Energy

10.1 The Tenth Five-Year Plan recognised the fact that underperformance of the energy sector can be a major constraint in delivering the targeted 8 per cent annual growth in gross domestic product (GDP). It, therefore, called for an integrated energy policy based on acceleration of the reform process and substantial increase in installed capacity and production in the energy sector. Several important steps have been taken in this direction, but the process is far from complete. The Electricity Act, 2003 was notified on 10 June 2003, and contains enabling provisions for the development of a competitive and efficient power sector, but there have been delays in operationalising the Act due to delays in finalising policies and implementing regulations required under the Act. Reforms in the petroleum and natural gas sector through the dismantling of the Administered Price Mechanism (APM) have also not progressed as envisaged and real competition in the marketing of petroleum products is yet to emerge. The Coal Bill 2000 aimed at amending the provisions of Coal Mines (Nationalisation) Act 1973 and permit private sector in non-captive mining is pending in Parliament.

10.2 Serious weaknesses in the State Electricity Boards (SEBs), especially in the distribution segment, continue to plague the power sector and weaken its financial viability. The anticipated capacity addition in power sector is likely to reach just over 75 per cent of the Tenth Plan target. The target for coal production is likely to be exceeded by over 6 per cent in the terminal year of the Tenth Plan. As a result of higher domestic production and higher imports, the demand supply gap of 35 million tones (mt) foreseen in the terminal year of the Tenth Plan is expected to narrow to about 11 mt. Although the target of crude oil production may be achieved, a 5 per cent shortfall is anticipated in the production of natural gas. The target for addition of power generation capacity through renewable energy sources is likely to be exceeded by 3 per cent primarily because wind power capacity addition is expected to more than make up for shortfalls in all other renewable capacity targets.

POWER SECTOR

10.3 The power sector remains the most important element of infrastructure essential for delivering targeted levels of GDP growth. The need to introduce reforms in the sector was recognised in the early 1990s but the outcome remains unsatisfactory despite a series of efforts. Energy and peaking shortages, low quality of supply and internationally uncompetitive tariffs adversely affect economic activity and the situation is not likely to improve unless the distribution segment becomes efficient and financially viable.

10.4 The thrust areas for the power sector in the Tenth Plan are:

- Power sector reform through:
  - unbundling of vertically integrated state utilities;
  - establishing independent regulatory regimes at the state level as well as the Centre;
  - improving financial discipline and the financial viability of the state utilities and
  - transforming the Accelerated Power Development and Reforms Programme (APDRP) from an investment-driven programme to an outcome-driven one.
- Raising the level of competition in each element of the electricity value chain through:

- increased private sector participation;
- instituting open access to consumers and
- creating a level playing field.

- Tapping the available captive capacity by integrating it into the grid.
- Enactment of the Electricity Bill to provide the legal framework that embodies all of the above.
- Encouraging CPSUs to take new investments through joint ventures with state utilities and private sector. .

Physical Performance

10.5 Against the originally envisaged Tenth Plan target of 41,110 MW of capacity addition, the likely capacity addition will at most be 31,290 MW, a shortfall of at least 23.9 per cent. The likely capacity addition includes 4293 MW of capacity that was not part of the original Tenth Plan targets. If the unplanned capacity is excluded, the shortfall would rise to 34.4 per cent.

10.6 Table 10.1 indicates the actual achievement in capacity addition during the first two years, anticipated capacity addition in 2004-05 and likely achievement for the last two years of the Tenth Plan period. While the Planning Commission projects a likely capacity addition of 31,290 MW during the 10th Plan, the Ministry of Power projects 36,955 MW. The difference between the two is largely due to gas based projects and nuclear projects included by the Ministry of Power. These projects were not part of Tenth Plan projects and the availability of gas over the next two years is highly uncertain. As per MoP's projections the likely shortfall will be 10 per cent if these projects come through, otherwise it will be 20 per cent.

10.7 The sector-wise break up of the projects that were not originally included in the Tenth Plan but have actually materialised or are likely to materialise in the Tenth Plan period is as follows:

Central sector	-	2,250 MW
State sector	-	1,620 MW
Private sector	-	423 MW
Total	-	4,293 MW

All the above unplanned projects are thermal plants. These non-Plan projects have helped improve the Tenth Plan performance.

10.8 The targets and anticipated likely achievement for each of the sub-sectors – hydro, thermal and nuclear capacity – are given in Table 10.2.

Table 10.1
Targets and achievements in capacity additions in the Tenth Plan period

(in MW)

	Tenth Plan Target	2002-03 Actual	2003-04 Actual	2004-05 Anticipated	2005-07 Likely	TENTH PLAN LIKELY ACHIEVEMENT	
						In respect of Tenth Plan Projects	Including projects not included in Tenth Plan
Centre	22,832	1,210	3,035	3,630	9,222	14,847 (65.0)	17,097 (74.9)
State/UT	11,157	1,114	819	1,443	7,727	9,483 (85.0)	11,103 (99.5)
Private*	7,121	548	232	173	2,137	2,667 (37.5)	3,090 (43.4)
TOTAL	**41,110**	**2,872**	**4,086**	**5,246**	**19,086**	**26,997 (65.6)**	**31,290 ^ (76.1)**

* Excludes windmill capacity through private sector
^ Likely achievement projected by Ministry of Power is 36,955 MW
Note- Figures in brackets indicate percentage of target achieved.

Table 10.2
Generating capacity anticipated at the end of the Tenth Plan

(MW)

	Hydro	Thermal	Nuclear	Total
Capacity as on 31.3.2002	**26,269**	**76,057**	**2,720**	**1,05,046**
Tenth Plan Target	14,393	25,417	1,300	41,110
Likely addition during Tenth Plan	**10,800 (75.0)**	**19,190 (75.5)**	**1,300 (100.0)**	**31,290 (76.1)**
Likely installed capacity On 31.3.2007	**37,069**	**95,247**	**4,020**	**1,36,336**

(Figures in brackets indicate percentage of target achieved)

10.9 The likely shortfall in capacity addition in the case of hydel and thermal plants will be around 25 per cent. The Tenth Plan envisaged building 9.6 per cent of the capacity using the more efficient super critical 660 MW modules. However, the use of the larger and more efficient units was shifted to the Eleventh Five-Year Plan in order to realise higher physical performance based on the proven 500 MW units. The capacity addition target for nuclear plants will be realised in full. The Central sector is expected to have a shortfall of 23 per cent, while the state sector is likely to have a marginal shortfall of 0.5 per cent. The private sector shortfall will be as high as 57 per cent, which largely reflects the fact that the distribution segment of the power sector remains financially unviable. The financial closure of private sector projects remains difficult in the absence of a payment security mechanism and the difficulties of obtaining fuel linkage both in respect of coal and gas. The sector-wise break-up of delayed Tenth Plan power generation capacity is given in Table 10.3.

10.10 Significant shortfalls in achieving Plan targets for capacity addition have been a consistent phenomenon, except during the Seventh Plan period. The inadequate creation of capacity has been partially addressed through higher plant load factor (PLF) as shown in Table 10.4. But high PLFs lower both quality and reliability of supply. System operators have handled capacity shortfalls by shifting agricultural load to low peak night hours and through scheduled power cuts. Low reliability, poor quality of supply and high tariffs have pushed industrial and commercial units to resort increasingly to captive generation. Table 10.4 also shows that the PLF for nuclear plants has gone down to 73.70 per cent in 2003-04, after reaching a high of 79.40 per cent in 2001-02. This is primarily due to non-availability of

Table 10.3
Delayed Tenth Plan power generation capacity

(MW)

Sector	Thermal Projects	Hydro Projects	Total
Central sector	5,420	2,565	7,985
State sector	1,116	558	1,674
Private sector	3,984	470	4,454
Total	**10,520**	**3,593**	**14,113**

Table 10.4
Plant Load Factor (%)

Mode	Beginning of the Ninth Plan 1996-97	End of the Ninth Plan 2001-02	2002-03	2003-04
Thermal	64.40	69.90	72.20	72.70
Nuclear	55.90	79.40	79.30	73.90

nuclear fuel because the development of domestic mines has not kept pace with addition of generating capacity.

10.11 Large gaps remain in rural electrification. Out of 5,87,000 inhabited villages, an estimated 4,95,000 villages were electrified up to the end of 31 March 2004 yielding an all-India village electrification level of 84.3 per cent. However, this is based on the earlier definition of village electrification, which states "a village will be deemed to be electrified if electricity is used in the inhabited locality within the revenue boundary of the village for any purpose whatsoever." The new definition of village electrification requires that:

- Basic infrastructure such as distribution transformer and distribution lines be provided in the inhabited locality as well as the dalit basti/hamlet where it exists.
- Electricity is provided to public places like schools, panchayat office, health centres, dispensary, community centres etc.
- The number of households electrified should be at least 10 per cent of the total number of households in the village.

If this new definition is applied, and if de-electrified villages are also included, the number of unelectrified villages is expected to at least double, thereby reducing village electrification to little less than 70 per cent.

10.12 The level of household electrification is, of course, much lower. The 2001 Census data indicates that only 44 per cent of the rural households are electrified, leaving 56 per cent of the households without electricity. The current status of village electrification and household electrification in individual states is given in Table 10.5.

Financial Performance

Plan Outlays

10.13 The Tenth Plan approved outlay for the power sector is Rs.2,70,276 crore, representing 18.2 per cent of the total public sector outlay. Tables 10.6 and 10.7 indicate the progress on Plan expenditure (Centre and States) and financing of Central sector. The likely Central sector expenditure during the first four years of the Plan will only be Rs.70,966 crore (at current prices) which amounts to around Rs.63,102 crore in constant (2001-02) prices compared to the total Tenth Plan outlay of Rs.1,77,050 crore in constant (2001-02) rupees.

Table 10.5
Reported status of rural electrification

Better Electrified States			Poorly Electrified States		
States	**Electrified villages (%)**	**Electrified households (%)**	**States**	**Electrified villages (%)**	**Electrified households (in %)**
Himachal Pradesh	99.38	94.80	Rajasthan	98.38	54.70
Punjab	100.00	91.90	Chhattisgarh	94.00	53.10
Haryana	100.00	82.90	West Bengal	83.63	37.50
Gujarat	100.00	80.40	North-East Region	75.32	33.20
Maharashtra	100.00	77.50	Uttar Pradesh	58.73	31.90
Madhya Pradesh	97.43	70.00	Orrisa	80.15	26.90
Karnataka	98.91	78.50	Jharkhand	26.00	24.30
Tamil Nadu	100.00	78.20	Bihar	50.00	10.30
Kerala	100.00	70.20			
Andhra Pradesh	100.00	67.30			

Table 10.6
Financial performance of power sector

All figures in 2001-02 prices (Rs. crore)

Sl. No.	Year	Central	State	Total at Constant 2001-02 prices
1.	Ninth Plan approved	68,782	91,918	1,60,700
2.	Ninth Plan realisation	43,347	1,10,329	1,19,576
3.	Tenth Plan approved	1,77,050	93,226	2,70,276
4.	2002-03	10,601	14,339	24,940
5.	2003-04	13,526 (Actuals)	14,528 (RE)	28,054
6.	2004-05	15,947 (RE)	15,076 (Est.)	31,023
7.	2005-06	23,028(BE)	15,794 (Est.)	38,822
8.	Likely achievement in first four years	63,102	59,737	1,22,839
9.	2006-07 (Likely)	51,269 #	16,546	67,815
10.	Likely investment during Tenth Plan	1,14,371#	76,283*	1,90,654
11.	(%) utilisation	64.60	81.83	70.54

As forecast by the concerned Ministries/Deptt.
* Assumes a 10 per cent growth in nominal terms (for the remaining three years) over the level 2003-04.

Table 10.7
Financing of Ministry of Power investment during Tenth Plan

Sl. No.	YEAR	IEBR		GBS	Outlay at constant 2001-02 Prices
		IR	EBR		
1.	Tenth Plan approved	14,138	1,04,261	25,000	1,43,399
2.	2002-03 (actual)	1,630	4,946	1,765	8,341
3.	2003-04 (actual)	2,138	6,176	1,726	10,040
4.	2004-05 (R.E)	3,280	6,986	2,116	12,382
5.	2005-06 (B.E)	4,276	11,609	2,520	18,405
6.	First four years Anticipated	41,041		8,127	49,168
7.	2006-07 (likely) #	31,179		12,594	43,773
8.	Likely investment during Tenth Plan #	72,220		20,721	92,941
9.	% of Tenth Plan	61.0		82.9	64.8

As estimated by the Ministry of Power

Notes for Tables 10.6 and 10.7 :

(1) The Tenth Plan outlays are based on 2001-02 price levels.

(2) The investments estimated by the Ministry of Power in the last two years of the Tenth Plan look very high compared to the actual achievement in the first three years. Planning Commission estimates that the likely outlay by the Ministry of Power will not exceed Rs.64,000 crore. The total central sector outlay will likely be Rs.85,430 crore.

