness. This calls for a regulatory approach, which includes setting of minimum standards and the labeling for all types of efficient equipment and appliances.

## Demand side management

7.3.83 In India, the emphasis has always been on supply side management. However, demand side management needs to be pursued so as to minimise the overall cost. Demand side management in the oil sector implies minimising the oil intensity of the economy without compromising on the pace of economic development.

7.3.84 The demand for petroleum products has increased rapidly during the last two decades. Since the transport sector consumes about 45 per cent of oil in the country, demand management measures should primarily be directed at this sector. These would involve shift of traffic from road to rail, introduction of mass transport and other public transport in metropolitan cities and mandating fuel efficiency levels in transport vehicles.

## ENVIRONMENT AND QUALITY IMPROVEMENT

7.3.85 Presently, the product quality requirements in India are ahead of most of the countries in the Asia-Pacific and Middle East regions. In order to enable adoption of Bharat Stage-II vehicular emissions standards through out the country and Euro-III equivalent emission norms in seven mega cities from April 2005, the quality of petrol and diesel would need to be further improved. For this purpose, measures such as further reduction of sulphur content need to be taken in a time-bound manner. Accordingly, Indian refineries would need to invest in secondary and tertiary processing facilities to ensure that the quality of products conforms to the appropriate specifications.

## REFORMS

### Dismantling of APM

7.3.86 With the dismantling of APM from 1 April 2002, the prices of all petroleum products have become market determined, with subsidy on kerosene under public distribution and LPG for domestic cooking to be met from the fiscal budget. These subsidies, to be provided on a flat rate basis, will be phased out over three to five years during the Tenth Plan.

7.3.87 In the deregulated scenario, refineries will have to improve their efficiency to meet the challenges of the competitive scenario. The four refineries (Digboi, Guwahati, Numaligarh and Bongaigaon) in the North-Eastern region are of sub-economic size compared to present day minimum/threshold size of 9 mtpa. There is no scope for increasing their capacities due to low consumption of petroleum products in the region and non-availability of crude oil from the North-East.

#### THE PATH AHEAD

- Deregulation of the petroleum sector with dismantling of APM.
- Establishment of a regulatory authority for the petroleum sector, including natural gas.
- Restructuring/disinvestment of oil and gas PSUs on a selective basis.
- Oil security through accelerated exploration activities, diversification of sources, securing equity oil abroad and strategic storage of oil.
- Development of alternative fuels such as CBM, MS-Ethanol blend, and gas hydrates.
- Benchmarking of the hydrocarbon sector to international levels.
- Phasing out of subsidies. Subsidies, if any, to be routed through the Central Budget.
- Improvement of product quality in line with international standards.
- Emphasis on R&D for introduction of latest technology.
- Creating an enabling atmosphere for development of infrastructure facilities to achieve global competitiveness.
- To promote a greener and cleaner environment in the country by setting emission norms and product quality specifications.

#### Restructuring/Disinvestment

7.3.88 The disinvestment process will be carried forward in selected oil and gas PSUs during the Plan period to enhance competition and maximise shareholder value.

#### REGULATORY MECHANISM

7.3.89 With the dismantling of APM, a regulatory mechanism will be established for the downstream and natural gas sector. The regulatory mechanism will oversee the functioning of the industry to ensure just and fair competition that protects consumer interest.

#### PLAN OUTLAYS

7.3.90 A public sector outlay for the Tenth Plan has been fixed at Rs. 96,041.19 crore. This consists of Rs. 59,468.95 crore for exploration and production and Rs. 36,572.24 crore for the refining and marketing sector. The company-wise outlays are given in Annexure-7.3.1 and the project-wise break-up of the Tenth Plan outlay is given in the Appendix. In view of the low utilisation of plan funds in Ninth Plan, all efforts should be made to stick to the approved cost and time schedule for the projects through regular monitoring so as to fully utilise the outlay.

#### COAL

##### Role of Coal in Global Energy

7.3.91 Coal contributes to around 22 per cent of the total global primary energy consumption against 40 per cent from oil, 23 per cent from gas, 7 per cent from nuclear, 2 per cent from hydro and 6 per cent from renewables. Around 38 per cent of total world electricity generation is based on coal. In the case of India, the share of coal in the supply of primary commercial energy has been about 50 per cent. About 70 percent of the power generated in India is coal and lignite based. The global hard coal consumption in 2000 was 3,738 mt against production of 3,639 mt. Coal demand grew by about one bt between 1980 and 2000. China is the largest producer (1,171 mt) followed by the United States (899 mt) and India (310 mt). The major coal

exporters are Australia (186.8 mt), South Africa (70 mt), Indonesia (56.8 mt), China (55.1 mt) and United States (53 mt). The major coal importers are Japan (145.3 mt), Republic of South Korea (61.7 mt), Chinese Taipei (45.4 mt), India (24.5 mt) and United Kingdom (23.5 mt).

7.3.92 Coal is a diverse and abundant source of energy. Most of the coal is consumed domestically and only 12 per cent of the world production is traded internationally. Coal will continue to play a key role in the future global energy demand. Known coal reserves are spread over almost 100 countries and at current production levels, proven coal reserves are estimated to last for over 200 years. In contrast, proven oil and gas reserves are estimated to last around 40 and 60 years respectively at current production levels.

7.3.93 Although combustion of coal produces environmental pollutants, this can be mitigated to a large extent by the development/adoption of clean coal technologies as they can substantially reduce the level of carbon dioxide emissions per unit of energy output. A 5 per cent conversion efficiency improvement in a coal-fired power plant brings more than 10 per cent reduction in carbon dioxide emissions. A global response encouraging voluntary actions on the part of industry and cooperation between industry and Government on this issue is required.

7.3.94 Coal is a relatively inexpensive source of energy compared to other fuels and coal prices are more stable when compared to the more volatile prices of oil and gas. Coal is easy and safe to transport and offers enhanced security of supply due to different and varied sources of supply. Levels of energy conversion efficiency in modern coal plants can reach 45 per cent through the use of supercritical steam conditions. This improves fuel efficiency and effective cleaning of flue gases.

### Coal's Role in India's Energy Needs

7.3.95 Coal remains India's principal source for meeting its primary and secondary commercial energy requirements. Of the 1,04,917.50 MW of overall installed power generation capacity in the

country (as on 31 March 2002), about 59,386 MW is coal based and 2,745 MW is lignite based, totaling to 62,131 MW or 59 per cent. In the 1970s, the coal sector was nationalised and emphasis was laid on coal-based thermal power generation as the backbone of India's energy economy. In the past two decades, coal consumption grew at an annual rate of 5.7 per cent while coal production has grown at 5.1 per cent annually. In 2000-01, coal production touched 313 mt (of which about 96 per cent is from public sector) from 114 mt in 1980-81 and lignite production reached 24.25 mt from 5.11 mt over the same period.

7.3.96 Indigenous coal is likely to remain the most stable and least cost option for the bulk of India's energy needs in the foreseeable future. This is so because coal based thermal power generation capacity has a shorter gestation period and lower specific investment costs when compared to other locally available commercial energy resources like nuclear or hydropower. Thus, there is need for concerted efforts for the overall development of the sector in future Plans. Energy security concerns underscore the need to further develop indigenous coal production in the foreseeable future.

#### ROLE OF COAL IN WORLD ENERGY

- Around 38 per cent of total world electricity generation is based on coal. In 1999, Indian coal's share in electricity generation was around 70 per cent against 56 per cent in the case of United States, 80 per cent in the case of China, 84 per cent in the case of Australia, 90 per cent in the case of South Africa, 51 per cent in the case of Germany and Poland at 96 per cent. Also, coal is a key input for the steel and cement industries.
- Coal will continue to play a key role in the future global energy demand.
- Indigenous coal will be the most stable and economical option for the bulk of India's energy needs in the foreseeable future.

## REVIEW OF NINTH PLAN

7.3.97 The Ninth Plan envisaged augmenting domestic coal production with a long-term perspective in view of the sharply increasing demand for the power sector through improved productivity, capacity utilisation, technology adaptation, simplified project clearance procedures, improved project implementation, exploration, conservation etc. An important area of concern

related to restructuring the coal sector and facilitating private sector participation in commercial coal mining through necessary legislative amendments. The Plan laid emphasis on clean coal technologies, science and technology in the coal industry, development of CBM resources, and augmentation of port and rail infrastructure facilities for improved coal movement and development of lignite resources.

### Ninth Plan Success Stories in the Coal Sector

- A total of 24 billion tonnes (bt) of incremental coal reserves and 25 bt of incremental lignite reserves have been established through regional/promotional exploration during the Plan.
- Forty-seven new projects for a coal production capacity of 21.62 mt and one new lignite project for a production capacity of 3 mtpa have been sanctioned during the Plan.
- The incremental coal production during the Plan has been about 36 mt.
- The incremental coal consumption during the Plan has been about 53 mt.
- The incremental coal-based generation during the Plan has been 77.67 billion units (bu).
- The incremental lignite production from Neyveli Lignite Corporation (NLC) during the Plan has been 1.05 mt.
- The incremental gross generation from NLC during the Plan has been 1.75 bu.
- The overall productivity in terms of Output per Manshift (OMS) increased from 1.86 tonne to 2.44 tonne in Coal India Ltd (CIL) and 1.34 tonne to 1.55 tonne in Singareni Collieries Company Ltd (SCCL) during the Plan.
- A voluntary retirement scheme (VRS) was introduced for rationalising manpower. A total of 37,380 employees availed VRS in Eastern Coalfields Ltd, Bharat Coking Coal Ltd, and Central Coalfields Ltd during the Plan and the funds were provided through the National Renewal Fund/domestic budgetary support.
- Under clean coal technologies, a demonstration project on Coal Bed Methane (CBM) extraction and utilisation has been taken up under coal sector S&T grants and UNDP/GEF funding.
- With deregulation of prices of remaining grades of coal with effect from 1 January 2000, the prices of all grades of coal stand decontrolled.
- Based on the recommendations of High Level Committee to look into the problems of subsidence and fire in Raniganj and Jharia coalfields, a Plan scheme, Rehabilitation, Control of Fire and Subsidence in Jharia and Raniganj Coalfields has been taken up for mitigation measures.
- In order to upgrade the proved coal reserves, particularly in the blocks outside the CIL command area, and to reduce time lag between allotment of coal mining blocks to the private entrepreneurs and the coal mining operations, a Plan scheme, Detailed Drilling in Non-CIL Blocks has been taken up with budgetary support. About 2 bt of coal reserves have been established under this scheme.
- The Government has allowed securitisation of outstanding coal and power sale dues from SEBs to coal companies. This is expected to yield results in the Tenth Plan.