Progress in Tenth Plan

10.14 Despite the importance given to the power sector in the Tenth Plan, it remains an area of serious concern because of the following factors:

- Internationally uncompetitive and poor quality power imposes a heavy burden on trade and industry.
- System wide aggregate technical and commercial (AT&C) losses exceed 40 per cent
  - In Orissa, such losses are over 45 per cent even six years after privatisation
  - In Delhi, the losses are over 40 per cent even three years of privatisation
- The SEBs are financially sick; loss on sale of electricity, though lower than the peak reached in 2001-02, has been rising since 2002-03.
- 56 per cent households are not electrified; power on demand remains a distant dream.
- Reported peaking and energy shortages are 7 per cent and 11 per cent respectively but these do not reflect the real shortages, as they do not account for suppressed demand and scheduled load shedding.
- The growing share of CPSUs relative to state sector and private sector. CPSUs receive guaranteed 14/16 percent post tax returns under a cost plus tariff regime. Such high guaranteed returns on a non-competitive basis are unique to India and, more importantly, cannot be sustained with the prevailing high level of AT&C losses. The need to make industrial/commercial tariffs internationally competitive limits the scope for further tariff increases for these two consumption categories. Less than 42 per cent of the energy is sold to industrial and commercial consumers (including sales to public water works and railway traction). However, this 42 per cent of energy yields over 70 per cent of the actual revenue collected by the state utilities.
- Even though distribution reform remains the key to improving the viability of the sector, generation and transmission investments continue to dominate the sector with a share exceeding 90 per cent of the investment. This is akin to building a superstructure without the foundation.

Power Sector Reform and Outcomes

10.15 Power sector reforms have been under way for over a decade. Some of the important changes it has effected are:

- Nine states — Orissa, Haryana, Andhra Pradesh, Uttar Pradesh, Karnataka, Rajasthan, Madhya Pradesh, Gujarat and Delhi — have enacted their State Electricity Reforms Acts which provide, inter-alia, for unbundling/ corporatisation of SEBs, setting up of State Electricity Reforms Commissions (SERCs), etc.
- Twenty-four states have either constituted or notified the constitution of SERC and eighteen SERCs have issued tariff orders. With the Electricity Act, 2003 having come into force the setting up of SERCs has become mandatory. The states where the SERCs are not in existence have been advised to take necessary action for the setting up of SERCs. These are Manipur, Nagaland, Meghalaya, Arunachal Pradesh and Mizoram.
- The SEBs of Orissa, Haryana, Andhra Pradesh, Karnataka, Uttar Pradesh, Uttaranchal, Rajasthan, Delhi, Madhya Pradesh, Gujarat and Assam have been unbundled/corporatised.
- Distribution has been privatised in Orissa and, Delhi, while Uttar Pradesh is in the process of doing so.

10.16 Despite these achievements, the power sector remains locked in a situation that is fundamentally unsustainable. The efficiency of the distribution segment as measured by the extent of Aggregate Technical and Commercial

(ATC) losses remains low. The proportion of energy billed to energy available has remained flat at under 67 per cent since 2000-01. Well over 40 per cent of the energy pumped into the system is lost, not billed, incorrectly billed or not collected. The losses have declined slightly (Table 10.8) but much less than was expected or, indeed, is necessary to ensure the financial viability of the SEBs. As a percentage of turnover, losses have come down because of tariff increases and efficiency improvement in SEBs. The tariff between 2000-01 and 2003-04 went up by 19.4 per cent while the cost of supply went up by only 4.8 per cent over the same period. Such a differential in tariff hikes and supply costs is not sustainable and the trend is already showing a sign of reversal. As tariff increases and efficiency gains become more moderate, the losses on sale of electricity are seen to be rising in absolute terms. (Table 10.8). In this situation, SEBs are unable to invest in improving the distribution system or in expanding generation and strengthening/ expanding inter-state transmission capacity. This is reflected in the fact that although the state sector accounted for two-thirds of the generating capacity at the start of the Tenth Plan and the Central Sector one-third, the targets for capacity creation of the two sectors were in reverse proportion in the Tenth Plan. The financial difficulties of the SEBs are also responsible for their inability to attract private investment and, therefore, the performance of the private sector against plan targets remains poor.

Tripartite Agreement

10.17 One reason why the Central sector has been insulated from these problems is the Tripartite Agreement (TPA) under which the outstanding dues of SEBs to CPSUs as on 30 September 2001 were securitized and subsequent payments to CPSUs were protected by recourse to the account of the state governments with the Reserve Bank of India. The states have been maintaining payment discipline vis-à-vis CPSUs since then, but the viability of the arrangement is questionable.

10.18 Compliance under the tripartite agreement is rewarded by cash incentives. Even payment of incentives under the APDRP and the release of the APDRP investment component has been made conditional on compliance with the tripartite agreement. Although these are good measures to ensure payment discipline, it is also a fact that the structure put in place ensures net transfers to the states in the early years of the scheme.

Table 10.8
Financial performance of 20 major states excluding Delhi and Orissa

Particulars	2000-01 Actual	2001-02 Actual	2002-03 Actual	2003-04 Provi.	2004-05 RE
Energy Sold (MU)	265396	279471	290017	311196	334684
Energy Sold/ Energy Available (%)	66.79	66.17	65.96	66.82	67.95
Revenue from sale of electricity (Rs.crore)	60989	68115	76597	85358	92553
Total expenditure (Rs.crore)	91437	98541	102800	112342	120282
Loss on sale of electricity (Rs.crore)	29760	30427	26203	26983	27729
Average cost of supply (Paise/Kwh)	344.53	352.60 (2.34)	354.46 (2.88)	361.00 (4.78)	359.39 (4.31)
Average tariff (Paise/Kwh)	229.80	243.73 (6.06)	264.11 (14.93)	274.29 (19.36)	276.54 (20.34)
Gap between average cost of supply and average tariff (Paise)	114.73	108.87	90.35	86.71	82.85

Note: Figures in the bracket represents increase over 2000-01

While this has encouraged payment in the early years, a reduction in cash incentives in the subsequent years may give rise to defaults by state governments or the state sector utilities. The risk of such defaults will rise once the repayment of the securitised dues starts in October 2006.

Accelerated Power Development and Reform Programme

10.19 The APDRP was aimed at supporting distribution reforms in the states through investments and incentives for achieving desired outcomes. Under the investment component, projects worth Rs.17,612.36 crore had been sanctioned by 15th March, 2005. All of these projects were designed to reduce the AT&C losses through strengthening of the sub-transmission and distribution system. While the total investment needs for projects in special category states were to be met by the Government of India, the non-special category states were required to fund 50 per cent of the approved project outlay through counterpart funding arranged by the state governments. A broad summary of the investment component is given in Table 10.9.

10.20 Table 10.9 highlights two issues. One, the total investment in APDRP projects over three years has only been Rs.5,768 crore. Thus, despite recognising the criticality of the distribution sector to the efficiency of the power sector, actual investments in the distribution sector remain low. Second, the actual investment is well below the total funding made available for APDRP projects. The performance of APDRP has, thus far, fallen well short of the promise held out in support of the programme. Availability of baseline data and its reliability to measure outcomes remains in doubt.

10.21 An independent review of APDRP is essential and the programme may have to be restructured to a completely outcome-driven one, with established baselines and monitorable outcomes. Ministry of Power has already engaged a number of independent agencies for a study of APDRP Schemes. The state utilities support the programme as it provides the only resource for upgrading distribution. However, they would prefer greater flexibility and delegation in the design/implementation of the programme. The distribution sector has been neglected in the past and, based on the experience thus far with APDRP, it is estimated that an investment exceeding Rs.1,00,000 crore could easily be absorbed in the short to medium term to improve distribution efficiency It would best if at least 40 per cent of the Plan outlays are earmarked for distribution over the next seven to 10 years.

10.22 As regards the incentive components of the APDRP scheme, five states – Gujarat, Maharashtra, Haryana, Rajasthan and Andhra Pradesh – have received incentives aggregating Rs.882.58 crore corresponding to an audited loss reduction of Rs.1,765.14 crore over their loss levels of 2001-02. However, the loss reduction includes improvements due to tariff increases. The budget provision for disbursement of incentive has been Rs.1750 per year during the first three years of the

Table 10.9
Summary of investment component of APDRP
(As on 15th March, 2005)

(Rs. Crore)

Sl. No.	Category of states	Project outlay	APDRP component to be funded by GOI	Amount actually released by GOI	Counterpart funds provided by states	Total utilisation (Actual investment)
1	Non-special	15,039.23	7,519.62	3,570.04	2,636.59	5,286.71
2	Special	2,573.13	2,573.13	943.04	-	481.00
Grand Total		**17,612.36**	**10,092.75**	**4,513.08**	**2,636.59**	**5,767.71**

Table 10.10
Summary of incentive component in APDRP
(Rs. crore)

States	Incentive Received		
	2002-03	2003-04	Total
Andhra Pradesh	-	265.11	265.11
Gujarat	236.38	-	236.38
Haryana	5.01	100.48	105.49
Maharashtra	137.89	-	137.89
Rajasthan	-	137.71	137.71
Total	**379.28**	**503.30**	**882.58**

scheme. The utilisation during the first two years of the Tenth Plan was only 25.2 per cent. The details of state-wise incentive disbursement for 2002-03 and 2003-04 is given in Table 10.10.

The Electricity Act 2003

10.23 The Electricity Act 2003 was notified on 10 June 2003. The Act, as finally approved, provides the basic framework for encouraging reforms and introducing competition in the sector.

The following notable actions have been taken since the notification of the Electricity Act, 2003:

- The Central Government notified the National Electricity Policy (NEP) on 12th February, 2005.
- Guidelines for the competitive bidding under Section 63 of the Act were notified on 19th January, 2005.
- Rules under 14 sections of the Electricity Act have already been notified. Other rules are currently being finalised.
- CEA has circulated draft notifications on following four items:
  - o Transaction of its business
  - o Standards for connectivity to the grid
  - o Regulations on metering
  - o Regulation on governing approval for hydro projects.

10.24 However, the Ministry of Power has not met, certain requirements relating to various policies and implementing regulations as foreseen under the Act (Box 10.1). The required consensus around these policies and implementing regulations is still missing. Hence, much remains to be done to operationalise the Act in letter and spirit.

10.25 The Electricity Act de-licenses notified rural areas completely for generation, transmission and distribution of electricity. However, this requires that the States notify rural areas. Such notification could see the emergence of independent rural suppliers of electricity.

10.26 There have been several demands for a review of key provisions of the Electricity Act. Some of the issues of concern have been addressed but other issues remain. These should be resolved as quickly as possible to end uncertainty. Care should be taken to ensure that the revisions do not affect the provisions relevant for promoting competition and improving efficiency of the sector. Such enabling provisions include unbundling, separation of content from carriage, phasing out of cross subsidies, shifting to direct subsidies where possible, flexibility for captive generation, parallel

Box 10.1
Commitment for implementing the Electricity Act, 2003

- Notify the Tariff Policy under Section 3
- Notify the National Policy on Rural Electrification under Section 5
- Notify the National Policy on Stand Alone Systems under Section 4
- Make rules for second and subsequent distribution licensees under Section 14
- Make remaining implementing Rules required under various Sections of the Act.
- Get the Central Electricity Authority (CEA) to issue notification under 7 sections of the Act
- Constitute and operationalise the Appellate Tribunal

distribution, open access etc. Competition is essential to realising efficiency gains in the sector and the proposed review, if any, should be driven by the need to realise such gains in this loss-making sector.

Regulatory Reform

10.27 The experience with independent regulation has been patchy, at best (Box 10.2). The record so far has raised the following concerns:

- Delayed, inconsistent and deficient orders.
- Regulations on competition, wheeling, open access, cross subsidies, trading are lacking or are deficient.
- Regulators have an all-powerful role but the checks and balances on the performance of regulatory institutions is inadequate. The issue of accountability of regulation needs to be addressed.
- Inappropriate eligibility criteria and a selection process that lacks transparency.
- Lack of regulatory capacity and expertise.
- Absence of necessary training for regulators.

Hydro Power Development

10.28 A 50,000 MW hydropower initiative was launched in May 2003 With the objective of realising the feasible balance of hydropower potential in the country in a systematic manner. This initiative includes 162 hydroelectric projects with an aggregate capacity of over 48,000 MW. The proposed schemes include 17,000 MW of storage scheme and 31,000 MW of run-of-the-river projects. Around 50 per cent of this capacity lies in Arunachal Pradesh alone, which is proposed to be taken up by CPSUs. The Central Electricity Authority (CEA) has prepared the pre-feasibility reports for these 162 projects. However, the run-of-the-river schemes (over 60 per cent of the total) do not have the ability to provide peaking capacity that is essential to improve the hydro/thermal mix.

Box 10.2
Regulatory System in Infrastructure

The Mid Term Appraisal points to the importance of overcoming the infrastructure deficit which plagues the economy as an essential condition for accelerating growth especially in the industrial sector. Given the constraints on expanding public investment, increasing reliance would have to be placed on public private partnerships for bridging the investment gap. Private investment requires a policy framework which can enable an adequate rate of return and also a regulatory system which is seen to be fair by consumers and also by producers. For the latter, the system must be independent of government. This is especially so when private sector service providers have to compete with incumbent public sector providers.

During the past decade, economic regulation has evolved in different ways in different sectors. In power and telecommunication regulators have been set up with extensive functions. In the highways sector, regulation has relied mainly on the concession agreement while in ports, the role of Regulatory Authority is confined to tariff setting.

Several issues arise. How far does the regulatory system in each area meet the requirement of the sector and does it measure up to international best practices? Should there be a separate regulator for each sector or should there be a common regulator for similar sectors? What should be the role and functions of the regulation in each sector? The Planning Commission will prepare a discussion paper reviewing the situation with regard to regulation in different sectors and make suggestions for changes as needed based on extensive consultation with stake holders and keeping in view international best practices.

Development of National Power Grid

10.29 The Power Grid Corporation of India Ltd. (PGCIL) has envisaged the establishment of an integrated National Power Grid by 2012 with an inter-regional power transfer capacity of 30,000 MW. The major considerations taken up while formulating such a perspective plan are, creation of "transmission highways" from potential surplus regions (mainly east and north-east) to load centres in the northern, southern and western regions. The inter-regional power transfer capacity had increased from 1,200 MW in 1997 to 8,000 MW by March 2004 and in terms of energy flow it has increased from 3600 MUs to 22,000 MUs during the same period. The performance of PGCIL in creating evacuation facilities and laying down the base for the National Grid is progressing as planned. Creation of such inter-regional transfer capacity augurs well for both system operation as well as promoting trading and open access.

Viability of the Strategy Of Cpsu-led Capacity Creation

10.30 One consequence of the financial unviability of the state sector is that creation of power capacity is being led by central sector PSUs. Based on current plans, the CPSUs are estimated to account for some 53 per cent of the energy generated by the end of the Eleventh Plan. It is also likely that all inter-state transmission remains under CPSU control even by the end of the Eleventh Plan. This dominant role of the CPSUs is the result of a number of asymmetries. One of these relates to the preferential payment arrangement. Another relates to the fact that the present system guarantees the CPSUs post tax returns of 14/16 per cent. In contrast, state regulators sometimes do not provide any returns to the state's own power sector facilities or else approve tariffs that effectively yield zero returns or returns well below those provided to CPSUs. Such an approach is necessitated by the need to limit increases in tariffs paid by consumers while meeting payment obligations to the CPSUs under the tripartite agreement. The result is that the state utilities are starved of investible resources required to address the problems of the distribution sector that remains under their control. The financially sick state utilities are forced to borrow funds for their own investments and this compounds their financial woes.

10.31 This arrangement clearly cannot be sustained. A reduction in AT&C losses from the current level of 40 per cent plus to a manageable 15-20 per cent level is essential. In the absence of such a loss reduction, the state utilities cannot continue to pay CPSUs even for the current level of purchases. Regulating supplies or enforcing the guarantee under the tripartite agreement to access funds from Central devolutions to the states, on a sustained basis, are not realistic options.

Competition for An Efficient Power Sector

10.32 The Indian power sector is internationally uncompetitive and the paying

Table 10.11
Retail tariffs in various countries in 2002

Country	Domestic (Cent/Kwh)	Industrial (Cent/Kwh)	Average tariff (Cent/Kwh)	Average tariff (Cent/Kwh) on PPP basis
Japan	21.3	14.3	17.8	15.3
Germany	12.4	4.4	8.4	9.5
United States	8.6	5.5	7.7	7.7
Brazil	12.8	5.7	9.25	27.6
China	4.5	4.4	4.45	20.6
India	4.7	8.6	5.6	30.8

Source: From various country reports

consumer is burdened with one of the highest tariffs in the world for similar class of consumption (Table 10.11). This can only be corrected by encouraging competition under level terms in each element of the electricity value chain. Such an enabling environment would create conditions that allow the private sector, the CPSUs and the state sector to compete on level terms based on tariffs and without any guaranteed returns.

Privatisation in Distribution

10.33 Distribution reform and reduction of distribution losses is critical for achieving to sustainability of the sector. Privatising distribution is a potential answer to tackling this issue. However, the experience so far in Orissa and Delhi suggests that privatisation is not a guaranteed solution. In Orissa, AT&C losses remain over 45 per cent. In Delhi, loss levels remain at an unsustainable level of 40 per cent plus even though the contracted loss reduction has been achieved. The privatisation programme in Delhi has been able to tolerate such huge losses because the state government has agreed to a subsidy to cover the gap generated by the current tariff. However, the costs of following this approach are enormous. Applying the Delhi model to the whole country would require an estimated Rs.1,00,000 crore of viability gap funding over three to five years. Alternatives such as last mile privatisation involving metering, meter reading, billing and collection must be pursued to improve the viability of the sector and help generate investible surpluses for upgrading the distribution network.

Village and Household Electrification

10.34 The current scheme of village and household electrification that provides for 40 per cent capital subsidy has not been successful. The National Common Minimum Programme (NCMP) has proposed that all households be electrified in five years. To achieve this objective, the Ministry of Power has proposed a revised village and households electrification scheme based on a 90 per cent capital subsidy. A sustainable revenue model is essential for the success of even the 90 per cent Capital Subsidy Scheme. The Ministry of Power is committed to disbursement under the 90 per cent subsidy scheme only if revenue sustainability is assured.

Nuclear Power Issues

Reducing Construction Periods and Lowering Costs

10.35 The Nuclear Power Corporation Limited (NPCIL) made major strides in cutting costs and construction periods for nuclear power projects in the Tenth Plan. Construction periods have already been brought down to less than five years from seven years in the past. The lower construction period and improved contracting and contract management has resulted in reduction in capital cost per MW.

Choice of Technology for Capacity Expansion

10.36 The Kudankulam project (2x1000 MWe) is being set up based on light water reactor (LWR) technology and NPCIL has initiated pre-project activities for its expansion with another two units of 1000 MWe. Further, the design of 700 MWe indigenous pressurised heavy water reactors (PHWRs) has been undertaken by NPCIL to enhance the pace of first stage capacity addition programme. Pre-project activities of four such units have been initiated. Site selection of these new plants is likely to be finalised shortly.

Promoting Fast Breeder Reactor Technology

10.37 Having successfully completed the research and development phase of the fast breeder reactor (FBR) technology, the Department of Atomic Energy (DAE) has engaged the Indira Gandhi Centre for Atomic Research (IGCAR) for the design, development, construction and operation of the country's first 500 MWe liquid sodium cooled fast breeder reactor. The Government set up a new company, Bharatiya Nabhikiya Vidyut Nigam Ltd. (BHAVINI) in September 2003 to implement the first project based on FBR technology. The first 500 MWe prototype fast breeder reactor is likely to be commissioned in the Eleventh Plan. The

FBR technology is critical to developing stage two of India's nuclear power programmes. Without developing the wide-scale use of FBR technology, India would find it difficult to go beyond 10,000 MWe nuclear capacity based on known indigenous uranium resources. Use of FBR technology would enable indigenous uranium resources to support a 20,000 MWe nuclear power programme that is critical to developing the thorium-based third stage of India's nuclear power programme. The Bhabha Atomic Research Centre (BARC) is also engaged in R&D activities to develop Advanced Heavy Water Reactors of 300 MWe capacity that provide an alternative route to the thorium-based Stage Three of India's nuclear power programme.

10.38 Nuclear energy remains an important tool for de-carbonising the Indian energy sector. Given limited indigenous uranium resources, India must seek at least 20,000 MWe of additional nuclear power capacity on a turnkey basis, based on a competitive power tariff, to be built over the next 10-12 years. Alternatively, India must seek nuclear fuel on competitive terms for a similar level of capacity to be built by NPCIL in the next 12-15 years

COAL & LIGNITE

10.39 Coal is the mainstay of India's energy sector. About 50 per cent of primary commercial energy supply and 70 per cent of the power generated is coal based. Coal reserves are also expected to last for over 50 years at the present levels of production, suggesting that coal will continue to remain the principal source of commercial energy in the country for the foreseeable future. The Tenth Plan envisaged a substantial expansion in domestic coal production to support the power sector expansion programme, needed to achieve the 8 per cent targeted GDP growth with emphasis on liberalisation to make the sector competitive.

10.40 The thrust areas for the development of the coal sector identified in the Tenth Plan are:

- Permitting private participation in non-captive mining through suitable legislative amendments.
- Revival of loss making coal companies and restructuring of the coal sector by providing autonomy to individual coal producing companies to encourage competition.
- Setting up of a regulatory authority for ensuring fair competition in the sector.
- De-blocking of coal blocks held by Coal India Ltd. (CIL) to offer the same on bidding basis both for public and private entrepreneurs.
- Permitting outsourcing of certain mining operations through appropriate legislative amendments for improving the economics of operations.
- Permitting free trade of coal.
- Intensification of exploration and up gradation of coal reserves.
- Rapid development of lignite resources.

Physical Performance

10.41 The overview of physical performance of coal sector in the first two years of the Tenth Plan 2002-03 and 2003-04 and anticipated achievement in 2004-05 is given in Tables 10.12 and 10.13.

Coal Demand

10.42 Against an estimated annual growth in consumption/offtake of coal of 5.74 per cent projected in the Tenth Plan, the actual growth is expected to be 6.11 per cent. This is largely the result of upward revisions in the production targets of steel (hot metal) and cement over the initially projected levels. Some marginal increase in the demand for the non core sector, such as bricks, from levels forecasted earlier is also expected. In the case of the power sector (utilities) there is a shortfall in coal based generation capacity by about 12 per cent as per the revised plans but the revised coal based generation programme of 446 billon units (BU) for 2006-07 is only marginally below the targeted generation of 452 BU. Thus the power sector demand is estimated to remain at levels forecasted earlier. However, upon the insistence of the Ministry of Power, a 5 million tonne provision has been added to the requirement in 2006-07 for shortfalls in stock levels, if any.

Table 10.12
Physical performance for coal and lignite

Sl. No.	Parameter	Ninth Plan actual achievement in the terminal year (2001-02)	Tenth Plan terminal year target (2006-07)	2002-03 Actual	2003-04 Actual	2004-05 Anticip.	MTA Revised target for the Tenth Plan terminal year (2006-07)	X Plan % CAGR	
								Original #	MTA Revised
0	1	2	3	4	5	6	7	8	9
1	Coal demand/ offtake (mt)	351.71 (3.60)	460.50 (5.24)	365.98 (3.25)	380.91 (3.16)	414.82 (3.20)	473.18	5.74	6.11
2	Coal production (mt)	327.80	405.00	341.23	361.06	386.95	431.50	4.46	5.65
3	Coal imports (Total)	20.55	20.48	20.02	21.68	26.79	30.69		
	Coking Coal	11.11	17.18	12.52	12.95	16.05	24.19		
	Thermal coal	9.44	3.30	9.50	8.69	10.74	6.50		
4.	Net gap in demand-Supply	-	35.02	-	-	-	10.99		
5	NLC* Lignite Production (mt)	18.36	27.00	18.62	20.56	21.00	21.50	9.06	4.20
	Gross Power Gen. (MU)	14451	15213	14970	16389	15286	16359	3.06	4.60

Note :- (i) Figures in brackets indicate washery middlings and are not included in the totals.
(ii) * NLC's plan includes lignite production and power generation.
(iii) # Original growth projections of the Tenth Plan were based on RE figures of 2001-02 and are slightly higher than the growth figures if compared with the actual figures of 2001-02 indicated in column 2.

Table 10.13
Performance of Central sector schemes

Sl. No.	Parameter	Ninth Plan Actual Achievement	Tenth Plan Target	2002-03 Actual	2003-04 Actual	2004-05 Anticipated	MTA Revised Target
0	1	2	3	4	5	6	7
1	Promotional Exploration (Drilling in m)	665213	600000	117300	131531	129350	687931
2	Detailed Drilling in Non-CIL Blocks (m)	233600	212800	31540	101378	48350	283000
3	Voluntary Retirement Schemes (no. of persons)	34675	15500	6173	3810	4360	15500

10.43 As a result of all this, coal demand in the terminal year of the Tenth Plan (2006-07) has been revised from 460.50 mt (excluding 5.24 mt of washery middlings) to 473.18 mt. However, it is important to note that the likely demand-supply gap envisaged at the time of formulating the Tenth Plan has actually narrowed from 35.02 mt to 10.99 mt because of increased output by CIL and a higher level of imports. The details of sectoral coal demand are given in Annexure-10.1.