## Coal Demand

7.3.98 Sluggish economic growth and non-materialisation of new coal based thermal power generation capacity in the first two years of the Ninth Plan has adversely affected coal demand. Coal consumption registered a marginal growth of 2 per cent during this period against the initially envisaged annual demand growth of 6.85 per cent in the Ninth Plan. Thus, during the Mid-Term Appraisal of the Ninth Plan, coal demand in the terminal year of the Plan was revised downwards from 412.20 mt to 370.80 mt of raw coal implying an average annual compounded growth of 4.6 per cent. However, the anticipated coal consumption of 348.43 mt (excluding 4.93 mt of washery middlings) in 2001-02 would imply a growth of only 3.32 per cent per annum in coal consumption against the revised Ninth Plan target of 4.6 per cent. This shortfall has been mainly due to a 49 per cent slippage in addition of coal-based power generation capacity. As against a target of 15,102 MW of incremental coal-based generation capacity, only 7,680 MW (51 per cent) has been realised during the Ninth Plan.

7.3.99 Unlike earlier Plans, where the coal offtake mainly got affected due to transportation constraints, in the Ninth Plan, it was mainly affected due to financial constraints of state electricity boards (SEBs). The SEBs did not lift the linked quantities entirely and did not maintain the stipulated norms for stocks at thermal power stations. Despite the slower growth in coal offtake by power plants, coal-based generation registered a growth of 5.2 per cent during the Ninth Plan as a result of improved plant performance. Offtake was also adversely affected because of import of non-coking coal by cement producers and coastal power plants. Such imports became economical due to high railway freights for coal and incentives for cement exports. Besides, import of coking coal by the steel sector increased from 9.45 mt at the beginning of the Ninth Plan to about 11 mt in the terminal year because of the lack of local coal supplies to meet the demand.

## Coal Production

7.3.100 The slump in coal offtake had its effect on coal production, which also suffered. The coal companies resorted to matching production to the

offtake to avoid piling up of pithead stocks. This, in turn, has necessitated downward revision of the coal production target in the terminal year of the Ninth Plan from 370.60 mt to 328.86 mt, implying an average annual compound growth of 2.86 per cent against the envisaged growth of 5.3 per cent. The anticipated coal production of 325.65 mt in 2001-02 implies an average annual compound growth of 2.4 per cent. It is to be noted that the anticipated coal production comprises of 4.10 mt from private sector mines in Meghalaya, which was not considered at the time of the formulation of the Ninth Plan.

7.3.101 Against an incremental coal production of 56.37 mt achieved in the Eighth Plan, the incremental coal production envisaged in the Ninth Plan was 84.94 mt. Of this, 60.04 mt was to come from new projects of PSUs [Coal India Ltd. (CIL)-55.71 mt and Singareni Collieries Co. Ltd. (SCCL)-4.33 mt] and 13 mt from new captive blocks. As against this, the anticipated incremental coal production during the Ninth Plan was only 36.36 mt. The capacity of the new projects sanctioned by CIL and SCCL till December 2000 was only 19.32 mt (CIL-17.06 mt; SCCL-2.26 mt). Production from the captive blocks yielded only 4 mt.

7.3.102 This slow rate of capacity addition is likely to affect the coal availability in the medium and long term. This shortfall is likely to become more acute as the gestation period for a coalmine is considerably longer than a power plant. Urgent steps are needed to develop all projects identified in the Ninth Plan and to invite private sector participation. Coal companies are reluctant to make investments in new projects in the absence of firm fuel supply agreements (FSAs). Augmentation of coal production capacity to meet the coal demand in the Tenth Plan and beyond is expected to be seriously impacted in the absence of immediate corrective actions.

4.5.103 The Ninth Plan physical and financial performance is given in Table- 7.3.11.

## Ninth Plan At A Glance

- Lower than expected economic growth and non-materialisation of new coal-based

**Table-7.3.11**  
**Ninth Plan Physical & Financial Performance**

Parameter	Ninth Plan (2001-02)				% ACGR		
	Original	Mid-Term Appraisal	Annual Plan Target	Anticipated	Original	Mid-Term Appraisal	Anticipated
<b>I. Physical</b>							
Coal Demand/Offtake (mt)	412.20 (7.70)	370.80 (7.70)	354.29 (4.83)	348.44 (4.93)	6.85	4.6	3.32
Coal Production (mt)	370.60	328.86	322.73	325.65	5.34	2.86	2.40
Lignite Production (mt)							
NLC	22.00	22.00	17.50	17.50	4.90	4.90	0.17
GMDC	10.00	NA	NA	6.55			
Rajasthan	13.00	NA	NA	0.25			
Total:	45.00			24.30			
Promotional Expl. Cumm. IX P (m)	7,75,000	7,20,000	NA	6,59,000			
Detailed Drilling Non-CIL cumm IX P (m)	3,75,000	3,63,000	NA	2,76,000			
<b>II. Financial (1997-02)</b> (Rs.Cr.)							
Coal & Lignite:	17575.23	17430.74		13130.31			
NLC (Power)	1866.36	1713.00		1257.41			
Total DOC:	19441.59	19143.74		14387.72			

**Note:-** NLC - Neyveli Lignite Corporation Ltd.; GMDC - Gujarat Mineral Development Corporation Ltd.

power generation capacity affected coal offtake and coal production.

- The slow rate of coal capacity addition during the Plan will adversely affect the domestic coal availability in case the coal demand for power picks up in the Tenth Plan and beyond.
- The Bill to amend the Coal Mines (Nationalisation) Act, 1973 allowing private sector in commercial coal mining is yet to be approved.
- The setting up of a regulatory authority and allocation of coal blocks for exploration and exploitation has not taken place.
- Restructuring of CIL as envisaged has not been done.
- Though decontrol of coal prices has improved the financial health of the coal

companies, the revival of loss-making coal companies has not taken place.

- Voluntary retirement scheme is being implemented in loss-making coal companies for rationalising the manpower and to improve their financial health.
- Detailed exploration in non-CIL blocks has been taken up to upgrade proven coal reserves.
- The extractable coal reserves stand at 18 bt only (21 per cent of the proved reserves of about 84 bt).
- Import dependence for coking coal in the case of steel sector is on increase, as the domestic supplies are not improving. Further, imports of non-coking coal are also on the rise, particularly in coastal regions, due to high domestic freight rates.

- Constraints of land acquisition, rehabilitation, forestry and environmental clearances, etc. continue to adversely affect implementation of coal projects.
- Unpaid dues from SEBs continue to rise and dent the financial health of the coal and lignite companies.
- Plan expenditure suffered as a result of shortfall in internal resource generation.

7.3.104 Presently, about 57 per cent of the total coking coal produced in the country is being used for metallurgical purposes and the rest for power and other industrial purposes. Though coking coal is meant for use in metallurgical purposes, the low utilisation of available production in India is because of the poor quality of the coal, which is not economical to wash. The existing coking coal washeries were designed to beneficiate coking coal of relatively easy to moderately difficult washability characteristics. Increased production from lower seams containing poor quality coal, increased production from mechanised opencast mines and increased proportion of fines below 0.5 mm with no proper facilities to process and handle are coming in the way of the performance of coking coal washeries.

7.3.105 The ash percentage in the washed coking coal is being maintained in the range of 18-20 per cent. The yield of washeries has deteriorated considerably declining from 51 per cent in the beginning of the Ninth Plan to about 43 per cent at the end of the Plan period. Against a planned supply of 12.26 mt of washed coking coal from CIL sources, the anticipated supply is only 5.19 mt. Some of the coking coal washeries of CIL have been converted for washing non-coking coal, but the results have been mixed and technical problems persist. Washeries have thus remained uneconomical.

7.3.106 The Ninth Plan laid emphasis on beneficiation of non-coking coal for supply to power plants located beyond 700 km from pitheads. Coal beneficiation was also emphasised to comply with the directive of the Ministry of Environment and Forests mandating use of coal containing not more than 34 per cent ash in thermal power stations

located 1,000 km from pitheads and those located in urban/sensitive/critically polluted areas, irrespective of their distance except the pithead plants. According to estimates by the Joint Apex Committee constituted by the Ministry of Power to consider the various aspects relating to the directive of the Ministry of Environment and Forests, about 90 mt is the requirement projected for such stations. However, the available capacity to wash non-coking coal in CIL is only about 10 mt from seven washeries. Though coal washing is open to private sector participation, there have not been any takers. This is mainly because washeries are not permitted to sell washed coal directly to the consumers. It has been proposed to supply blended coal to maintain 34 per cent ash level but even this is not happening. The need to create additional capacity for washing and coal beneficiation continues.

### Demand Supply Gap

7.3.107 The assessed raw coal demand of 354.29 mt in 2001-02 was proposed to be met through a domestic production of 322.73 mt, a stock draw down of 1.5 mt from CIL and import of 15.97 mt of coking coal for steel. This left a gap of 14.09 mt, which was proposed to be met from CIL and SCCL should the demand pick up. As against this, the anticipated coal consumption/offtake of 348.43 mt in 2001-02 is proposed to be met through domestic production of 325.65 mt, likely coking coal imports of 10.80 mt with the balance being met through import of non-coking coal and stock draw down from CIL.