Coal Production

10.44 The public sector coal companies have risen to the challenge of meeting the rising demand by exceeding the planned 4.46 per cent annual growth in coal production during the Tenth Plan. Production is expected to grow at 5.65 per cent per annum during the Plan Period. This is a considerable improvement over the 2.5 per cent growth achieved in the Ninth Plan. This has been achieved despite the fact that production from new mines that was expected to add 83 mt to the production by the terminal year of the Tenth Plan is now likely to yield only 61 mt of additional production. This achievement is the result of increasing production from existing mines and accelerating production build up in mines under development. New mines are taking longer to fructify due to delays in obtaining environmental and forest clearances, land acquisition, rehabilitation, etc. Measures adopted to successfully enhance production during the Tenth Plan are not long-term solutions and unless CIL brings new mines to production in a timely fashion, the demand-supply gap can be expected to rise in the Eleventh Plan. Production in the terminal year of the Tenth Plan (2006-07) is now expected to reach 431.50 mt (CIL 373 mt; Singareni Collieries Company Ltd. (SCCL) 37.50 mt; Others 21 mt), which is 6.5 per cent more than the original target of 405 mt (CIL 350 mt; SCCL 36.13 mt; Others 18.87 mt). However, there is a need to further augment domestic production through private participation in non-captive mining in order to meet rising coal demand. The company-wise details of coal production are given in Annexure-10.2.

10.45 Production from Tata Steel/Indian Iron and Steel Co (IISCO) / Damodar Valley Corporation (DVC) and others (including captive blocks) projected at 18.87 mt originally is now expected to reach 21 mt in 2006-07. Captive blocks continue to have difficulties in delivering targeted outputs due to delays in land acquisition and environmental clearances.

10.46 The availability of washed coking coal from CIL (mainly from Bharat Coking Coal Ltd or BCCL) sources has stagnated at around 4.5 mt. New mines and modernising existing washeries is critical for the operations of BCCL if this level of output has to be raised. In order to comply with the coal quality stipulations of the Ministry of Environment & Forests, the capacity of thermal coal washeries in the country needs to be increased to about 90 mt from a level of about 30 mt.

Coal Imports

10.47 Against an overall coal import of 20.55 mt (11.11 mt of coking coal and 9.44 mt of thermal coal) in the terminal year of the Ninth Plan (2001-02), the imports in the terminal year of the Tenth Plan (2006-07) were estimated at 20.48 mt (17.18 mt of coking coal & 3.30 mt of thermal coal). It is now estimated that coal imports in 2006-07 will be 30.69 mt (24.19 mt of coking coal and 6.5 mt of thermal coal). These imports will account for 6.5 per cent of the estimated demand in the terminal year of the Tenth Plan against 5.8 per cent in the terminal year of the Ninth Plan. However, since the import requirements in the terminal year of Tenth Plan presume that the revised higher production targets will be met, it would be prudent for the core sectors to plan for higher levels of imports compared to estimates for coal imports. This would avoid loss of production in the core coal consuming sector and is in line with the advice of the Ministry of Coal.

Irrationality of Coal Pricing

10.48 CIF prices of imported thermal coal ranged between US$ 35-40 per tonne in recent history inclusive of a freight element of US$ 7-10 per tonne. In the last three years, imported

thermal coal price has reached US$ 85-90 per tonne inclusive of a freight element of US$ 25-30 per tonne. Imported coal currently translates to US$ 13.71-14.52 per million kilo calories on a CIF basis and typically has ash below 10 per cent and sulphur above 2 per cent.

10.49 In comparison, the poor quality Indian coal from CIL with ash in excess of 40 per cent and sulphur of around 1 per cent costs US$ 3.76 per million kilo calories at the mine mouth. However, this translates into a delivered cost that is two to three times higher i.e. US$ 8.09-11.56 per million kilo calories at distance ranging from 1000 km. to 2000 km. from the mine mouth. This is the result of rail freight for coal that is higher than economically justified. The Indian Railways uses its freight revenues from coal to cross subsidise passenger traffic. Even the mine mouth price of coal is based on a cost plus formulation and could come under competitive pressure if private mining takes root, linkages are abolished and trading of coal is made easier.

Lignite Production & Gross Power Generation-Neyveli Lignite Corporation Ltd.

10.50 Lignite production was projected to grow by 9 per cent per annum in the Tenth Plan to reach 27 mt in 2006-07, the terminal year of the Tenth Plan. However, actual growth is now expected to be only 4.2 per cent per annum and lignite production in 2006-07 will only reach 21.5 mt. The total electricity production by the Neyveli Lignite Corporation (NLC) was projected as 15.2 BU in 2006-07 and is now likely to be higher by 7.8 per cent at 16.4 BU. Despite the lower lignite production and higher electricity generation, NLC is not facing any fuel shortages. This clearly shows that the original Tenth Plan targets for lignite production were over estimated in comparison to the actual requirement.

Infrastructure Development

10.51 For facilitating smooth movement of coal, certain critical rail links in potential coalfields were proposed in the Tenth Plan. These rail links are Talcher to Paradeep (Mahanadi Coalfields Ltd or MCL), a new rail link between Korba and Pendra Road (South Eastern Coalfields Ltd or SECL), link between Belpahar- Sardega and Talcher-Bimlagarh (MCL) and development of Tori-Shivpuri link in North Karanpura Coalfields (Central Coalfields Ltd. or CCL). Work has been initiated in most of these cases. Also, port capacity for handling coal is being strengthened to permit higher imports and coastal movement of domestic coal. Port handling capacity for coal shall rise from 47 mt in the beginning of the Tenth Plan to 67 mt by 2006-07.

Promotional Exploration

10.52 This scheme is aimed at supplementing GSI's efforts for regional exploration of coal and lignite. During the Tenth Plan, a drilling target of 6 lakh metres had been set comprising of 3.3 lakh metres for coal covering 43 blocks and 2.7 lakh metres for lignite covering 13 blocks. This was expected to raise coal reserves by 6.68 billion tonnes in the indicated and inferred categories. Against this, the anticipated achievement in the first three years is 3,78,181 m or 63 per cent of the Tenth Plan drilling target. It is proposed to enhance the drilling target by 87,931 m thus requiring 3,09,750 m of drilling in the next two years of the Tenth Plan. The revised drilling target for the Tenth Plan would be 6,87,931 m. However, while drilling targets are being exceeded, performance of other components of the programme such as preparation of Geological Reports (GRs), developing coal and lignite resource information, conducting coal bed methane studies, etc. is below expectations. Despite the higher drilling target, no additional outlay is foreseen for promotional exploration because of savings in certain components of the programme.

Detailed Drilling in Non-CIL Blocks

10.53 The blocks outside the purview of CIL have been proposed to be explored in detail for reducing the time lag between offering the blocks to potential entrepreneurs and start of mining operations. Out of 2,12,800 metres of drilling target set under this programme to cover 19 blocks, the likely achievement in the

first three years is 1,81,268 metres or 85 per cent of the Tenth Plan target. Due to the inclusion of 15 new blocks, the drilling programme has been revised upwards from 2,12,800 metres to 2,83,000 metres. This implies completion of 1,01,732 m of balance drilling in the next two years of the Tenth Plan. In view of additional blocks being taken up and the need for enhanced drilling, the original outlay has been revised upwards and the details are given in Annexure-10.3.

Science and Technology

10.54 Despite the thrust laid on science and technology (S&T) programmes in coal, the progress has not been satisfactory both in taking up new projects or utilising the outlays provided to various ongoing projects. Some of the high value S&T projects like pilot project for washing low volatile medium coking coals, demonstration project for coal bed methane exploration and production (taken up with the assistance of United Nations Development Programme/ Global Environment Facility or UNDP/GEF) have not been progressing satisfactorily. Due to slow progress in implementation of various schemes, the original outlay has been revised downwards and the details are given in Annexure-10.3.

Environmental Measures and Subsidence Control

10.55 A number of schemes for subsidence control, restoration/reclamation and rehabilitation of mined out areas and for dealing with fires in the Jharia and Raniganj coalfields have been taken up under this head. Such schemes are designed to mitigate the damages caused by unscientific mining carried out before nationalisation. However, the progress has not been satisfactory due to constraints of land acquisition, agitation/frequent interruption by local people, non-availability of a site for rehabilitation and certain technical problems. Cooperation of the local administration is important for the successful implementation of the scheme. In the absence of sufficient progress in the implementation of various projects under the head of EMSC, the original outlay has been revised downwards and the details are given in Annexure-10.3.

Voluntary Retirement Scheme

10.56 The Voluntary Retirement Scheme (VRS) is aimed at rationalising manpower in loss making coal companies, namely, Eastern Coalfields Ltd. (ECL), BCCL and CCL. The target was to reduce staff strength by 15,500 persons through VRS funded by domestic budgetary support in the Tenth Plan. About 92 per cent of the targeted reduction in manpower is likely to be achieved in the first three years of the Tenth Plan. The original outlay for this scheme has been retained. Details are given in Annexure-10.3.

Financial Performance

10.57 The overview of the financial performance of the coal sector is given in Table-10.14.

10.58 The anticipated cumulative capital expenditure in the first three years of the Plan is only 18.12 per cent of the target. The main reasons for shortfall in plan expenditure are:

- Delay in taking up of new projects

Table 10.14
Financial performance of coal sector

(Rs. crore, constant prices at 2001-02)

Sl. No.	Sector	Ninth Plan expenditure	Tenth Plan approved outlay	2002-03 actual	2003-04 actual	2004-05 anticipated	Cumulative expenditure (2002-05)	2002-07 MTA Revised
1	Coal and Lignite	13699.95	23583.36	1685.84	1479.80	2239.29	5404.93	13379.91
2	NLC (Power)	1105.43	8007.64	169.43	72.20	79.37	321.00	2455.24
	Total MOC	**14805.38**	**31591.00**	**1855.27**	**1552.00**	**2318.65**	**5725.93**	**15835.15**

- Delay in procurement of heavy earth moving machinery
- Outsourcing of mining operations by some coal companies
- Slow progress in implementation of other central sector schemes.

10.59 Despite a lowering of the Tenth Plan outlay to 50 per cent of the original outlay, coal production is expected to exceed the original target by over 6 per cent. This is largely the result of outsourcing and improving production from existing mines. The revised outlay is to be financed through internal and extra Budgetary resources (IEBR) of Rs.14974.71 crore and a gross budgetary support (GBS) of Rs.860.44 crore (domestic budgetary support or DBS Rs.848.27 crore and Externally Aided Projects or EAP Rs.12.17 crore) in 2001-02 prices. The company-wise/scheme-wise outlays are given in Annexure-10.3.

Royalty on Coal and Lignite

10.60 The royalty rates on coal were last revised on 16 August 2002 (after eight years) and set at between Rs.65 per tonne and Rs.250 per tonne depending on the grade of coal. These are specific rates and a number of coal producing states have been requesting that coal royalty rates be changed to an advalorem basis. The Planning Commission also supported this view. The royalty rate on lignite was last revised in March 2001 to Rs.50 per tonne from the earlier level of Rs.2.50 per tonne.

PETROLEUM AND NATURAL GAS SECTOR

10.61 The current indigenous production of crude oil is about 33 mt whereas the requirement is about 120 mt. Import dependence is therefore very large and is expected to increase over time. India's current balance recoverable reserves of crude oil may last for about 22 years at the current rate of production unless reserve accretion exceeds current rates of production.

10.62 The following thrust areas were identified for the Tenth plan:

- Reforms in the sector through:
  - Market determined pricing mechanism for crude oil and petroleum products.
  - Rationalisation of taxes and duties
  - Restructuring of the sector
  - Establishing an independent regulatory regime

Table-10.15
Overview of physical performance of petroleum and natural gas sector

Parameters	Tenth Plan target	2002-03 Actual	2003-04 Actual	2004-05 Likely	2005-06 Projected	2006-07 Projected	Tenth Plan anticipated	% of Tenth Plan target
Consumption of petroleum products (mt)	120.40#	104.12	107.76	111.99	116.14	120.40	120.40	100.00
Crude oil production (mt)	169.38	33.04	33.37	33.75	34.48	33.97	168.01	99.19
Natural Gas production (BCM)	177.48	31.39	31.95	30.88	37.23	37.63	169.13	95.30
Accretion to reserves (mt)	785.00-914.00	329.57	348.32	-	-	-	>785.00-914.00	>100.00
Refining capacity (mtpa)	138.00-155.00	116.97	127.37	132.47	140.87	141.70	141.70	102.70-91.20

Targets for the terminal year of the Tenth Plan; mt – Million tonne
BCM- Billion cubic metres; mtpa- Million tonne per annum

- Oil security through:
  - Aggressive exploration for oil and gas in the Indian sedimentary basins
  - Acquisition of equity oil and gas abroad
- Development of marketing and distribution network to meet the growing demand
- Environmental management through:
  - Adoption of vehicular emission norms equivalent to Bharat stage II and III
  - Improvement of fuel quality.

Physical Performance

10.63 An overview of the physical performance of petroleum and natural gas sector is given in Table10.15. A more detailed account is given in Annexure 10.4.

Consumption of Petroleum Products

10.64 The consumption of petroleum products was estimated to reach 120.4 mt by the terminal year of the Tenth Plan against the consumption of 100.4 mt in 2001-02. Based on the trend in consumption of petroleum products during the first three years (Table 10.15), the projected consumption of 120.4 mt in the year 2006-07 is likely to be realised.

Exploration for Oil and Gas

10.65 There has been a sharp rise in exploration activity after the initiation of the New Exploration Licensing Policy (NELP) in 1997-98. Out of the total area of 3.14 million sq. km. in 26 sedimentary basins including deep water, an area of 1.0 million sq. km. is currently under petroleum exploration licenses. This includes an area of 0.24 million sq. km that had been under exploration in the pre-NELP period. About 35 per cent of Indian sedimentary basins were targeted to be appraised under the exploration programme for the Tenth Plan. The area under exploration coverage is currently 31.8 per cent of the Indian sedimentary basins. With the award of further NELP blocks in the remaining period of the Tenth Plan, the target of 35.0 per cent coverage is likely to be exceeded.

Reserve Accretion

10.66 The Tenth Plan target for accretion to in-place domestic hydrocarbon reserves during the Plan period was 785-914 mt. The accretion during the first two years of the Plan was 677.89 mt, which is 86.4-74.2 per cent of the Tenth Plan target. This is mainly on account of large finds of reserves of 404.6 mt (primarily in the Krishna-Godavari basin) by private/ joint venture companies. The reserve accretion target for the Tenth Plan is likely to be achieved.

Crude Oil and Natural Gas Production

10.67 The Tenth Plan target for domestic crude oil production by the Oil and Natural Gas Corporation (ONGC), Oil India Ltd. (OIL) and joint venture companies was fixed at 169.38 mt over five years. The cumulative crude oil production during the first three years of the Tenth Plan is estimated to be 99.56 mt including 87.39 mt of production (88.1 per cent) by the public sector companies and 12.17 mt of production (11.9 per cent) by private/joint venture companies. The production for 2005-06 and 2006-07 has been projected at 34.48 mt and 33.97 mt respectively. Based on current assessment, the likely achievement of crude oil production in the Tenth Plan will be 168.01 mt (99.2 per cent of the Tenth Plan Target) including 146.99 mt (87.5 per cent) by public sector companies and 21.02 mt (12.5 per cent) by private/joint venture companies.

10.68 The Tenth Plan target for domestic production of natural gas was fixed at 177.48 BCM over five years. The cumulative production of natural gas during the first three years is expected to be 94.27 BCM including 75.63 BCM (80.2 per cent) by public sector companies and 18.64 BCM (19.8 per cent) by private/joint venture Companies. The production for the remaining two years of the Tenth Plan is projected to be 37.23 BCM and 37.63 BCM respectively. The projected production of gas in the Tenth Plan is estimated at 169.13 BCM including 123.58 BCM (73.1 per cent) by public sector and 45.55 BCM (26.9 per cent) by private/joint venture companies.

This level of output will be 95.3 per cent of the Tenth Plan target. The production will be below target because of lower anticipated production by OIL (89.93 per cent of target) and private/joint venture companies (86.32 per cent of target). Natural gas production shortfall of 4.7 per cent from the target production may seem small. However, as compared to the projected addition of 36.56 BCM in production during the Tenth Plan, the shortfall of 8.35 BCM is substantial (22.8 per cent). This will have significant impact on generation from new gas based power plants constructed over the 10th Plan period.

Acquisition of Equity Oil and Gas Abroad

10.69 The Tenth Plan targets for ONGC Videsh Ltd. (OVL) share in production of equity oil and natural gas overseas were set at 5.2 mt and 4.94 BCM respectively, mainly from Sakhalin-1 and Vietnam. OVL's equity oil and gas share in the first three years of the Tenth Plan is estimated to be 7.34 mt of oil and 1.72 BCM of natural gas. The increase in share of oil is mainly on account of the Nile Ganga project in Sudan, which was not envisaged at the time of formulation of the Tenth Plan. Current indications are that OVL might succeed in raising its equity oil and gas shares to 15 mt and 4.41 BCM respectively by the end of Tenth Plan. This assessment factors in the delay in Sakhalin-I development.

Refining Capacity Build up

10.70 The total refining capacity in the country at the end of the Tenth Plan was projected to be in the range of 138-155 MMT. The actual refining capacity as on 1 April 2004 was 127.37 MMT. The total refining capacity by the end of the Tenth Plan will reach 141.70 MMTPA, which will be more than the capacity required to meet the consumption in the country. The refinery-wise capacity build-up is given in Annexure-10.5.

Table- 10.16
Tenth Plan outlays and expenditure

(Rs. Crore at 2001-02 prices)

Sl. No.	Year	Exploration & production	Refining & marketing	Total at constant 2001-02 prices
1.	**Ninth Plan Approved (1997-2002)**	**35621.37**	**59893.12**	**95514.49**
2.	**Ninth Plan Realisation (1997-2002)**	**28472.99 (79.93%)**	**25514.90 (42.60%)**	**53987.89 (56.52%)**
3.	**Tenth Plan approved**	**59468.95**	**36572.24**	**96041.19**
4.	2002-03 (Actual)	11715.89	3525.84	15241.73
5.	2003-04 (Actual)	11416.46	4124.75	15541.21
6.	2004-05 (RE)	15989.87	4291.63	20281.50
7.	2005-06 (B.E)	17726.09	5176.14	22902.23
8.	**Likely achievement in first four years**	**56848.31**	**17118.36**	**73966.67**
9.	% Utilisation in first four years	95.59	46.80	77.01
10.	2006-07 (likely)	17597.18	5199.17	22796.35
11.	**Likely expenditure during Tenth Plan**	**74445.49**	**22317.53**	**96763.02**
12.	**(%) Utilisation**	**125.18**	**61.02**	**100.75**

Financial Performance

10.71 The approved Tenth Plan outlay and actual expenditure during the first two years and likely expenditure for 2004-05 and the remaining years of the Tenth Pan are given in Table 10.16.

10.72 The Tenth Plan approved outlay was fixed at Rs.96,041.19 crore at constant 2001-02 prices. The likely expenditure for the first four years of the Tenth Plan is Rs.73966.67 crore at constant prices of 2001-02. Based on the trend of expenditure during first four years, the likely expenditure for 2006-07 is assessed at Rs.22796.35 crore. Thus, the likely expenditure for the Tenth Plan is assessed at Rs.96763.02 crore at constant 2001-02 prices, which will be 100.75 per cent of the Tenth Plan approved outlay. However, it may be seen from Table 10.16 that expenditure on exploration and production activities will be higher and that of the refining and marketing activities will be lower than the approved outlays.

Progress in Tenth Plan

Pricing of Petroleum Products

10.73 The Administered Price Mechanism (APM) for petroleum products was formally dismantled with effect from 1 April 2002, after which the pricing of crude oil and petroleum products except for kerosene and domestic LPG sold through the public distribution system (PDS) was to be market determined. However, the factual position is that the public sector oil companies are collectively fixing prices of crude oil and petroleum products based on so called import parity pricing. However, all price changes are approved by the Government of India prior to implementation. Thus, the sector is devoid of any real competition among the public sector oil companies. The entry of private oil companies such as Reliance Industries, Essar Oil and Shell in the marketing of petroleum products in a small way has not changed this ground reality since the bulk of output from private refineries is still marketed by the oil sector CPSUs. However, the stated policy is to encourage competition in the marketing of petroleum products. Currently, competition exists in certain products such as lubricating oils that account for about 1.2 per cent of the total petroleum products.

10.74 The current pricing policy based on import parity is not transparent and includes several elements in the price build up that are debatable. In any event, recent history shows that increase in product prices are not always in tandem with increase in crude oil prices. Further, the current pricing mechanism uses import parity pricing even for products, in which India is the net exporter. This provides higher margins to the refiners. Economic rationality suggests that trade parity should be the norm for pricing instead of import parity. Moreover, custom duty on crude oil is 5 per cent while average duty on petroleum products is 10 per cent. This further increases the refinery margins. The normative transportation and storage costs charged to the products instead of the actual costs also increase the margins of refining and marketing companies. Private sector refineries are following the same methodology for building up prices for their products. Bulk of the output from private refiners is being marketed by the oil sector CPSUs. The current-pricing methodology results in large profits and cash surpluses for the oil and gas sector CPSUs and even larger benefits for the more efficient private refineries.

Rationalisation of Taxes And Duties

10.75 Rationalisation of the tax structure in the petroleum sector has been under consideration for some years. Currently, the tax and duty structure is characterised by: a differential custom duty on import of crude oil and petroleum products; differential excise duties and cess on various petroleum products; differential royalty regimes; and differential sales taxes and state levies. The current tax and duty structure leads to hidden subsides to the refining and marketing companies; irrational fuel choices; opportunities for adulteration and diversion of products from intended uses; and practices such as invoicing sales in states with low taxes. Reduction in custom duties on crude and petroleum products in the 2005-06 budget is expected to reduce the protection that the refining and marketing companies currently

enjoy as a result of the prevailing import parity pricing mechanism.

Investment Programmes of Oil Sector CPSUs and The Emerging Structure

10.76 The investment pattern of CPSUs (ONGC, Indian Oil Corporation, Hindustan Petroleum Corporation Limited, Bharat Petroleum Corporation Limited, GAIL and OIL) indicates that instead of building upon core competencies, they are all aiming to vertically integrate operations from upstream exploration and production to downstream retail activities. The proposed approach offers no strategic advantage either for the sector or to the consumer as it leads to sub optimal investments. Six government owned national oil majors that individually compare poorly in size with global integrated oil majors, are competing with one another to become integrated oil companies on the strength of public funds at their disposal. There are no parallels of such an approach worldwide. The investment patterns are clearly sub-optimal and are making the sector increasingly uncompetitive. There is a need to review the investment programme of each oil PSU and take an integrated view of the sector as a whole to optimally invest public funds. The oil sector companies need to be re-structured to attain sectoral objectives more efficiently. Alternatively, the Government of India, in its capacity as the owner, may wish to mop up surpluses generated by the oil companies to limit sub-optimal investment patterns.

Restructuring of Oil and Gas Sector

10.77 In order to improve the intrinsic competitiveness of the sector, there is need to restructure the oil CPSUs. Potential options that may be considered are:

i. Create two fully integrated public sector national oil companies that compete with each other and private companies. These two national oil companies would engage in exploration and production activities in the field of oil and gas and have downstream refining and marketing operations. These integrated national oil companies would (directly or through majority owned subsidiary companies) also invest in equity oil and gas overseas.

ii. Develop transportation, storage, port handling, fueling at airports etc. as common services offered on regulated open access principles. This may involve stripping existing non-captive assets of CPSUs falling in these categories and placing them in a separate company promoted by the oil and gas industry with private participation.

iii. Encourage competing private companies with concentration in any one segment of the industry (exploration and production, refining, marketing) or integrated operations covering the entire or any part of the oil and gas sectors.

Need for Upstream and Downstream Regulation

10.78 The APM was dismantled to generate competition. However, not much has changed as the Ministry of Petroleum and Natural Gas continues to effectively control prices as well as the investment decisions of all oil and gas CPSUs. There is a need for independent regulation in both the upstream and downstream segments of the oil and gas sector till such time that competitive markets come into place. The draft "Petroleum and Natural Gas Regulatory Bill 2004", as currently drafted covers only the downstream oil and natural gas activities with no upstream regulation.

New Exploration Licensing Policy

10.79 Out of a total of 90 blocks awarded under NELP in four rounds of bidding, 26 (29.0 per cent) have gone to CPSUs, 13 (14.4 per cent) to private companies (mainly Reliance Industries Limited), 31 (34.4 per cent) to joint ventures with CPSUs and 20 (22.2 per cent) to joint ventures with private companies. Although the response to NELP bidding from the private sector is quite encouraging, the response from foreign companies has been poor. Further, there is

Box 10.3
Petroleum and Natural Gas Regulatory Bill 2004

The Bill envisages:

- Regulation of downstream activities, excluding production of crude oil and natural gas
- Adequate supply of petroleum products and natural gas in all parts of the country
- Promotion of competitive downstream markets
- Resolution of disputes through the mechanism of the Petroleum and Natural Gas Appellate Tribunal
- Establishment of a Petroleum and Natural Gas Regulatory Board

The Bill covers the downstream oil and natural gas sector only. There is a need for establishing a regulatory mechanism for the upstream sector also.

no response from major international oil companies. This lack of interest may reflect their negative assessment of the potential of the Indian sedimentary basins. The need of the day is to attract companies with experience in deep sea basins so as to be able to maximally exploit commercially viable potential of the Indian Sedimentary Basins. This must be achieved expeditiously to address concerns relating to energy availability to fuel India's growth. If attracting such technology requires changes in NELP or the regulatory environment then MOP&NG should seek such changes. The Ministry of Petroleum and Natural Gas need to formulate a strategy to attract foreign oil companies and oil majors so as to ensure that the exploration and production objectives are not only met competitively but also attract the best technologies available in the world. This will become critical as India seeks to explore its deep-sea potential.

Acquisition of Equity Oil and Gas Abroad

10.80 The bulk of OVL's acquisitions so far have been in non-investment grade countries. Further, OVL has limited control over the actual cost of developing the reserves because it, typically, buys minority stakes and is not the operator. OVL must ensure that equity oil is being acquired in a cost effective manner while recognising political risks to investments in host countries. Acquiring equity oil/gas is a sophisticated business and there is need to develop strong commercial and technical skills within OVL to ensure that its investments are optimal and well managed. It is pointed out that economic considerations relating to crude mix requirement of Indian refineries and transport costs may require that OVL sell the equity oil/gas instead of bringing it to India. This requires skills in international trading of oil and gas.