### Productivity

7.3.108 To improve the overall productivity of men and machinery certain steps like rationalisation of manpower through implementation of voluntary retirement scheme (VRS), decommissioning of uneconomic mines, prioritising the investment programme, improving the utilisation of capital intensive heavy earth moving machinery (HEMM), etc have been taken up during the Ninth Plan. As a result, the overall productivity in CIL and SCCL, which was standing at 1.86 t [under ground (UG) - 0.57 t; open cast (OC) - 5.12 t] and 1.34 t (UG - 0.72 t; OC - 6.25 t) at the beginning of the Ninth Plan has improved to 2.44 t (UG - 0.66 t; OC - 6.41



t) and 1.55 t (UG - 0.81 t; OC - 7.00 t) respectively. The improvement in output per manshift (OMS) is primarily the result of improvements at opencast mines. The underground mines productivity needs to be further improved. In the case of HEMM, the norms prescribed earlier by the Central Mine Planning and Design Institute Ltd. (CMPDIL) are under review by a Committee of the Department of Coal whose report is awaited.

## Lignite

7.3.109 The Ninth Plan laid emphasis on lignite development in the country. An incremental lignite-based generation capacity of 995 MW was envisaged in the beginning of the Plan. As against this, 535 MW (54 per cent) has been realised. In the Neyveli Lignite Corporation (NLC), a lignite production capacity of 4 mtpa through expansion of the existing Mine-I project for supplying lignite to the 2x210 MW TPS-I Expansion project has nearly been achieved and a new project, namely, Mine-1A for a capacity of 3 mtpa for supplying lignite to an independent power project of 250 MW has been taken up. The estimated demand for lignite in the terminal year of the Ninth Plan was 54.44 mt (Tamil Nadu 28.99 mt; Gujarat 9.50 mt; Rajasthan 14.90 mt; and other states 1.05 mt) with a corresponding production of 45 mt (NLC-22 mt; GMDC-10 mt; Rajasthan-13 mt). The anticipated lignite production from NLC in 2001-02 is 17.5 mt. The GMDC has achieved a production of 5.82 mt (2000-01) whereas the lignite production from Rajasthan has not taken off and is hovering around 0.25 mt only.

## Exploration

7.3.110 Reserves of coal are classified into three categories, namely, 'proved', 'indicated' and 'inferred'. 'Regional exploration' is carried out for making a general assessment of the 'geological resources' of coal under the 'inferred' and 'indicated' categories. Following the regional exploration, 'detailed exploration' is carried out by the coal companies for upgradation of coal reserves into the 'proved' category by accurately delineating the geometry of coal seams and determining the quality or grade of coal in potential coal blocks. Based on the findings of detailed exploration, detailed geological reports and project reports for coalmines

are formulated. The Geological Survey of India (GSI), under the Department of Mines, carries out regional exploration from its own funds.

7.3.111 The GSI is not in a position to allocate sufficient funds for regional exploration for coal and lignite. In order to accelerate the pace of regional exploration, the subsequent detailed exploration for designing projects to exploit coal reserves to meet the demand for coal during the Seventh Plan and after, the Planning Commission set up a separate fund under a plan scheme, 'Regional/Promotional Exploration' within the budget of the Department of Coal, in 1989-90. The fund was initially for SCCL areas only, and was subsequently extended to CIL and NLC areas from 1991. The execution of exploration work was initially undertaken by Mineral Exploration Corporation Ltd. (MECL) and was extended to GSI from 1992-93. From September 1999, CMPDIL has also been inducted as the third agency for promotional exploration for coal.

7.3.112 CIL and CMPDIL have identified the blocks retained by CIL as 'CIL Blocks' and those not to be retained by CIL as 'Non-CIL Blocks'. Until 1997-98, the CIL's subsidiaries were funding detailed exploration in all the blocks. Due to paucity of funds, the coal companies are not willing to fund the detailed drilling in non-CIL blocks. Therefore, it was decided to fund this activity through budgetary support in order to reduce the time lag between allotment of mining blocks to private entrepreneurs and coal mining operations and thus to reduce the gap between the demand and availability of coal. The Ninth Plan exploration programme is given in Table-7.3.12.

7.3.113 As against the coal reserve inventory of 204.65 bt (bt) [proved - 72.73 bt; indicated - 89.84 bt; inferred - 42.08 bt] at the beginning of the Ninth Plan, the reserves of coal as on 1 January 2001 stand at 220.98 bt [proved - 84.4 bt or 38 per cent of total reserves; indicated - 98.5 bt (45 per cent); inferred - 38.00 bt (17 per cent)]. Of the 84.4 bt of proved coal reserves, the estimated extractable reserves are 17.96 bt (21 per cent) only. Similarly, the reserves of lignite in the country as on 1 January 2001 are estimated to be 34.61 bt against 27.45 bt during the beginning of the Ninth Plan.

**Table-7.3.12**  
**Ninth Plan Exploration Programme**

Type of Exploration	Agency		Ninth Plan Drilling Programme		Reserves Established
			Target (Lakh metres)	Anticipated (Lakh metres)	(billion tonnes)
I. Regional	GSI	Coal	2.25	1.10	1.38
		Lignite	-	0.11	-
		Sub-Total:	2.25	1.21	1.38
II. Regional/ Promotional	GSI	Coal	1.05	0.70	6.88
		Lignite	0.45	0.14	0.032
	MECL	Coal	2.25	2.81	14.41
		Lignite	4.00	2.57	25.41
	CMPDI	Coal	-	0.37	-
	Sub-Total:	Coal	3.30	3.88	24.00
		Lignite	4.45	2.71	25.44
III. Detailed Drilling-Non-CIL	CMPDI	Coal	-	1.36	0.80
	MECL	Coal	-	1.09	1.19
	Sub-Total:	Coal	3.63	2.45	1.99
IV. Detailed Drilling	CIL Areas	Coal	13.5	8.04	20.02
	SCCL Areas	Coal	2.80	1.68	0.826
	Others	Coal	2.50	0.16	-
	Sub-Total:	Coal	18.80	9.88	20.85

### Project Implementation

7.3.114 Of the initially targeted coal production of 350 mt from the coal PSUs in the Ninth Plan, 60.04 mt was to come from new projects (CIL 55.71 mt; SCCL 4.33 mt) and the balance from existing mines and ongoing projects. A review of the actual performance reveals that a capacity of only 21.62 mt in new projects has been sanctioned in CIL and SCCL till December 2001. The production from captive blocks has been 4 mt against a target of 13 mt. This rate of capacity addition would affect coal availability in the Tenth Plan period and beyond. Land acquisition, forestry clearance, rehabilitation, equipment supplies, availability of funds, inadequate geological studies, improper project formulation, etc. continue to delay the implementation of coal projects, de-ration of capacity of some projects and some foreclosures. The decision of the Department of Coal to only undertake projects yielding an internal rate of return (IRR) of 16 per cent or more has also affected a number of technically viable coal projects. However, the

Department has reviewed this decision at the end of the Ninth Plan and lowered the IRR to 12 per cent.

7.3.115 There are several instances of projects, which are formulated with low initial specific investments only to be revised subsequently with significant cost overruns and delays. While this in itself is cause for concern, what is even more worrisome are repeated instances of a third level of revisions which essentially lower production estimates for varying technical and non-technical reasons resulting in even higher specific investment costs. This pattern appears consistently across projects promoted by Eastern Coalfields Ltd. (ECL) and Bharat Coking Coal Ltd. (BCCL) and hinders proper assessment and utilisation of limited resources. This establishes a need for reviewing project formulation practices of the coal companies.

7.3.116 The problems of mutation and transfer of land by state governments need to be addressed in the right perspective for meaningful implementation of coal projects. Similarly, grant/

renewal of lease by state governments also needed to be speeded up to reduce delays in the case of new projects. In spite of several recommendations that a single window system with specific time frames needs to be established for environmental and forestry clearances, it takes unduly long time for new projects to get clearances. Further, charging of the 'expectation value' towards forest land by the state governments is becoming a hurdle in project implementation and coal companies are being made to pay huge amounts in this regard adding to the cost of the projects over and above the cost of afforestation.

### Movement

7.3.117 The movement of raw coal and coal products by rail from CIL and SCCL has increased from 165.07 mt (59 per cent of the total coal offtake) in 1996-97 to 181.33 mt (58 per cent of the total coal offtake) in 2001-02. The component of merry go round (MGR) movement has increased from 61.54 mt (22 per cent of the total coal offtake) in the beginning of the Ninth Plan to 77.76 mt (24.9 per cent of the total offtake) in the terminal year. Movement of coal by road in the beginning of the Plan was 50.90 mt (18.16 per cent of the total coal offtake) and has increased to 53.6 mt (17.2 per cent of the total coal offtake). Coastal shipment of coal has increased from 11.58 mt (4.1 per cent of the total coal offtake) in 1996-97 to 16.52 mt (5.3 per cent of the total coal offtake) in 2001-02.

7.3.118 The Ninth Plan identified certain critical rail links in potential coalfields and the Railways have taken up most of these for implementation. It was envisaged to strengthen the port infrastructural facilities in the Ninth Plan for facilitating coal imports. The capacity of coal handling at ports has increased from 8 mt at the beginning of the Ninth Plan to 44 mt in the terminal year.

### Science And Technology

7.3.119 Though research and development (R&D) has been a thrust area in the Ninth Plan, not much of progress has taken place in this regard in the coal sector. As a result, the outlays provided remained largely unutilised. However, two important projects, namely, CBM extraction in collaboration

with the UNDP and GEF and washing of low volatile medium coking coal have been taken up for demonstration under the coal sector science and technology grants.

### Environmental Measures

7.3.120 The Ninth Plan had proposed a renewed thrust on improving the environmental conditions in coal mining areas, particularly, to tackle fire and subsidence problems in the Jharia and Raniganj coalfields in Jharkhand and West Bengal respectively. As per the recommendations of a high powered committee of the Government of India, the Department of Coal has formulated a Master Plan under which a scheme 'Rehabilitation, Control of Fire and Subsidence in Jharia and Raniganj Coalfields' has been taken up for phased implementation.

### Coal Bed Methane (CBM)

7.3.121 CBM is emerging as a new source of commercial energy in the country and a potential of about 1,000 billion cum of CBM is estimated. The Ninth Plan laid emphasis on the exploration and exploitation of CBM. The policy for exploration and exploitation of CBM was approved in July 1997 and steps taken to exploit CBM by awarding blocks to private parties. Further, a few companies have attempted pilot testing for CBM in the country. The ONGC has been working on CBM exploration as a research and development project since 1994 and has drilled six experimental wells - two in Durgapur in West Bengal and four in Jharia. The ONGC has been given a block in the North Raniganj area for CBM exploration on nomination basis. The Government has also approved exploration and exploitation of CBM in the Raniganj area by the Great Eastern Energy Corporation Ltd. OIL has also been awarded a block on nomination basis.

7.3.122 Further, in September 1999, the Government approved a demonstration project 'Coalbed Methane Recovery and Commercial Utilisation' under the science and technology plan of the Department of Coal. The project is being jointly funded by the GEF/UNDP and the Government of India. The duration of the project is five years and it is being implemented mainly by

CMDPIL with BCCL as the co-implementing agency on behalf of the Department. The project sites are Moonidih and Sudamdih mines in BCCL in Jharia coalfield.

### Policy Measures

7.3.123 During the Ninth Plan, the recommendations of the Committee on 'Integrated Coal Policy', 1996 were implemented by the Government. Coal prices have been deregulated and the Coal Mines (Nationalisation) Amendment Bill, 2000 for permitting private sector in commercial coal mining is before the Parliament. However, implementation of the other recommendations with regard to setting up of an independent body for allocation of coal blocks for exploration and mining, establishing a regulatory authority etc. are contingent on the enactment of the Bill.

7.3.124 The Ninth Plan laid emphasis on making the coal sector competitive by restructuring the coal PSUs. It was proposed to give them more autonomy and to do away with the holding company structure. The capital restructuring of both CIL and SCCL was done at the beginning of the Ninth Plan and again during the Ninth Plan. Some coal PSUs have started posting profits and paying taxes and dividends to the Government. However, some inherently sick coal companies like ECL and BCCL could not be revived and are currently before the Bureau of Industrial and Financial Reconstruction (BIFR). More importantly, rationalisation of manpower has been taken up by implementing the VRS in these coal companies. Of late, Central Coalfields Ltd. (CCL) has also started posting losses and the VRS has been extended to it as well. The proposal of doing away with the holding company structure has not been implemented in this case.

7.3.125 Unlike the earlier Plans, the Ninth Plan started with a focus on reforms in the coal sector in line with the other sub-sectors of the energy sector. However, the delay in passing the Coal Mines (Nationalisation) Amendment Bill has negated the envisaged benefits of private participation in commercial coal mining. During the Plan period, coal producers and consumers have started entering into commercial coal supply agreements and a cash and carry system of coal trade has

emerged. The prices of all grades of coal are decontrolled and coal PSUs have been empowered to fix the price of coal. However, in view of the fact that coal still remains under the Essential Commodities Act, selling of coal by private parties is not permitted. Coal imports have been kept under OGL and import duties have been significantly pruned in the Ninth Plan. The royalty rate on lignite has been revised. Plans for reviving loss-making coal companies have been initiated and rationalisation of manpower is being done. The Government has amended the 1979 Mining Policy for Coal, which confined coal-bearing states to mining only non-coking coal in isolated patches. State governments can now mine either coking or non-coking coals through their undertakings/ companies on par with CIL.

#### Towards Reforms

##### *During the Eighth Plan—*

- Private sector was allowed in captive coal mining.
- Coal was put on OGL and import duties reduced significantly.
- Financial restructuring of coal PSUs took place for strengthening financial health and doing away with budgetary support.
- Switching over to fuel supply agreements (FSAs) between coal companies and consumers started.
- Partial disinvestment of NLC done.
- FDI permitted in coal mining.

##### *During the Ninth Plan –*

- Coal prices decontrolled totally from 1 January 2000.
- VRS introduced for rationalising manpower.
- Removal of overburden by hired HEMM in opencast mining projects taken up.
- The 1979 Mining Policy for coal and lignite was replaced. State governments of coal bearing states are now allowed to mine both coking and non-coking coal without any restriction through their undertakings/ companies on par with Coal India Ltd.
- Joint ventures are permitted for coal projects.
- Equipment manufacturers are involved in underground mining operations on production sharing basis.

## Plan Expenditure

7.3.126 The approved Ninth Plan outlay for coal and lignite was Rs.17,575.23 crore excluding Rs.1,866.36 crore for the power component of NLC. However, during the Mid-Term Appraisal of the Ninth Plan, it was revised to Rs.17,430.74 crore for coal and lignite and Rs.1,713 crore for NLC (Power). This included enhanced outlays for the Regional/Promotional Exploration scheme and Detailed Drilling in Non-CIL Blocks scheme. The outlay for VRS was also included in this as it was taken out of National Renewal Fund (NRF). The outlays of CIL and SCCL have been revised downwards due to reduction in the coal production targets and the capital restructuring package of SCCL, which envisaged recourse to offloading of overburden removal operations in their open cast mines instead of doing the same by procuring HEMM departmentally. As a result, the capital cost of the major ongoing open cast projects has gone down significantly, bringing down the overall outlay of SCCL. The outlay for NLC (Mines) has slightly increased due to the committed expenditure for Mine-1A and expansion projects of Mine-I and TPS-I. On the whole, the anticipated Plan expenditure of coal and lignite is about 74 per cent of the Plan outlay and that of NLC (Power) is about 67 per cent.

7.3.127 CIL was not provided any domestic budgetary support from the beginning of the Plan as per the capital restructuring package. SCCL has also stopped getting domestic budgetary support from 2001-02 onwards consequent to its capital restructuring. CIL funded its investments mainly through their internal resources, a World Bank loan for the Coal Sector Rehabilitation Project (CSRP) and other extra budgetary resources. However, the World Bank loan was discontinued after availing part of it under Phase-I. NLC was provided domestic budgetary support for implementing the Mine-1A project, which is linked to an independent power project. Other schemes of the coal sector, which were exclusively supported through domestic budgetary support are Regional/Promotional Exploration, Science and Technology, Environmental Measures and Subsidence Control, Detailed Drilling in non-CIL Blocks, Rehabilitation Project, IT and VRS. The scheme of Regulatory Framework Review Project was taken up through

World Bank aid as a precondition for availing CSRP loan and has been completed.

## APPROACH TO THE TENTH PLAN

7.3.128 Since coal will continue to remain the principal source of commercial energy in the country for the foreseeable future, all out efforts are needed for rapid development of coal resources. A substantial expansion in domestic coal production will be needed if the power sector is to expand to support the targeted 8 per cent GDP growth. Since the gestation period of a coal mine is considerably longer than that of power plants, planning for coal production should not only keep in mind the requirements of the Tenth Plan but also future Plans. In view of the significant role of coal in the energy security net of the country, it is important to bring out a long-term vision i.e. 'Vision 2025' for proper development of the coal sector. Approval of the Coal Mines (Nationalisation) Amendment Bill, 2000 by Parliament will expedite the reform process in the coal sector and help attract private investment in this area. Simultaneously, it is important to amend certain provisions of other statutes to overcome the hurdles in the way of private mining in notified tribal areas. The procedures for environmental clearance also need to be greatly simplified so that potential private investors have to deal with clear and transparent rules. Similarly, amendments to labour laws are equally important to offload certain mining activities.

## Coal Demand

7.3.129 As against the anticipated coal offtake/consumption of 348.43 mt of raw coal excluding 4.93 mt of washery middlings during the terminal year of the Ninth Plan, the demand in the terminal year of the Tenth Plan has been estimated at 448.05 mt excluding 5.24 mt of middlings. The estimate has been worked out after discussions with major consuming sectors and with reference to the projected coal-based thermal generation capacity addition programme of 19,565 MW of the overall capacity addition programme of 46,565 MW envisaged in the Tenth Plan by the Ministry of Power. However, the Planning Commission has reviewed the situation and on the basis of most likely capacity addition, the overall capacity addition has been

revised downwards to 41,110 MW of which the coal-based capacity addition is envisaged to be 18,308 MW. Accordingly, the coal demand in 2006-07 has been revised to 460.50 mt excluding 5.24 mt of washery middlings. This implies a compound annual growth rate of 5.73 per cent for coal demand in the Tenth Plan against an anticipated growth of 3.32 per cent during the Ninth Plan. Of this

estimated demand, 37.21 mt (8.1 per cent) is of coking coal for the steel sector and 423.29 mt (91.9 per cent) is of non-coking coal. Sixty-nine percent of the total estimated demand is for power sector utilities, 5.3 per cent for the cement sector, 6 per cent for captive power and the remaining 11.6 per cent is for other sectors. The sector-wise details of coal demand/offtake are given in Annexure-7.3.2.

### Tenth Plan Thrust Areas

- Continuation of the reform process and facilitating private sector participation in commercial coal mining with a view to gaining access to latest technologies for coal exploration, production and utilisation and to raise competitiveness through competition.
- Restructuring of the coal sector by providing more autonomy to individual coal-producing companies for making them viable and enhancing their competitiveness.
- Setting up of a regulatory authority for resolving disputes and allocation of coal blocks both for exploration and exploitation.
- Rationalisation of rail freight rates for coal movement.
- Need for rationalising import duty on coal for improving competitiveness of the sector.
- Setting up a mechanism for expeditious clearance of dues from SEBs for improving the financial health of coal PSUs.
- Augmentation of the coal production capacity to meet the projected demand of the power sector in particular and other end use sectors in general.
- Intensification of exploration and upgradation of coal reserves to the proven and recoverable category in the context of the energy security.
- Improvement of environmental aspects and promotion of clean coal technologies – beneficiation of non-coking coal for power generation; development of CBM; carbon dioxide sequestration; coal gasification; integrated gas combined cycle (IGCC) and fluidised bed combustion (FBC) route of power generation, development of slurry transportation, etc.
- Promoting washed coking coal with the adoption of better technologies and making domestic products competitive for the steel sector with a view to reducing import dependence.
- Development of port and rail infrastructure for coal movement and reducing dependence on road transportation and promoting other modes of coal transportation.
- Rapid development and utilisation of lignite resources both for power generation and industrial purposes.
- Development of in-house research and development.
- Need for improving productivity and capacity utilisation.
- Pricing and grading of coal on gross calorific value (GCV).