Import of Gas Through Transnational Gas-pipeline

10.81 The import of natural gas through transnational gas-pipelines has been under consideration for over a decade. Such imports are desirable for ensuring competitive supplies and diversifying supply sources to serve the ultimate objective of meeting India's energy security needs. Continuing efforts through negotiations at both bilateral and multilateral levels have recently resulted in a Memorandum of Understanding (MOU) between India, Bangladesh and Myanmar for a gas pipeline from Myanmar to India via Bangladesh. Iran has also agreed to supply gas through the Iran-Pakistan-India pipeline at the Indian border.

Recovery from Abandoned and Marginal Untapped Fields

10.82 Technological innovations make it possible to extract significant quantities of oil and gas from abandoned and marginal fields not considered economical based on extraction

technologies deployed by the ONGC. These abandoned/marginal fields could be made productive by allowing foreign operators to bring technology and investment to exploit their potential. Output, if any, may be shared with the investor with a right to procure the investor's share at prevailing international prices. Currently, sufficient attention is not being paid to attracting foreign technology for this purpose.

Extending Common Carrier Principle to Develop Marketing and Distribution Assets

10.83 The Petroleum Regulatory Bill 2004 has included pipelines under the common carrier principle. However, it is not possible to differentiate between a pipeline and import terminal that feeds it or a product pipeline and the interim storage that is associated with it. It is recommended that the existing common facilities of the oil and gas companies that are not 100 per cent dedicated may be hived off into a new/existing service company that has no upstream or downstream interests. Such a company could provide services on common carrier principles, under regulated tariffs, to the refining and marketing companies. This will be in the best interest of developing a competitive market.

Developing Natural Gas/LNG Markets

10.84 The overall LNG/natural gas scenario and strategy for development of a competitive gas/LNG market remains unclear due to the existing distortions like different prices for natural gas both by source and region. Further, LNG instead of competing with local gas or with India's energy basket that it replaces is being procured/priced in a manner that is raising pressure to increase local natural gas prices. Such an approach works because of a supply constrained gas market. There is a need to evolve a system of pricing and allocation of all components of natural gas/LNG till an efficient natural gas/LNG market develops. These components feeding the petrochemical industries are not being priced at market prices even when there is no official policy to continue doing so.

Policy for the Development of Gas Pipeline Network

10.85 The draft policy for the development of Gas Pipeline Network (National Gas Grid) envisages regulation of gas transmission pipelines only. Gas distribution assets, comprising of low-pressure pipelines feeding local distribution network, are also natural monopolies. Such assets should be made available to competing suppliers of gas on open access basis. In order to be able to do this, separation of carriage from content is essential. Low-pressure pipelines and local distribution network will also need to be regulated as natural monopolies.

Private Participation in Distribution and Retail Business

10.86 The distribution and retailing of petroleum products and natural gas is also dominated by CPSUs. This was expected to change with the privatisation of BPCL and HPCL. Given the shift of policy in this regard, alternatives that make it easy to bring private sector efficiencies to the distribution and retail segments of the sector need to be explored. One possibility could be to lower the Rs.2,000 crore investment barrier for the right to market transportation fuels. However, given the absence of common carrier features in the distribution and marketing assets and the inability of new operators to poach existing franchisees, progress is slow as new entrants have to create new assets.

Role of Petronet India Limited

10.87 Petronet India Limited (PIL) was set up for laying product pipelines under the common carrier principle. In reality, however, product pipelines are being laid by incumbent players through separate companies that have participation by PIL. Such pipelines are essentially driven by the interests of the incumbent player promoting the investment. Thus, the very objective of setting up of PIL for laying pipelines on common carrier principle is being defeated. This anomaly needs to be rectified by enforcing a policy that requires all non-dedicated infrastructure such as pipelines/ tankages etc. to be built on common carrier

principles. Competition in pipelines is essential since currently pipelines are being justified largely on the back of an inefficient railway sector that cross subsidises passenger traffic with freight traffic. All non-dedicated product pipelines and associated tankages should be operated on common carrier principles.

Viability of Retail Outlets

10.88 All the marketing companies are making pre-emptive investments by setting up a number of retail outlets. The viability of these outlets needs to be examined. A sub-optimal pattern appears to be emerging with each company planning to set up a retail network that primarily absorbs its own output. This phenomena will be addressed once real competition emerges in marketing of petroleum products.

National Auto Fuel Policy

10.89 The government announced a comprehensive National Auto Fuel Policy for the country on 3rd October 2003. The policy broadly addresses the issue of environmental management through: adoption of vehicular emission norms equivalent to Bharat Stage-II and Bharat Stage-III; supply of auto fuels that enable achievement of vehicle emission norms with available commercial technologies; and a road map for meeting vehicular emission norms covering new and in-use vehicles.

10.90 CPSUs have undertaken several investments in the recent past to enable the supply of superior grade fuels. In addition, initiatives have been taken to introduce alternative clean fuels such as CNG/LPG, ethanol-blended petrol and bio-diesel. With the ongoing investment in the refineries for upgrading fuels, oil companies are expected to meet the targets of fuel quality as per the road maps envisaged in the auto fuel policy. Only about 60 per cent of diesel is being used in the transport sector. The balance is used in the agriculture and industrial sectors. Auto fuel quality diesel may not be needed in these sectors. Therefore, there is a need to review the strategy of improving quality of the entire production of diesel as it may unnecessarily add to the cost of operations in sectors other than transport. Further, the programme on ethanol-blended petrol is facing problems in respect of ethanol availability and its price. The programme needs to be reviewed.

NEW AND RENEWABLE SOURCES OF ENERGY

10.91 The programmes under new and renewable energy sources include: power generation through wind, small hydro, biomass and solar energy; socially oriented programmes to meet rural energy demand such as the National Project on Biogas Development (NPBD) and the Integrated Rural Energy Programme (IREP); solar energy programmes for applications like lighting, water heating, cooking and water pumping and research and development covering ocean energy, photo-voltaics, hydrogen energy, fuel cells, and alternate fuels for surface transport.

Physical Performance

10.92 Targets and actual achievement under the major renewable energy programmes including electrification of remote villages through decentralised renewable energy sources such as solar, biomass and small hydro are detailed in Table 10.17. Achievement in wind power is likely to exceed targets, but there are shortfalls in all other areas especially in the solar power programme. The target set for solar power includes the 140 MW Integrated Solar Combined Cycle (ISCC) power plant to be installed at Mathania, Rajasthan. This project is unduly delayed due to questions about its viability and availability of gas to run the hybrid plant during periods of low insolation.

Financial Performance

10.93 The Tenth Plan outlay is comprised of GBS of Rs.4,000 crore and IEBR of Rs.3,167 crore. The financial progress in the first two years of the Tenth Plan, the budget allocations in the third year and the assessed requirement of funds in the remaining two years are given in Table 10.18.

Progress in the Tenth Plan

10.94 Several important issues emerged from the mid-term appraisal of new and renewable energy sources of energy sector.

Table 10.17
Likely physical achievements in respect of the major renewable energy programmes during the Tenth Plan

Sl. No.	Year	Wind Power (MW)	Small Hydro (MW)	Biomass Cogeneration (MW)	Biomass gasification (MW)	Solar Power (MW)	Energy from wastes (MW)	Village Electri fication* (Nos.)
1.	Tenth Plan Target	1500	600	700	50	145	80	5000
2.	2002-2003 (Actual)	241.30	80.39	102.63	2.07	0.50	3.75	520
3.	2003-2004 (Actual)	615.25	84.04	129.50	4.85	0.05	15.65	613
4.	2004-2005 (Actual ach.)	1111.00	102.27	136.10	8.33	1.75	4.00	381
5.	Actual ach. In first 3 years (% of Tenth Plan)	1967.55 (131.17)	266.70 (44.45)	368.23 (52.60)	15.25 (30.50)	2.30 (1.59)	23.40 (29.25)	1514 (30.00)
6.	Likely achievement in last two years	1050.00	335.00	360.00	30.00	0.00	25.00	3500
7.	Likely achievement during Tenth Plan (% of Tenth Plan target)	3017.55 (201.17)	601.70 (100.28)	728.23 (104.03)	45.25 (90.50)	2.30 (1.59)	48.40 (60.50)	5014 (100.28)

* Proposed to be energised through renewable energy technologies

Table 10.18
Likely utilisation of Central Sector funds by the Ministry of Non-conventional Energy Sources (MNES) during the Tenth Plan
(Rs. crore at 2001-02 Prices)

Sl. No.	Year	GBS	IEBR	Total outlay at constant 2001-02 prices
	Ninth Plan (approved)	4168.97	3296.43	7465.40
.	Ninth Plan Realisation	2171.90 (52.09%)	2697.84 (81.84%)	4869.74 (65.23%)
1.	10th Plan (approved)	4000.00	3167.00	7167.00
2.	2002-2003 (Actual)	408.64	450.07	858.71
3.	2003-2004 (Actual)	359.33	310.63	669.96
4.	2004-2005 (Actual)	204.74	352.69	557.43
5.	2005-2006 (B.E.)	503.91	222.93	726.84
6.	Likely achievement in first four years	1476.62	1336.32	2812.94
7.	% Utilisation in first four years	36.92	42.2	41.32
8.	Expected level of expenditure in 2006-07*	225.21	387.96	613.17
9.	Likely investment during Tenth Plan	1701.83	1724.28	3426.11
10.	Tenth Plan likely utilisation in %	42.55	54.45	47.80

* Assumes a 10 per cent annual growth in nominal terms over the level of 2004-05

Wind Power

10.95 There is lack of clarity on the economically exploitable wind resource potential for wind power generation. The earlier estimated potential of 20,000 MW has been scaled up to 45,000 MW. The Ministry of Non-Conventional Energy Sources (MNES) has estimated that the exploitable technical potential is limited at only 13,000 MW due to limited power evacuation capacity of the grid. This is a technical limitation and steps are needed to overcome this limitation in order to exploit a higher portion of the available potential. It may not be possible to economically tap the entire revised potential of 45,000 MW. MNES must estimate the economically and technically viable wind potential in the country.

10.96 The installed capacity of wind power has touched 3595 MW (as on 31st March 2005) and has already exceeded the Tenth Plan target. This is largely the result of heavy capital subsidies in the initial years of the programme and, more recently, attractive fiscal incentives. While capacity has been realised on the back of one of the most aggressive incentive programmes; the actual capacity factors achieved average about 17 per cent for the country as a whole.

Small Hydro Power

10.97 The assessed potential for such projects for the country as a whole is 15,000 MW. The actual cumulative achievement as on 31st March 2004 was around 1705 MW. However, about 1,100 MW was developed earlier by the Ministry of Power when it was given the responsibility for hydropower above three MW. The definition of small hydro now also includes projects between 3 MW and 25 MW size. If the capacity developed by Ministry of Power is excluded, it becomes evident that MNES has helped exploit some 500 MW of the small hydro potential even though the programme has been in existence for over 20 years. MNES is yet to gear up fully to tap small hydropower projects up to 25 MW capacities.

10.98 The real barrier to small hydro generation is the absence of a structure for distributed generation, absence of independent networks, and difficulty in interconnectivity to the grid where feasible and, most importantly, getting paid for the energy supplied to the grid. None of the available subsidies are specifically designed to address these barriers.

Integrated Rural Energy Programme

10.99 The Integrated Rural Energy Programme (IREP) was started as a pilot exercise in the Planning Commission in 1985 and was transferred in 1994 to the MNES as an operational programme. IREP assesses the local energy needs and integrates the same with locally available energy resources like solar, biomass, biogas, small hydro etc. and external energy sources that might include electricity, kerosene, LPG etc. IREP is a comprehensive demand driven programme aimed at meeting the rural energy needs with an optimal mix of local and external energy resources. However, it is operating in isolation, though, ideally other MNES programmes should feed into this. IREP has a small budget that is spread over 860 blocks and actual annual utilization has never exceeded Rs.12 crore. A significant part of the Central funding actually ends up in supporting soft costs.

Biomas Gasification

10.100 Biomass Energy Systems have been successfully demonstrated in several states, including Karnataka, Tamil Nadu and West Bengal. These programmes are also being implemented in Chhattisgarh and Orissa. The local community is involved in biomass collection. The operation of the energy supply systems is done through locally available manpower. The electricity generated is used for providing drinking water supply and other basic needs like lighting. Biomass energy schemes such as these create direct and indirect employment for the unemployed local youth in addition to providing much needed electricity and safe drinking water.

Village Energy Security Programme

10.101 As a part of the Remote Village Electrification Programme (approved in the

Tenth Plan), MNES has taken up a pilot project to provide total energy security, with the village as the basic unit. This programme, covering around 200 villages, will endeavor to integrate locally available renewable energy sources like biogas, biomass and bio-fuels to meet all energy needs at the village level. This is an innovative programme and the demonstration experiment in varied conditions would provide valuable insights into creating self-sustaining rural energy systems. With the experience gained from the pilot projects a programme combining IREP and Village Energy Security Programme (VESP) may be evolved for replication, wherever found feasible.