7.3.130 The estimated demand for power is related to an incremental coal-based thermal power generation capacity addition programme of 18,308 MW and a coal-based generation programme of 452 billion units (BU) in 2006-07. Similarly, the estimated coal demand for captive power considered a capacity of 8,671 MW. Coal demand for steel is related to a hot metal production programme of 25.59 mt in 2006-07. The envisaged demand for cement is related to a cement production programme of 153.5 mt in 2006-07.

7.3.131 However, the estimated coal demand for power sector utilities will depend on various clearances for new power projects by the end of 2002-03, finalisation of fuel supply agreements with coal companies and achievement of financial closures by the proposed new power plants.

### Coal Production

7.3.132 The coal production target in 2006-07 is set at 405 mt against an anticipated production of 325.65 mt in 2001-02 implying annual compound growth of 4.46 per cent in the Tenth Plan against 2.4 per cent likely to be achieved during the Ninth Plan. This comprises 350 mt from CIL, 36.13 mt from SCCL, 5.24 mt from Tata Iron and Steel Co. (TISCO now renamed Tata Steel), 2.4 mt from PSUs like Indian Iron and Steel Co. (IISCO), Damodar Valley Corporation (DVC), Bihar State Mineral Development Corporation Ltd. (BSMDCL) etc., 6.73 mt from captive block holders and 4.5 mt from the private sector in Meghalaya. The incremental coal production in the Tenth Plan is 79.35 mt against 39.56 mt in the Ninth Plan. This comprises of 71 mt from CIL, 5.13 mt from SCCL and 3.22 mt from others. Of CIL's 71 mt, the major incremental contribution is from South Eastern Coalfields Ltd. (SECL) - 21.55 mt, Mahanadi Coalfields Ltd. (MCL)

- 21.5 mt, Northern Coalfields Ltd. (NCL) - 8.5 mt and Central Coalfields Ltd. (CCL) - 10.3 mt. The category-wise coal production is given in Table-7.3.13.

7.3.133 Of the envisaged total coal production of 386.13 mt from CIL and SCCL, 83.12 mt (CIL 79.11 mt; SCCL 4.01 mt) or 22 per cent is to come from new mines to be taken up in the Tenth Plan (CIL will have 98 projects for a total capacity of 197.40 mt and with an estimated capital investment of Rs.23,159.24 crore while SCCL will implement 17 projects for a capacity of 4.13 mt and a capital investment of Rs.2,116.96 crore). Unless these projects come up, it will be difficult to meet the requirements from domestic sources and the preparedness of the coal companies in meeting this target needs to be ascertained. However, it will be prudent to concentrate on such projects where augmentation of coal production is feasible by means of marginal investments and within a shorter gestation period with the use of existing infrastructural facilities. The contribution from captive blocks is only 2 per cent of the total targeted production of 405 mt. This shows there is an urgent need to encourage private participation for augmenting coal production from domestic sources.

7.3.134 The share of underground and open cast production in CIL works out to 17 per cent and 83 per cent respectively and 46 per cent and 54 per cent respectively in the case of SCCL. Of CIL's projected underground production of 60.65 mt, 4.97 mt is from mechanised longwall faces and 34.13 mt from mechanised bord and pillar (B&P) workings. In SCCL, of the total 16.76 mt of projected underground production, 2.54 mt is planned from mechanised longwall faces and 3.12 mt from mechanised B&P workings. Although, the reserves amenable to open cast mining are being targeted

**Table-7.3.13**  
**Categorywise Coal Production (million tonnes)**

Category	CIL	SCCL	TISCO/IISCO/DVC	Captive Blocks	Meghalaya	Total
Existing	25.50	3.87	7.55	4.00	4.10	45.02
Completed	200.81	19.03	-	-	-	219.84
Ongoing	44.59	9.22	-	-	-	53.81
New	79.11	4.01	0.09	2.73	0.40	86.34
<b>TOTAL:</b>	<b>350.00</b>	<b>36.13</b>	<b>7.64</b>	<b>6.73</b>	<b>4.50</b>	<b>405.00</b>

due to low cost of production, quality concerns are getting diluted. Open cast mines lead to degradation of the environment compared to underground mines and are not sustainable in the long run. The global trend is to opt for highly mechanised underground mines with economies of scale. In the long run, considering depletion of reserves amenable to open cast mining, environmental and quality considerations, economies of scale etc., coal companies need to plan for a suitable mix of open cast and underground mines. Coal sector policies and regulation will need to set up the right incentives under a deregulated environment for movement in this direction.

7.3.135 The production of CIL comprises 22.58 mt of coking coal (6.5 per cent of total production) and 327.32 mt of non-coking coal (93.5 per cent). Of the non-coking coal, 36 per cent is of superior grade and 64 per cent is of inferior grade. In absolute terms, the projected Tenth Plan target for CIL comprises 2.97 mt of incremental coking coal production, 14.9 mt of incremental superior grade non-coking coal production and 53.03 mt of incremental inferior grade non-coking coal production over the 2001-02 levels. In the case of SCCL, the projected production target comprises 55 per cent of superior grade non-coking coal and 45 per cent of inferior grade non-coking coal. SCCL's production of superior grade non-coking coal is expected to rise by 7.01 mt, while that of inferior grade non-coking coal is expected to decline by 1.88 mt over 2001-02 production levels. The details of company-wise coal production are given in Annexure-7.3.3.

7.3.136 As against the anticipated washed coking coal production of 5.19 mt from CIL in 2001-02, the target in 2006-07 is fixed at 5.96 mt. There is dire need to stem the declining production of washed coking coal from domestic sources by undertaking modernisation of all the coking coal washeries and converting them into multi-product washeries suiting the raw coal feed and specifications of the steel sector for improved financial viability. The financial implication of the proposed import of 20 mt of coking coal by the steel sector in 2006-07 at current prices (Rs. 3,000 per tonne) would be in the range of Rs. 5,000 crore to Rs. 6,000 crore in foreign exchange terms. Washing of low volatile medium coking

(LVMC) coals, as has been suggested by a number of committees, needs serious consideration in order to reduce import dependence of washed coking coal.

7.3.137 Sizing of coal has significant influence on maintaining quality. Uniformly-sized coal is being delivered wherever coal washing is taking place. However, for other stations where raw coal is being used, the size of coal being delivered is mostly (-) 200 mm. It is important to consider if coal grinding could be done at pitheads instead of the thermal power station end to avoid transportation of unwanted material etc. and thus improving the quality of coal being delivered in case of new thermal power stations. Further, in order to comply with the requirement of the Ministry of Environment and Forests directive relating to ash content of coal used in power generation, a number of non-coking coal washeries would need to be set up in the Tenth Plan.

### Demand Supply

7.3.138 Since the domestic coal production in 2006-07 is expected to touch only 405 mt against an estimated coal demand of 460.50 mt excluding 5.24 mt of washery middlings, this will leave a gap of 55.50 mt. This is proposed to be met through import of 17.18 mt of coking coal for the steel sector and 3.3 mt of non-coking coal for the cement sector, which works out to 4.4 per cent of the estimated coal demand, 1.2 per cent less than imports in the Ninth Plan. However, that still leaves a gap of about 35.02 mt.

### Coal Movement

7.3.139 Against an anticipated movement of 181.33 mt coal and products by rail from CIL and SCCL in 2001-02, the projected coal movement by rail in 2006-07 is 221.62 mt. This implies a wagon requirement of 25,789 four-wheeler wagons against 21,099 four-wheeler wagons in the Ninth Plan. This requirement is within the overall target of rail movement of 280 mt in 2006-07 envisaged by the Ministry of Railways. The coal movement by MGR is projected at 101.05 mt in the Tenth Plan against an anticipated movement of 77.76 mt in the Ninth Plan. Similarly the movement by road is estimated



at 67.34 mt against 53.6 mt in the Ninth Plan. Coastal shipment including rail-cum-sea route is projected to be 17.37 mt against 16.52 in the Ninth Plan.

### Project Implementation

- Strengthen project formulation with firm geomining, technological and financial resources.
- Improve procedures for land acquisition, environment, forests, resettlement and rehabilitation.
- Depletion allowance for mines needs to be initiated.
- Financing of coal projects must be based on the strength of the cash flows of the projects instead of company's balance sheet.
- Technical auditing of coal and lignite reserves.

### Infrastructure

7.3.140 In order to facilitate the smooth movement of coal in the Tenth Plan, certain critical rail links are required to be completed. These are: Talcher to Paradip, a new rail link between Korba and Pendra Road (SECL), rail link of Belpahar-Sardega and Talcher-Bimalgarh (MCL) and development of Tori-Shivpuri link in the North Karanpura Coalfield of CCL. To overcome the constraints of rail movement and to create competition in coal supplies, it is desirable to create new coal-based thermal generation capacity in coastal regions of the country. Similarly, the envisaged coal handling capacity at major ports in the Tenth Plan is 67.20 mt against a capacity of 48.20 mt in the Ninth Plan. This includes the Ninth Plan spillover capacity of 8.00 mt and a new capacity addition of 11.00 mt. The total projected land requirement for coal mining projects of CIL and SCCL in the Tenth Plan is 53,924 hectares (Ha) comprising 35,529 Ha of non-forest land (66 per cent) and 18,395 Ha of forest land (34 per cent). Availability of this land is critical for realising the projected coal production of 83.12 mt from new projects of CIL and SCCL in 2006-07.

The projected requirement of power in the Tenth Plan for CIL and SCCL is 1236.61 mega volt amperes (MVA).

### Productivity

7.3.141 Salaries and wages comprise the single largest component of the unit cost of coal production. Unless concerted efforts are made to improve productivity, the unit cost of production cannot be brought down and competitiveness cannot be improved. There is a need for benchmarking the productivity with reference to international standards. The targeted OMS in 2006-07 for CIL is 3.55 t (UG - 0.88 t; OC - 9.25 t) and for SCCL 1.77 t (UG - 0.94 t; OC - 7.31 t). Some important steps to improve productivity and the system capacity utilisation of coal mines are: scheduled equipment maintenance programme, utilisation of skilled manpower, training personnel to handle capital-intensive equipment, offloading certain activities, mechanisation of UG operations, introduction of IT-based management information systems and opting higher capacity HEMM etc.

### EXPLORATION

#### Regional Exploration

7.3.142 For regional exploration during the Tenth Plan, a drilling target of 1.83 lakh metres has been set for coal and 0.21 lakh metres for lignite, totaling 2.04 lakh metres. This regional exploration work will be carried out by GSI with funding from the Department of Mines. A total coal reserve of about 4.90 bt is envisaged to be established under this programme.

#### Promotional Exploration

7.3.143 For promotional exploration during the Tenth Plan, a drilling target of 6 lakh metres has been set comprising 3.3 lakh metres for coal and 2.7 lakh metres for lignite. About 994 sq. km. area will be covered for coal and a reserve of 6.68 bt of coal is planned to be established during the Tenth Plan. This work will be carried out by GSI, CMPDIL and MECL with funding from the Department of Coal.

### Detailed Exploration

7.3.144 The mineable coal reserves required for meeting the Tenth Plan coal production programme have already been established. The present programme of detailed drilling to be carried out during the Tenth Plan will establish mineable coal reserves required for the coal production programme beyond the Eleventh Plan. In CIL areas, the target for detailed drilling programme for the Tenth Plan is set as 6.13 lakh metres and 2.7 lakh metres in SCCL areas. It is planned to establish 9.16 bt of coal in CIL areas through this. About 1.01 bt of coal reserves is expected to be established in SCCL areas. For lignite, a detailed drilling programme of 3.69 lakh metres has been planned for the Tenth Plan.

### Detailed Exploration in Non-CIL Areas

7.3.145 For drilling in non-CIL areas, a target of 2.13 lakh metres has been set for the Tenth Plan which will lead to the establishment of 3.58 bt of coal reserves. This activity was taken up to explore the blocks away from the CIL command areas as to keep the geological reports ready for potential entrepreneurs.

### Environmental Measures

7.3.146 Maintaining the environment in coalfields is critical for sustaining the projected coal production levels. The Tenth Plan will continue to lay emphasis on the implementation of environmental management measures for mitigating the adverse effects of coal mining like land degradation, mine effluents, sound and air pollution etc for sustainable development of coal resources. The age-old problems of subsidence and fires in the mined-out areas of Raniganj and Jharia have been addressed by taking up of a number of schemes under Environmental Measures and Subsidence Control. Besides, schemes to rehabilitate the affected mining areas and persons in these coalfields have also been taken up as per the recommendations of the High Level Committee of the Department of Coal. It has been decided to merge these schemes during the Tenth Plan for effective implementation. Cooperation of state governments is necessary for the proper implementation of these schemes.

7.3.147 The power grade coals are high in ash content and suitable measures need to be taken to deal with it both at the despatch end i.e. pit head and the utilisation end i.e. thermal power stations. Beneficiation of non-coking coal for power generation and measures for utilisation of fly ash would mitigate the adverse effects of the same on environment. As various sectors are involved in this area, it is desirable to constitute an Inter-Ministerial Group to look in to the aspects of fly ash utilisation in the country.

### Science And Technology (Research And Development)

7.3.148 Research and development in the coal sector is carried out under four thrust areas - production, productivity and safety; coal beneficiation; coal utilisation; and environment & ecology. Formulation of schemes of science and technology needs to be more application-oriented rather than remaining confined to fundamental research. Close interaction between research institutions and industry is critical for the science and technology programme to be meaningful. The three-pronged approach envisaged in the Ninth Plan - coal science and technology programme under the standing scientific research committee (SSRC), in-house research and development programmes of coal companies and inter-sectoral research-technology advisory committee (IS-STAC), would continue in the Tenth Plan. The major thrust areas for the coal science and technology programme are - coal gasification, coal washing, beneficiation of low volatile coking coals, coal liquefaction, fluidised bed combustion, sequestration of carbon dioxide in the control of green house gas and extraction of CBM, etc.

### Information Technology

7.3.149 Some of the important areas identified for the use of IT in the coal sector in the Tenth Plan are - introduction of Internet/Intranet technology, development of local area networks and wide area networks, development of a coal net project, introduction of geological information system (GIS) in selected mines, introduction of global positioning system (GPS) for improving the open cast project productivity, etc.

### Voluntary Retirement Scheme

7.3.150 This scheme was introduced in the Ninth Plan for improving the financial health of loss-making coal companies by rationalising manpower through budgetary support. Initially, it was started in ECL and BCCL and was later extended to CCL. A total of 44,400 employees (ECL - 19,200, BCCL - 19,200, CCL - 6,000) were planned to be retired. Against this, 37,380 persons (85 per cent) were retired under this scheme during the Ninth Plan. The proposed target for Tenth Plan is retirement of 15,500 persons (ECL - 4,000; BCCL - 9,000; CCL - 2,500).

### Lignite

7.3.151 The total reserves of lignite as on 1 January 2001 stood at 34.6 bt spread over the states of Tamil Nadu and Pondicherry (87.5 per cent), Rajasthan (6.9 per cent), Gujarat (4.95 per cent), Jammu & Kashmir (0.37 per cent) and Kerala (0.31 per cent). Some lignite occurrences have also been reported in Andhra Pradesh, Karnataka, Maharashtra and Orissa. The importance of lignite as a source of energy in the western and southern regions increases, as its occurrences are far away from the coalfields. Therefore, the development of the lignite resources needs to be continued vigorously as it can contribute to energy supply where rail-transported coal is difficult/expensive to be reached.

7.3.152 The projected demand of lignite in 2006-07 is 57.79 mt, of which the demand for power generation is 49.34 mt (85.4 per cent) and other sectors 8.45 mt (14.6 per cent). A lignite-based thermal generation capacity addition of 1,745 MW comprising Rajasthan Barsingsar TPS of 250 MW; Gujarat KLTPS Extension 75 MW; Akrimota 250 MW; Tamil Nadu-NLC TPS I Expansion 420 MW; TPS-II Expansion 500 MW and STCMS (Zero Unit) 250 MW has been envisaged in the Tenth Plan by the Ministry of Power. As against this, the projected lignite production is 55.96 mt (Tamil Nadu- NLC 27 mt, Jayamkondam 3.2 mt, Srimushnam 3.48 mt; Gujarat - 15.8 mt; Rajasthan - 6.48 mt). In NLC, it is proposed to expand the capacity of Mine-II from 10.5 mtpa to

15 mtpa for supplying lignite to the proposed expansion of TPS-II from 1,470 MW to 1,970 MW by adding one unit of 500 MW. Further, one new project namely Mine-III for a lignite production capacity of 8 mtpa for supplying lignite to TPS-III of 2x500 MW has also been proposed.

### Coal Bed Methane (CBM)

7.3.153 The Tenth Plan will continue to lay emphasis on development of CBM in view of its immense potential as a domestic source of clean commercial energy. Further, carbon dioxide sequestration has been identified as an important area of development in the coal sector.

### Outlay And Financing

7.3.154 An overall outlay of Rs. 31,591 crore has been provided for the coal sector in the Tenth Plan, including Rs. 8,007.64 crore for NLC (Power) comprising an internal and extra budgetary resources (IEBR) of Rs.30,541 crore and a gross budgetary support (GBS) of Rs.1,050 crore. This outlay is about 63 per cent more than the outlay provided in the Ninth Plan and about 120 per cent more than the anticipated expenditure during the Ninth Plan. However, the significant change in the Tenth Plan is that the domestic budgetary support (DBS), at Rs. 1,034.52 crore, is about 51 per cent less than the provision of Rs. 2,109.93 crore in the Ninth Plan. Including the component of externally aided projects of Rs.15.48 crore, the GBS provision is Rs. 1,050 crore, which is 57 per cent less than the provision in the Ninth Plan. The outlays required for the three PSUs under the Department of Coal are to be financed entirely through IEBR and DBS is not required. In the case of SCCL, the entire outlay is proposed to be met through internal resources. The DBS of Rs. 1,034.52 crore is exclusively meant for supporting Plan schemes of the Department of Coal. The outlay includes a requirement of Rs. 425.06 crore for implementation of VRS. The company-wise/scheme-wise outlays/expenditure is given in Table-7.3.14 and the year-wise details in Annexure-7.3.4. The schemewise break up of Tenth Plan outlay for Department of Coal is given in the Appendix.

**Table-7.3.14**  
**Company-wise/Scheme-wise Outlay & Expenditure (Rs. Crore)**

Sl. No	PSUs/ Scheme	Ninth Plan				Tenth Plan		
		Approved Outlay	MTA Outlay	2001-02		Cumm. (1997-02) Prov	2002-07 Outlay	2002-03 BE
				BE	RE			
1	CIL	12401.00	12000.00	2309.90	1540.00	9025.50	14310.00	2190.00
2	SCCL	2235.00	1665.32	355.00	290.00	1043.87	2113.00	405.00
3	NLC (Min)	2581.80	2857.00	449.97	401.81	2121.25	6125.84	292.23
4	S&T	80.00	80.00	11.92	1.71	20.77	100.00	7.76
5	EMSC	79.00	79.00	12.17	5.41	34.26	163.00	34.65
6	Reg.Expl.	130.00	140.00	32.26	35.21	143.67	275.80	49.19
7	Det.Drill.	9.38	91.18	37.27	50.00	69.38	70.66	13.92
8	RFRP	8.05	8.05	0.00	0.00	6.28	0.00	0.00
9	Rehab.Proj	50.00	50.00	7.24	8.04	8.54	0.00	0.00
10	R&D Centre	1.00	1.00	0.00	0.00	0.00	0.00	0.00
11	IT	0.00	0.00	0.39	0.55	1.10	0.00	0.00
12	VRS	0.00	459.19	156.99	300.00	598.55	425.06	206.00
	Sub-Coal & Lignite:	17575.23	17430.74	3373.11	2632.73	13073.17	23583.36	3198.75
13	NLC (Power)	1866.36	1713.00	538.84	494.96	1257.41	8007.64	292.72
14	NEC	0.00	0.00	65.20	0.00	57.14	0.00	0.00
	Total DOC:	19441.59	19143.74	3977.15	3127.69	14387.72	31591.00	3491.47

## Safety and Welfare

7.3.155 Successive Plans have emphasised the importance of safety and welfare of the coalmine workers. During the Ninth Plan, certain important areas for safety in coalmines had been identified and schemes relating to these are under implementation. Some of the major thrust areas identified for safety in coalmines for the Tenth Plan are - (i) installation of environmental tele-monitoring systems (ETMS) in mines; (ii) digitising mining plans at the area level for identification of water danger from adjoining mines, checking correlation survey and estimating thickness of barriers; (iii) replacement of timber support by steel support; (iv) improved self-rescuers; etc.