Cogeneration Programme

10.102 One of the commercially viable power generation programme under MNES is cogeneration in sugar mills using bagasse as the fuel. There is a potential to generate 3500 MW of exportable surplus power through bagasse based cogeneration. Sugar mills hardly require 20-30 per cent of their power generating capacity for internal consumption. The balance power is available for feeding into the grid. However, the actual level of achievement in bagassebased cogeneration is only 447 MW. The lower achievement is on account of issues related to power evacuation facilities, purchase and payment for surplus co-generated power and tariff for power produced using conventional fuels during the off-season periods when no cane crushing takes place. Several other industries requiring both power and steam could use technologies for cogeneration and waste heat recovery to improve overall energy balance. MNES needs to promote such technologies/programmes.

Biogas Programme

10.103 This is the oldest programme under MNES and was started in 1981-82. Some 35,24,000 household plants have been installed against an assessed potential of 120,00,000 units. However, the programme faced issues in respect of functionality of the units and their benefits to the users. The community biogas plant programme did not succeed under MNES and was, thus, transferred to the states.

10.104 Institutional biogas plants promoted by MNES were successful. However, since community and institutional biogas plants formed a composite scheme, the institutional scheme was also transferred to the states along with the community plants. The states are now requesting MNES to extend necessary support/subsidies for the institutional plants as was done before. However, MNES maintains that institutional biogas plants are commercially viable and capital subsidies are not needed. In order to exploit the full potential of institutional biogas plants promotional measures like awareness campaigns, technical support, marketing of biogas manure etc. are still needed.

10.105 Biogas has traditionally been produced in India from cow dung (*gobar gas*). However, dung is not adequately and equitably available in villages. Technologies have now been developed for using tree-based organic substrates such as leaf litter, seed starch, seed cakes, vegetable wastes, kitchen wastes etc. for production of biogas. Besides cooking, biogas can also be used to produce electricity in dual fired diesel engines or in hundred per cent gas engines. MNES is taking initiatives to integrate biogas programme in its VESP.

Solar Photovoltaic Pumps

10.106 Under this programme, pumps of 200-3000 Wp capacity were promoted to include small capacity pumps used for horticulture. However, the majority of pump sets promoted at present are in the range of 900 – 3000 Wp. The estimated cost of a solar photo voltaic pump of 1800 watt is Rs.2.7 lakh. Two-third of the cost is subsidised by MNES for general areas and in the case of pumps installed in special areas 90 per cent of the cost is subsidised. Soft loans from the Indian Renewable Energy Development Agency (IREDA) are also available to meet the balance cost after availing MNES subsidy. Some 6452 pumps had been installed as on 31st March 2004. MNES should ascertain the economic benefits of this programme in terms of savings in diesel to justify the large amount of subsidies provided to sustain this programme.

THE WAY FORWARD

Across the Energy Sector

Improve regulation by:

- Creating a Regulatory Academy.
- Institutionalising the selection of regulators and their impact assessment under the Regulatory Academy
- Mandating training for all regulators
- Granting financial autonomy to regulatory institutions.
- Limiting the quasi-judicial role of regulators to tariff setting and dispute resolution
- Providing for system to make regulators accountable to Parliament
- Mandating annual reports from all regulators in compliance with the Act
- Develop a debt pool that would provide up to 20-year loan funding for energy projects.
- Establish and enforce energy efficiency standards. The Bureau of Energy Efficiency (BEE) and Petroleum Conservation Research Association (PCRA) must be required to develop such standards for an initial set of energy intensive industries and appliances and develop modalities for a system of incentives/penalties for compliance/non-compliance.

Power Sector

- As far as possible the power generation and transmission projects taken up for construction in future must be bid out competitively on level terms. At some points of time in future, this should become a mandatory requirement. Respective Regulators may grant exemption after allowing due process through public hearings.
- CERC must review compliance with the tariff guidelines it issues the state Electricity Regulators, especially with respect to returns on equity or net capital employed.
- All Central assistance to state governments for the sector must be linked exclusively to loss reduction and improved viability.
- Project finance must replace corporate finance as the norm, starting with projects taken up for construction in the Eleventh Plan to ensure that financial institutions appraise projects purely on their individual merit.
- Promote an industry structure that embodies the following elements to ensure efficiency and growth:
  - Multiple generators with access to transmission and distribution
  - Transco – a regulated monopoly only providing carriage
  - Competition in distribution through separation of content from carriage and regulated wheeling charges
  - Flexible and enabling captive regime
  - Consumer choice through open access
  - Independent load dispatch at regional and state levels
  - An independent planning body for transmission network
  - New technologies such as distributed generation with waste heat recovery where feasible.
  - Demand side management
  - Energy conservation and energy efficiency with incentives for Negawatts.
- Operationalising open access to consumers requires:
- Respective regulators to notify normative wheeling tariffs for different transmission voltages up to 66 KV.
- State regulators to notify normative wheeling tariffs for accessing distribution networks.
- Respective regulators to notify norms for differential time-of-day pricing for

electrical energy at the bulk and retail levels.

- Identifying cross subsidies and replacing them with direct subsidies over time.
- States need to notify rural areas as required by the Electricity Act, 2003. Such notification could see the emergence of independent rural suppliers of electricity.
- Undertake an independent review of the APDRP programme in order to improve its functioning and impact on AT&C loss reduction.
- Develop up to 20,000 MW of coal based coastal thermal generation capacity by 2012. These plants can either fire domestic coal (moved by sea) or imported coal.

Nuclear Power

- An independent review of NPCIL's current construction costs and construction periods against international benchmarks.
- Seek 20,000 MWe of additional nuclear power capacity under bi-lateral arrangements, based on a competitive power tariff, to be built over the next 10-12 years. Alternatively, India must seek nuclear fuel on competitive terms for a similar level of capacity to be built by NPCIL in the next 12-15 years

Coal Sector

- Pending the passage of the Coal Bill 2000, increase the number of players in coal mining through captive mining. Increase the flexibility of captive mines by permitting captive block holders to sell incidental coal surpluses during development and operation of the block to CIL or directly to currently linked end users; and allow group-captive mines. Set a target for the Ministry of Coal to achieve at least 50 mt of captive production by 2012.
- Amend Section 3 fo the coal mines (Nationalisation) Act, 1973 to facilitate offering of coal blocks to potential entrepreneurs through competitive bidding.
- Restructure CIL. One possibility could be dismantling of the holding company structure, extending autonomy to the individual coal companies, allowing these coal companies to compete with one another and reviving the lossmaking coal PSUs.
- Permit trading and marketing of coal by removing it from the list of essential commodities.
- Make available about 10 per cent of the domestic production through e-auctions open to traders and actual users.
- Promote additional thermal coal imports (through MMTC or any other body) under long term supply contracts similar to those followed by Japan. Starting with a commitment to import an additional 5 mt by 2006-07, negotiate up to 50 mt of thermal coal imports by 2012 at prices competitive with domestic coal. Such coal imports could feed coastal power plants. Further, the Ministry of Coal should encourage captive mines and/or equity coal in the source countries in support of such imports.
- Change grading and pricing of non-coking coal from the existing useful heat value (UHV) (based on excessively wide bands for grading coal on the basis of an obsolete empirical formula whose validity is in doubt) to the international practice of pricing coal based on gross calorific value (GCV). This is expected to encourage efficient use and promote use of washed coal.
- Amend the provisions of Contract Labour (Regulation & Abolition) Act, 1970 to facilitate offloading of certain activities in coal mining for improved economics of operations.
- Replace coal linkages with fuel supply agreements. As a step towards abolishing coal linkages completely,

these linkages could be made tradable in the first instance.

- Promote in situ coal gasification and tapping of coal bed methane.
- Rationalise rail freight rates for coal transport.
- Extend infrastructure status to the coal industry. Lower duties on capital goods imported for coalmines.
- Institute an independent regulatory mechanism for the coal sector.
- Review the royalty on coal and consider switching to an advalorem basis.

Petroleum and Natural Gas Sector

- Restructure the oil and gas CPSUs in order to promote effective competition.
- Review the current pricing of crude (both domestic and imported), natural gas and all its components, petroleum products and pipeline transportation and other services.
- Introduce price competition in all petroleum products. Impose universal service obligations by requiring a percentage of sales in notified areas but allow differential pricing in different markets to reflect cost of supply. States may choose to subsidize prices in remote areas.
- Bid out subsidies for LPG and kerosene.
- Encourage competing private participation in each element of the oil and gas industry (exploration and production, refining, marketing).
- Rationalise the tax and duty structure prevailing in the oil and gas sector
- Declare authorised end uses (as long as demand exceeds supply) for domestic natural gas and piped natural gas imports. Allow the market to determine the price of natural gas for these recognised end uses. LNG may be sold for any end-use and could compete with natural gas to meet any residual demand for the authorised end uses.
- Increase emphasis on acquiring equity oil and gas abroad. Develop capacity and structures that provide better assessment/control of commercial and political risks of such investments.
- Increase emphasis on transnational pipelines and LNG imports.
- Develop transportation and distribution assets in the oil and gas sector that provide services under common carrier principles applicable to natural monopolies.
- Modify the Petroleum and Natural Gas Regulatory Bill, 2004 to include regulation of upstream sector.
- Allow foreign operators to bring technology and investment to recover oil/gas from currently abandoned and/or marginal fields on economic considerations.

Non-Conventional Energy Sources

- Switch incentives and support from the supply driven programmes to demand driven programmes and technologies
- Explore alternative subsidy structures that encourage utilities to integrate wind, small hydro, cogeneration etc. into their systems.
- Phase out capital subsidies linked to creation of renewable with subsidies linked to renewable energy generated.
- SERCs to mandate purchase of energy from renewable sources as per the Electricity Act..
- Improve coordination and synergise the various programmes of MNES with similar programmes of other Central ministries and state governments.

Annexure 10.1

SECTORAL COAL DEMAND/OFFTAKE - MTA of Tenth Plan (Coal Sector)

(in million tonnes)

		IX Plan	Tenth Plan					
Sl.	Sector	2001-02	2002-03	2003-04	2004-05		2006-07	
No.		Actual	Actual	Prov.	BE	RE	Original Target	MTA Revised
I	**Coking Coal**							
1	Steel	27.81	29.88	29.83	33.27	34.02	35.32	40.70
2	Coke Ovens	0.67	0.86	0.71	0.71	0.60	1.89	2.00
	Sub-Total Coking:	**28.48**	**30.74**	**30.54**	**33.98**	**34.62**	**37.21**	**42.70**
II	**Non-Coking**							
3	(i) Power Utilities (Gen. Req.)	248.80 (1.80)	252.78 (1.71)	268.13 (1.44)	279.52 (2.48)	285.19 (1.33)	317.14 (3.74)	317.00
	(ii) Power Utilities (stocks)							5.00
4	Cement	15.25	16.36	16.78	19.00	18.55	24.56	25.40
5	Steel DR	4.40	6.17	7.82	7.5	10.15	7.00	7.00
6	Railways		-				-	
7	Fertilisers	3.20	2.54	2.07	2.81	2.44	4.18	3.52
8	LTC/Soft Coke*						0.20	0.20
9	Cokeries/Coke oven (NLW)*						1.50	1.50
10	Export	0.02	0.01	0.04	0.02	0.02	0.10	0.10
11	Captive Power	17.02 (1.29)	19.04 (1.53)	22.14 (1.75)	24.9 (1.10)	24.75 (1.87)	28.26 (1.40)	28.26
12	BRK & Others	32.75 (0.51)	36.86 (0.01)	32.06 (0.00)	35 (0.00)	37.77 (0.00)	37.85 (0.10)	40.00
13	Colly. Consumpt.	1.79	1.48	1.33	1.46	1.33	2.50	2.50
	Sub-Total NonCoking:	**323.23** (3.60)	**335.24** (3.25)	**350.37** (3.19)	**370.21** (3.58)	**380.20** (3.20)	**423.29** (5.24)	**430.48**
	Grand Total (I+II):	351.71 (3.60)	365.98 (3.25)	380.91 (3.19)	404.19 (3.58)	414.82 (3.20)	460.50 (5.24)	473.18
Note: 1. Figures in brackets are washery middlings and are not included in totals. (ii) *Included in BRK & Others.								
Details of Imports (figures included in the sectoral demand/ offtake)								
Import of Coking Coal		11.11	12.52	12.99	15.89	16.05	17.18	24.19
Import of Non-Coking Coal:		9.44	9.50	8.69	7.50	10.74	3.30	6.50
Power Sector		3.56	3.30	2.60	3.00	3.22	-	3.00
Cement Sector		5.88	3.66	3.18	4.00	7.52	3.30	3.00
Others			2.54	2.91	0.50			0.50
Sub-Total Non-Coking Coal:		9.44	9.50	8.69	7.50	10.74	3.30	6.50
Total Imports :		20.55	22.02	21.68	23.39	26.79	20.48	30.69
SECTORAL PHYSICAL TARGETS								
		2001-02	2002-03	2003-04	2004-05		2006-07	
		Actual	Provisional	Provisional	BE	RE	Original	MTA
Coal Based Power gen. (BU)		343.16	362.2	375.30	390.00	390.00	452.00	446.00
Cement Production (MT)		115.00	111.35	117.50	130.70		153.50	158.56
Hot Metal Prodn. (MT)		21.86	24.5	25.95	25.32		25.59	31.83