7.3.156 During the Tenth Plan, it is envisaged to increase the housing satisfaction in the coalfields and water supply facilities to cover the additional population.

## THE PATH AHEAD

### Reforms

7.3.157 Reforms initiated earlier need to be continued and intensified in the Tenth Plan. Expeditious passing of the pending Coal Mines (Nationalisation) Amendment Bill, 2000 for permitting private sector in non-captive coal mining, restructuring of coal PSUs by winding up the holding company, CIL, and making subsidiary coal companies independent in order to promote competition and improve performance are some of the steps that need to be taken. Other issues that need to be addressed are: setting up of an independent body for allocating coal blocks for both exploration and exploitation, installing a regulatory authority/mechanism and undertaking all the required legislative amendments including that of labour laws, land acquisition, etc.

### **Towards More Reforms**

- Coal to be removed from the list of essential commodities in order to allow free sale and to withdraw Colliery Control Order 2000 along with the Coal Control Orders of the state governments.
- Amendments to the Coal Bearing Areas (Acquisition & Development) Act, 1957 to allow private sector rights for coal exploration and mining without taking permission from the state governments as has been done in the case of CIL.
- Amendments to the Contract Labour (Regulation & Abolition) Act 1970 for facilitating offloading of certain activities in coal mining.
- De-blocking of coal blocks held by CIL for offering to the private sector.
- Adopting gross calorific value (GCV) based grading and pricing of coal.
- Improved procedures for land acquisition, environmental and forest clearance and quick resettlement and rehabilitation.
- Need for rationalising import duty on coal for improving competitiveness of the sector.

**Tenth Plan Outlay - Petroleum & Natural Gas Sector**

Rs. Crore

<b>Name of the Company</b>	<b>Tenth Plan Outlay</b>
<b>A. Exploration &amp; Production</b>	
1. Oil & Natural Gas Corporation Ltd.(ONGC)	46,968.95
2. Oil India Limited (OIL)	5,000.00
3. Gas Authority of India Ltd. (GAIL)	7,500.00
<b>Sub-Total (A)</b>	<b>59,468.95</b>
<b>B. Refining &amp; Marketing</b>	
1. Indian Oil Corporation (IOC)	18,001.44
2. Chennai Petroleum Corporation Ltd. (CPCL)	2,400.00
3. Bongaigaon Refinery & Petro Chemicals Ltd (BRPL)	100.00
4. Hindustan Petroleum Corporation Ltd. (HPCL)	7,500.00
5. Bharat Petroleum Corporation Limited (BPCL)	3,998.80
6. Kochi Refinery Limited (KRL)	2,500.00
7. Numaligarh Refinery Limited (NRL)	310.00
8. Indo-Burma Petroleum Ltd. (IBP)	1,762.00
<b>Sub Total (B)</b>	<b>36,572.24</b>
<b>Total</b>	<b>96,041.19</b>

## TENTH PLAN 2002-07 &amp; ANNUAL PLAN 2002-03 - SECTORAL COAL DEMAND/OFFTAKE

Sl. Sector No.	VIII PLAN		Ninth Plan					Tenth Plan		% ACGR			
	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02		2002-03	2006-07	IX Plan 2001-02/1996-97	X Plan 2006-07/2001-02		
	Actual	Actual	Actual	Actual	Prov. Proj.	Original Proj.	MTA Proj.	AP Target	Anticipated Target	Projected	Projected		
I	Coking Coal												
1	Steel	34.52	31.99	29.92	28.76	49.60	44.60	32.21	29.75	32.90	35.32		
2	Coke Ovens	0.84	0.90	0.96	0.50	2.00	2.00	1.91	0.66	1.50	1.89		
	<b>Sub-Total Coking:</b>	<b>35.00</b>	<b>32.89</b>	<b>30.88</b>	<b>29.26</b>	<b>51.60</b>	<b>46.60</b>	<b>34.12</b>	<b>30.41</b>	<b>34.40</b>	<b>37.21</b>	<b>-2.77</b>	<b>4.12</b>
II	Non-Coking												
3	Power Utilities	199.00 (2.58)	214.05 (3.62)	205.38 (3.02)	222.85 (2.11)	237.03 (2.49)	262.00 (5.00)	241.54 (2.78)	241.19 (3.27)	249.50 (3.275)	317.14 (3.74)	3.92	5.63
4	Cement	11.34	13.73	13.47	15.54	14.68	21.40	17.00	15.00	17.10	24.56	5.75	10.36
5	Steel DR	1.96	2.62	2.46	2.99	3.72	6.10	4.20	3.48	4.00	7.00	21.36	6.29
6	Railways	0.13	0.05	0.03	0.01	0.01	0.00	0.01	0.00	-	-	-	-
7	Fertilisers	4.38	4.64	4.11	3.37 (0.02)	3.18	3.80	3.50	3.10	3.50	4.18	-6.68	6.16
8	LTC/Soft Coke	0.09	0.04	-	0.04	-	3.00	*	*	0.20	0.20		
9	Cokeries/Coke oven (NLW)	-	1.53	1.24	1.20	1.40	1.40	1.40	*	1.50	1.50		
10	Export	0.13	0.06	0.04	0.06	0.04	1.00	0.07	0.02	0.05	0.10		
11	Captive Power	15.3 (1.62)	16.22 (1.58)	15.93 (1.40)	16.90 (1.30)	16.03 (1.28)	25.80 (2.70)	21.11 (1.35)	18.39 (1.45)	21.15 (1.55)	28.26 (1.40)	3.75	8.97
12	BRK & Others	25.19 (0.53)	25.41 (0.60)	29.96 (0.59)	30.89 (0.82)	33.00 (0.77)	33.50	29.56 (0.70)	33.00 (0.22)	31.10 (0.10)	37.85 (0.10)	5.55	2.78
13	Colly. Consumpt.	3.39	3.07	2.89	2.50	2.19	4.00	2.50	2.17	2.50	2.50	-8.54	2.87
	<b>Sub-Total NonCoking:</b>	<b>260.91 (4.73)</b>	<b>281.42 (5.80)</b>	<b>275.51 (5.01)</b>	<b>296.35 (4.25)</b>	<b>311.28 (4.53)</b>	<b>360.60 (7.70)</b>	<b>320.17 (4.83)</b>	<b>318.03 (4.93)</b>	<b>328.90 (4.925)</b>	<b>423.29 (5.24)</b>	<b>4.04</b>	<b>5.88</b>
	<b>Grand Total (+II):</b>	<b>295.91 (4.73)</b>	<b>316.78 (5.80)</b>	<b>308.40 (5.01)</b>	<b>327.23 (4.25)</b>	<b>340.54 (4.53)</b>	<b>412.20 (7.70)</b>	<b>354.29 (4.83)</b>	<b>348.44 (4.93)</b>	<b>363.30 (4.925)</b>	<b>460.50 (5.24)</b>	<b>3.32</b>	<b>5.74</b>
Note: 1. Figures in brackets are washery middlings and are not included in totals. (ii) * Included in BRK & Others.													
<b>Details of imports included in the sectoral demand/offtake.</b>													
	<b>Import of Coking Coal</b>	10.62	11.75	10.02	10.99	11.06	19.00	15.97	10.80	16.78	17.18		
	<b>Import of Non-Coking Coal</b>												
	Power Sector	2.67	3.49	2.67	4.87				2.50	3.13	-		
	Cement Sector	2.03	3.02	6.04	5.00				6.30	3.20	3.30		
	Sub-Total Non-Coking Coal:	2.56	4.70	6.51	8.71	9.87			8.80	6.33	3.30		
	<b>Total Imports :</b>	<b>13.18</b>	<b>16.45</b>	<b>16.53</b>	<b>19.70</b>	<b>20.93</b>			<b>19.60</b>	<b>23.11</b>	<b>20.48</b>		

Contd....

Annexure 7.3.2 (Contd.)

Sl. Sector No.	VIII PLAN		Ninth Plan				Tenth Plan		% ACGR	
	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2006-07	IX Plan 2001-02/1996-97	X Plan 2006-07/2001-02
	Actual	Actual	Actual	Actual	Prov. Proj.	Original Proj.	MTA Proj.	AP Target	Anticipated Target	Projected
<b>SECTORAL PHYSICAL TARGETS</b>										
1996-97 Actual	265.50	276.58	286.53	310.89	330.79	2000-01 Actual	2001-02 BE	2001-02 RE	2002-03 BE	2006-07 Proj.
Coal Based Power gen. (BU)	76.20	82.10	88.00	100.00	102.00	102.00	345.00	345.00	353.52	452.00
Cement Production (MT)	18.84	20.70	19.65	21.06	23.11	23.11	115.00	115.00	121.00	153.50
Hot Metal Prodn. (MT)							21.86	21.86	24.31	25.59



## TENTH PLAN 2002-07 &amp; ANNUAL PLAN 2002-03 - COMPANYWISE COAL PRODUCTION

Million tonnes

Sl. No.	Company	VIII PLAN		Ninth Plan								Tenth Plan		% ACGR											
		1996-97	Actual	1997-98	Target	Actual	1998-99	Target	Actual	1999-00	Target	Actual	2000-01	Target	Actual	2001-02	AP	Anticipated	2002-03	Target	2006-07	Target	IX Plan	X Plan	
		2001-02	MTA	AP	Target	Actual	Original	Proj.	Target																
<b>CIL:</b>																									
1	ECL	29.65	27.43	32.00	27.16	29.00	25.12	28.00	28.03	37.00	29.50	28.50	28.50	29.00	31.00	0.79	1.70								
2	BCCL	27.13	30.70	32.30	27.17	27.50	27.90	29.50	25.97	34.00	30.00	30.00	27.50	28.00	33.00	0.27	3.71								
3	CCL	32.18	34.00	33.07	35.00	33.50	32.40	34.00	31.75	41.30	36.00	36.00	33.00	34.25	43.30	0.50	5.58								
4	NCL	37.01	37.00	37.12	37.00	36.52	37.50	38.43	39.00	41.40	45.85	41.00	43.50	44.00	52.00	3.28	3.63								
5	WCL	31.23	30.50	32.52	32.00	31.75	32.00	33.86	33.00	35.20	34.70	34.60	35.00	37.00	37.50	3.17	0.54								
6	SECL	55.3	55.50	56.63	58.70	57.56	58.00	58.75	60.00	60.33	68.90	66.00	63.00	65.25	84.55	2.64	6.06								
7	MCL	37.37	39.50	42.17	41.00	43.51	41.00	43.55	43.00	44.80	51.25	47.40	44.50	48.00	68.00	4.47	7.90								
8	NEC	0.75	0.80	0.69	0.85	0.64	0.60	0.57	0.50	0.66	1.00	0.50	0.50	0.50	0.65	-7.79	5.39								
<b>Sub-Total CIL:</b>		250.62	260.50	260.55	268.85	256.48	259.10	260.58	267.00	268.14	314.00	285.00	279.00	286.00	350.00	2.17	4.64								
<b>Category:</b>																									
Existing Mines		33.16	32.90	33.87	31.36	32.45	30.94	32.75	29.64	30.11	31.64	29.11	31.38	29.46	25.50	-1.91	-3.27								
Completed Projects		170.59	163.52	193.06	157.94	184.22	176.29	197.13	177.79	214.71	118.57	182.27	216.98	217.90	200.80	5.21	-1.80								
Ongoing Projects		46.03	62.68	33.62	76.86	39.81	51.83	30.70	59.35	22.61	108.08	70.33	28.86	31.63	44.59	-9.74	10.09								
New Projects		0.84	1.4	0.00	2.69	0.00	0.04	0.00	0.22	0.71	55.71	3.29	1.78	7.01	79.11	10.44	124.73								
<b>Total:</b>		250.62	260.50	260.55	268.85	256.48	259.10	260.58	267.00	268.14	314.00	285.00	279.00	286.00	350.00	2.17	4.64								
9	<b>SCCL</b>	28.73	31.00	28.94	31.00	27.33	31.00	29.56	31.67	30.27	36.00	34.00	32.38	32.50	36.13	1.53	3.11								
<b>Category:</b>																									
Existing Mines		5.16	4.90	4.85	4.59	4.7	4.13	4.45	4.18	4.79	4.15	4.14	4.19	4.30	3.87	-2.83	-2.84								
Completed Projects		21.36	22.60	21.90	19.76	22.25	22.30	22.68	22.56	19.15	19.56	22.28	21.33	21.55	19.03	-0.03	-2.26								
Ongoing Projects		2.21	3.50	2.19	4.51	2.87	4.62	2.81	4.81	2.92	8.37	5.87	5.91	6.55	9.22	18.66	12.14								
New Projects		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.33	4.43	0.00	0.10	4.01										
<b>Total:</b>		28.73	31.00	28.94	31.00	27.33	31.00	29.56	31.67	30.27	36.00	34.00	32.38	32.50	36.13	1.53	3.11								
10	TISCO/IISCO/DVC	6.73	6.50	6.51	6.65	6.63	6.80	6.96	7.40	7.33	7.60	7.60	7.55	7.60	7.64	2.33	0.24								
11	Captive		0.71	1.83			2.95	2.00	3.83	13.00	2.26	3.75	4.00	5.50	6.73	10.97									
12	Others	3.21	3.23	4.24			4.06	NA	4.07	4.10	4.10	4.50	5.02	4.50	5.02	1.88									
<b>All India Total:</b>		289.29	298.00	299.94	306.50	296.51	296.90	304.11	308.07	313.64	370.60	328.86	322.73	325.65	405.00	2.40	4.46								

## Ninth Plan Outlay &amp; Expenditure &amp; Tenth Plan Proposed Outlay - DOC (Current &amp; Constant Prices)

Rs.Crore

Sl. No.	PSU/Scheme	IX Plan Outlay (1997-2002)		1997-98		1998-99		1999-00		2000-01		2001-02		Cumulative (Provl.) IX Plan		X Plan (2002-07)	Annual Plan 2002-03
		Approved	MTA	Outlay	Expenditure	Outlay	Expenditure	Outlay	Expenditure	Outlay	Expenditure	Outlay	RE	Expenditure	% Utilisation		
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Coal India Ltd.-Curr.-Constant	12401.00	12000.00	2269.95	1824.55	2517.00	1831.97	2556.00	2769.66	2790.32	1059.32	2309.90	1540.00	9025.50	75.21	14310.00	2190.00
2	SCCL - Current -Constant	2235.00	1665.32	502.75	208.48	331.57	206.09	227.19	145.20	327.82	194.10	355.00	290.00	1043.87	62.68	2113.00	405.00
3	NLC (Mines)-Curr.-Constant	2581.80	2857.00	334.96	149.34	776.59	457.13	575.98	521.44	609.80	591.53	449.97	401.81	2121.25	74.25	6125.84	292.23
4	S&T-Current -Constant	80.00	80.00	10.00	8.61	33.56	5.14	20.71	5.15	13.50	0.16	11.92	1.71	20.77	25.96	100.00	7.76
5	EMSC-Current -Constant	79.00	79.00	5.00	0.85	20.00	10.00	20.00	8.00	13.52	10.00	12.17	5.41	34.26	43.37	163.00	34.65
6	Regional Expl.-Curr.-Constant	130.00	140.00	20.00	20.95	24.58	21.18	27.01	32.56	30.37	30.37	32.26	35.21	143.67	102.62	275.80	49.19
7	Detailed Drill.-Curr. (Non-CIL) - Constant	9.38	91.18	0.00	0.00	9.38	4.00	5.38	4.46	23.10	7.83	27.65	37.09	69.38	76.09	70.66	13.92
8	RFRP-Current -Constant	8.05	8.05	0.00	0.00	4.61	1.22	3.89	5.06	0.00	0.00	0.00	0.00	6.28	78.01	0.00	0.00
9	Rehab. Proj.-Current -Constant	50.00	50.00	0.00	0.00	3.97	1.05	3.23	4.20	0.00	0.00	7.24	8.04	8.54	17.08	0.00	0.00
10	R&D Centre-Curr.-Constant	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	IT-Current -Constant	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.33	0.33	0.39	0.55	1.10	-	0.00	0.00
12	VRS *-Current -Constant	0.00	459.19	0.00	0.00	0.00	0.00	160.00	158.52	180.00	140.03	156.99	300.00	598.55	130.35	425.06	206.00
	<b>Total Coal &amp; Lignite:-Constant</b>	<b>17575.23</b>	<b>17430.74</b>	<b>3142.66</b>	<b>2212.78</b>	<b>3717.29</b>	<b>2540.13</b>	<b>3601.71</b>	<b>3651.19</b>	<b>4001.86</b>	<b>2036.34</b>	<b>3373.11</b>	<b>2632.73</b>	<b>13073.17</b>	<b>75.00</b>	<b>23583.36</b>	<b>3198.75</b>
	<b>NLC (Power)-Curr.-Constant</b>	<b>1866.36</b>	<b>1713.00</b>	<b>249.81</b>	<b>37.00</b>	<b>335.46</b>	<b>124.80</b>	<b>296.64</b>	<b>131.16</b>	<b>558.65</b>	<b>469.49</b>	<b>538.84</b>	<b>494.96</b>	<b>1257.41</b>	<b>73.40</b>	<b>8007.64</b>	<b>292.72</b>
	<b>NEC Component-Curr.-Constant</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>87.30</b>	<b>57.14</b>	<b>65.20</b>	<b>0.00</b>	<b>57.14</b>	<b>-</b>	<b>0.00</b>	<b>0.00</b>
	<b>TOTAL DOC-Curr.:-Constant</b>	<b>19441.59</b>	<b>19143.74</b>	<b>3392.47</b>	<b>2249.78</b>	<b>4052.75</b>	<b>2664.93</b>	<b>3898.35</b>	<b>3782.35</b>	<b>4647.81</b>	<b>2562.97</b>	<b>3977.15</b>	<b>3127.69</b>	<b>14387.72</b>	<b>75.16</b>	<b>31591.00</b>	<b>3491.47</b>
	<b>TOTAL DOC-Curr.:-Constant</b>	<b>3184.52</b>	<b>2111.87</b>	<b>3491.64</b>	<b>2295.97</b>	<b>3234.34</b>	<b>3138.10</b>	<b>3637.92</b>	<b>2006.08</b>	<b>2950.63</b>	<b>2320.42</b>	<b>11872.44</b>	<b>62.02</b>				

Note:- Deflators: 1996-97- 1.00; 1997-98 - 1.0653; 1998-99 - 1.1607; 1999-2000 - 1.2053; 2000-01 - 1.2776; 2001-02 - 1.3479

\* The outlay for VRS excludes Rs.400 crore provided under NRF initially. Against this Rs.240 crore was made available to DOC in the first two years of the Plan. However, expenditure doesnot include this.

Later on the outlay for VRS was made available through the DBS available to DOC for IX Plan.

@ The percentage is against MTA outlay. The percentage as per approved outlay is 74% on current price basis and 61.06% on constant price basis.