Annexure 10.2

COMPANYWISE COAL PRODUCTION - MTA of Tenth Plan (Coal Sector)

(in million tonnes)

Sl. No.	Company	IX PLAN		Tenth Plan							
		2001-02		2002-03		2003-04		2004-05		2006-07	
		Target	Actual	Target	Actual	Target	Actual	BE	RE	Original Target	MTA Revised
	CIL:										
1	ECL	28.50	28.55	29.00	27.18	29.00	28.00	29.00	29.40	31.00	34.50
2	BCCL	30.00	25.25	28.00	24.15	27.50	22.70	25.20	25.20	33.00	27.00
3	CCL	36.00	33.81	34.25	36.98	35.50	37.34	40.00	40.00	43.30	44.00
4	NCL	41.50	42.46	44.00	45.10	46.50	47.03	47.50	49.90	52.00	54.00
5	WCL	35.00	37.01	37.00	37.82	37.25	39.53	38.00	41.50	37.50	44.00
6	SECL	63.00	64.12	65.25	66.60	69.00	71.01	74.50	78.11	84.55	88.50
7	MCL	44.50	47.81	48.00	52.23	53.10	60.05	59.00	66.06	68.00	80.00
8	NEC	0.50	0.64	0.50	0.63	0.65	0.73	0.80	0.80	0.65	1.00
	Sub-Total CIL:	**279.00**	**279.65**	**286.00**	**290.69**	**298.50**	**306.39**	**314.00**	**330.97**	**350.00**	**373.00**
	Category:										
	Exisiting Mines	31.38	30.11	29.46	29.12	26.71	28.41	27.99	29.30	25.50	30.22
	Completed Projects	216.98	219.94	217.90	234.67	223.42	250.23	218.61	226.59	200.80	225.91
	Ongoing Projects	28.86	27.57	31.63	26.11	32.13	27.58	45.11	50.88	44.59	66.45
	New Projects	1.78	1.38	7.01	0.78	16.24	0.16	22.30	24.20	79.11	50.42
	Total:	279.00	279.00	286.00	290.68	298.50	306.38	314.01	330.97	350.00	373.00
9	**SCCL**	**32.38**	**30.81**	**32.50**	**33.16**	**33.50**	**33.85**	**35.00**	**35.00**	**36.13**	**37.50**
	Category:										
	Exisiting Mines	4.19	4.47	4.30	4.14	4.12	3.88	3.82	4.02	3.87	2.60
	Completed Projects	22.28	21.33	21.55	26.46	24.01	27.53	25.86	26.92	19.03	17.34
	Ongoing Projects	5.91	5.20	6.55	2.56	5.37	2.44	5.32	4.06	9.22	6.85
	New Projects	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	4.01	10.71
	Total:	32.38	31.00	32.50	33.16	33.50	33.85	35.00	35.00	36.13	37.50
10	**TISCO/IISCO /DVC**	7.60	7.73	7.60	7.46	7.85	7.45	7.45	7.45	7.64	*
11	**Captive**	3.75	4.46	5.50	5.51	5.20	7.61	8.20	7.70	6.73	*
12	**Others**		5.15	4.10	4.41	5.00	4.50	4.50	4.50	4.50	*21
All India Total:		**322.73**	**327.80**	**335.70**	**341.23**	**350.05**	**359.80**	**369.15**	**385.62**	**405.00**	**431.50**

Note: In the absence of revised projections the actual production achieved in 2003-04 has been considered for 2006-07 in case of others including TISCO/IISCO/DVC & Captive blocks etc.

Annexure 10.3

Companywise/Schemewise Outylay/Expenditure - MTA of Tenth Plan (Coal Sector)

(Rs. Crore)

Sl. No.	Company / Scheme	IX Plan 1997-02 Actual Exp.	X Plan Approved Outlay 2002-07	2002-03 Actual Exp.	2003-04 Actual Exp.	2004-05		Cumu-lative Expen-diture 2002-05	Cumulative Exp. As % of Appd. X Plan Outlay	X Plan MTA Revised Outlay	Revised Outlay as % of Approved Outlay
						BE	RE				
I.	**CIL**										
1	ECL	650.10	1460.00	131.44	82.49	200.00	195.24	409.17	28.03	1363.17	93.37
2	BCCL	555.40	1300.00	55.39	71.91	200.00	237.57	364.87	28.07	995.39	76.57
3	CCL	973.93	1250.00	131.60	229.00	280.00	280.00	640.60	51.25	1620.00	129.60
4	NCL	2121.43	2750.00	432.08	329.03	635.00	354.27	1115.38	40.56	2325.00	84.55
5	WCL	1307.73	1435.00	145.01	158.43	200.00	200.00	503.44	35.08	977.85	68.14
6	SECL	1726.14	3520.00	153.34	186.00	400.00	270.00	609.34	17.31	1859.33	52.82
7	MCL	1233.70	2500.00	139.83	93.55	350.00	275.00	508.38	20.34	1650.00	66.00
8	NEC	63.76	45.00	2.25	2.26	4.00	3.00	7.51	16.69	15.51	34.47
9	Others (CIL/ DCC/IICM/ CMPDIL)		50.00	1.23	4.15	41.00	62.27	67.65	135.30	168.88	337.76
10.	VRS#				120.77			120.77			
	Total CIL	**8632.19**	**14310.00**	**1192.17**	**1277.59**	**2310.00**	**1877.35**	**4347.11**	**30.38**	**10975.13**	**76.70**
II.	**SCCL**	**935.79**	**2113.00**	**139.49**	**163.42**	**325.00**	**275.00**	**577.91**	**27.35**	**1550.00**	**73.36**
III.	**NLC**										
1	NLC (Mines)	2097.14	6125.84	259.13	80.80	237.63	177.00	516.93	8.44	2130.26	34.77
2	NLC (Power)	1055.30	8007.64	175.70	77.24	243.07	90.00	342.94	4.28	2992.91	37.38
Total NLC		**3152.44**	**14133.48**	**434.83**	**158.04**	**480.70**	**267.00**	**859.87**	**6.08**	**5123.17**	**36.25**
IV	**Central Sector Schemes**										
1	R&D/S&T	19.23	100.00	7.00	9.82	9.88	12.43	29.25	29.25	72.93	72.93
2	Coal Contr. Orgn.@			0.20	0.20	0.22	0.22	0.62			
3	EMSC	32.16	163.00	13.12	0.00	4.85	18.22	17.97	11.02	150.52	92.34
4	Regl./Proml. Expl.	140.07	275.80	17.50	36.20	51.84	43.00	96.70	35.06	261.55	94.83
5	Detailed Drilling in Non-CIL	65.23	70.66	12.53	15.06	12.83	22.50	50.09	70.89	93.84	132.80
6	RFRP*	6.28	0.00	0.06	0.00	0.00	0.00	0.06		0.00	
7	Rehabilitation Project**	7.24	0.00	0.00	0.00	0.00	0.00	0.00		0.00	
8	VRS	490.93	425.06	107.02	0.00	103.50	103.5	210.52	49.53	425.06	100.00
9	IT	1.06	0.00	0.00	0.00	4.50	2.50	2.50		0.00	
10	North Eastern Council	122.34		0.00	0.00	21.00	21.00	22.33			
	Total Central Sector Schemes	**884.54**	**1034.52**	**157.43**	**61.28**	**223.32**	**210.00**	**428.71**	**41.44**	**1003.90**	**97.04**
Total MOC		**13604.96**	**31591.00**	**1923.92**	**1660.33**	**3339.02**	**2629.35**	**6213.60**	**19.67**	**18652.20**	**59.04**

* Not continuining in the X Plan

** Merged with EMSC in X Plan

@No outlay is provided in the x plan.

#No budgetry provision was made for VRS in 2003-04 due to which expenditore of 120.77 crore incured by CIL to IR is shown as plan expenditure of CIL.

Annexure 10.4

MID-TERM REVIEW OF TENTH PLAN (2002-07)
Physical Performance
Ministry of Petroleum & Natural Gas

Parameters	Tenth Plan	2002-03		2003-04		2004-05		Cumulative (3+5+7)	%age of Tenth Plan	2005-06	2006-07	Anticipated achievement Tenth Plan (8+10+11)	Anticipated achievement as % of Tenth Plan
	Target	Target	Actual	Target	Actual	Target	Likely			Target	Target		
	1	2	3	4	5	6	7	8	9	10	11	12	13
Consumption of POL (MMT)	120.4#	104.14	104.12	107.16	107.76	113.58	111.99	–	–	116.14	120.4	–	100.00
Crude oil Production (MMT)													
ONGC	130.02	25.90	26.00	25.99	26.06	26.17	26.18	78.23	60.2	26.19	25.56	129.98	99.97
OIL	18.70	3.50	2.95	3.60	3.00	3.21	3.22	9.16	49.0	3.85	4.00	17.01	90.96
PVT/JVCs	20.66	3.68	4.09	3.63	4.31	3.77	4.35	12.17	58.9	4.44	4.41	21.02	101.74
Total	**169.38**	**33.08**	**33.04**	**33.22**	**33.37**	**33.15**	**33.75**	**99.56**	**58.8**	**34.48**	**33.97**	168.01	99.19
Natural Gas Production (BCM)													
ONGC	112.10	23.91	24.24	23.13	23.58	22.13	22.12	69.95	62.4	21.47	20.82	112.24	100.12
OIL	12.61	2.19	1.74	2.34	1.88	2.06	1.97	5.68	45.0	2.81	2.85	11.34	89.93
PVT/JVCs	52.77	5.49	5.41	7.58	6.49	6.74	6.79	18.64	35.3	12.95	13.96	45.55	86.32
Total	**177.48**	**31.59**	**31.39**	**33.05**	**31.95**	**30.93**	**30.88**	**94.27**	**53.1**	**37.23**	**37.63**	169.13	95.30
Accretion to Hydrocarbon Reserves (MMT) *													
ONGC	**562-577**	121.7	128.10	134.55	104.78	148.40	NA	381.28	66.0-67.8	85.86	68.95	536.09	93-95
OIL	**110-123.50**	20.70	21.87	18.00	18.54	18.00	NA	58.41	47.2-53.1	30.65	30.65	119.71	97-121
Total NOC	672-700.50	142.40	149.97	152.55	123.32	166.40	NA	439.69	62.7-65.4	116.51	99.60	655.80	93.6-97.6
Pvt./JV Co.	113-213.50	NA	179.60	NA	225.00	NA	NA	NA	NA	NA	NA	NA	N.A.
Total	**785-914**	**142.4**	**329.57**	**152.55**	**348.32**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**>785-914**	**>100.00**

Targets for the terninal year of the Tenth Plan.
Note: Informantion on accretion to reserves for 2004-05, 2005-06 and 2006-07 in respect of private/JVs companies is not available.
NA- Not Available

Annexure 10.5

Refining Capacity

(in MMT as on 1st April)

Name of the Refinery	2003	2004	2005	2006	2007
1. IOC, Guwahati	1.00	1.00	1.00	1.00	1.00
2. IOC, Barauni	6.00	6.00	6.00	6.00	6.00
3. IOC, Gujarat	13.70	13.70	13.70	13.70	13.70
4. IOC, Haldia	4.60	6.00	6.00	6.00	6.00
5. IOC, Mathura	8.00	8.00	8.00	8.00	8.00
6. IOC, Digboi	0.65	0.65	0.65	0.65	0.65
7. IOC, Panipat	6.00	6.00	6.00	12.00	12.00
8. BPCL, Mumbai	6.90	6.90	12.00	12.00	12.00
9. HPCL, Mumbai	5.50	5.50	5.50	7.90	7.90
10. HPCL, Visakh	7.50	7.50	7.50	7.50	8.33
11. KRL, Kochi	7.50	7.50	7.50	7.50	7.50
12. CPCL, Manali	6.50	9.50	9.50	9.50	9.50
13. CPCL, Narimanam	1.00	1.00	1.00	1.00	1.00
14. BRPL, Bongaigaon	2.35	2.35	2.35	2.35	2.35
15. NRL, Numaligarh	3.00	3.00	3.00	3.00	3.00
16. MRPL, Mangalore (JV)	9.69	9.69	9.69	9.69	9.69
17. ONGC, Tatipaka	0.08	0.08	0.08	0.08	0.08
18. RPL, Jamnagar	27.00	33.00	33.00	33.00	33.00
Total	116.97	127.37	132.47	140.87	141.70

* indicates capacity addition as a result of Modernisation cum Expansion projects.