CHAPTER VI

FORECAST OF ENERGY AND GROSS DOMESTIC PRODUCT

6.1 Demand Forecast

Thus far we have seen the structure and the growth of Indian Economy for the last few decades. We have seen the state of Indian economy, its prosperity and paucity of resources, with it the hope it holds for a better future. In turn, the realization of a better and prosperous future depends upon the one critical resource, the energy sources. This chapter aims at estimating the energy requirement for different time periods under different growth rates. Estimates of future energy demand are critical element of energy planning, at either aggregate sectoral level or at the level of some specific fuel such as electricity or oil or coal. One of the most important reasons for making projections of the future demand in the lead time required for energy supply; most often the lead time extends anywhere between five to fifteen years.

Future energy demand estimates can fall into two categories: (I) energy demand projection (ii) energy demand forecast. Energy demand projections is normative. Because projections often incorporate policy objectives that might or might not be attained, e.g., the social policy that the government intend to implement in the successive plans. Where as energy demand forecast is predictive. Given a set of conditions at a given time, and if such

a set of conditions continues to be, what impact will it have on the structure of the economy. In reality this distinction is mostly of superficial in nature.

6.1.2 Approaches to Energy Forecasting

There are several approaches to energy demand analysis. The most widely followed methods are (I) Econometrics Methods (ii) Input - Output Method (iii) Linear Programming Method (iv) Optimization Method (v) Non - Inferior Set Estimation. In this study the first three approaches are applied. In the subsequent paragraphs they are explained in brief and models applied to the Indian situation.

Many demand estimates are based on an extrapolation of past trends. On the other hand, the econometrics methods demand estimates takes a quite different perspective, in that the parameters of the projection algorithm are based on statistical estimation of historical data.[1] The econometrics model built should firstly explain the past performance of the economy, secondly it should be able to explain the turning points in the historical data. There are no all purpose models and models are built with specific purpose. The model with a good explanation power need not necessarily be a good forecasting model. Here we present a model that has been widely used to explain the energy demand for developing countries.

$$\ln TCE = \beta_0 + \beta_1 \ln GDP + \beta_2 (\ln GDP)^2 + \beta_3 \ln Pop + \beta_4 (\ln Pop)^2 + e$$

where,

TCE = Total Commercial Energy Consumption.(MTOE)

pop = Population (Million).

GDP = Gross Domestic Product (Rs. Million).

Ind = Share of industrial sector in GDP

e = error term, and

βi = Parameters to be estimated

Depending upon the Modelers purpose and the reliability of the data source at hand, the parameters to be estimated could be extended to arrive at a better estimates. To say the least, firstly, such econometric approaches may contain problems of multicollinearity and auto correlation.[2] Second, in econometric approaches, when the BLUE[2] estimator is determined, problem of heteroscedasticity, multicollineavity, transmitted error terms may occur.[3]

The model has total commercial energy as the dependent variable with gross domestic product and population as the explanatory variables. These models are in double log form which directly give us the electricities. The second model has quadratic terms of the model so as to capture rate of change in energy demand. For the purpose of this study

we have run the second model. The model exhibits positive auto correlation, which has been corrected using the correction factor ρ.

The results are as follows.

$$\underset{}{\text{LnTCE}} = \underset{}{-19.39} + \underset{(4.11)^{**}}{17.52\ \text{lnpop}} - \underset{(3.62)^{**}}{1.24\ (\text{lnpop})^2} - \underset{(1.56)}{6.19\ \text{ln GDP}} + \underset{(1.43)}{0.62\ (\text{ln GDP})^2}$$

$R^2 = 0.9801$, DW = 1.1759

F Ratio = 873.94

Figures in brackets are `t-values'.

** - significant at 1% level

The results indicate the elasticity of total commercial energy is positively and significantly related to population, other things remaining same. The results are not significant corresponding to gross domestic product at independent variable, so no conclusion can be drawn. The model gives a high R^2 and the F ratio is significant.

6.1.3 Energy Forecast and the I-O Model

As stated earlier, the I-O table of 1989-90 is the basis for energy demand analysis laid out in this chapter. Before diverging into further discussion, the analysis seeks to answer certain policy issues.

(1) How does changes in final demand influence energy consumption and how sensitive is the inter-industrial requirement to the level and structure of final demand. In other wards, how much energy in MTOE needs to be increased to produce the gross output such that it meets the required final demand.

(2) Can there be any reduction in the energy demand if energy savings devices are opted for and implemented in the producing and consuming sectors and how far a volatility and perturbation in the international energy production (OPEC) and disruption of supply from thereof would affect the output to meet the final demand requirements.

(3) In the event of energy supply disruptions, how much would it cost the economy to maintain certain strategic resources to meet such eventualities.

(4) Is the energy forecast from I-O consistent with macroeconomic scenario arrived at with econometrics tools ?

Energy sector, constituting coal and lignite, crude petroleum and natural gas, petroleum products and electricity are part of the whole system in the I-O frame work. The former two are primary energy sources and the latter two are secondary energy sources. The primary sources go through transformation process to produce 'useful energy'. How better an economy produces this useful energy is an indicator of the level of development of the economy. Stated differently, how much the economy can minimize the transformation losses. The secondary energy is termed as end-use energy. They are directly available for utilization in different sectors of the economy, including private and public consumption to operate various equipments and appliances at efficience. The end-use energy is an indicator of how efficiently energy is utilized in the economy. If energy is used less efficiently, there is scope for energy saving and the implementation of energy saving devices and techniques are warranted. In the input-output framework, all energy sources are treated at par, hence, there is no account for transformation losses.

In reality, the distinction between primary and secondary energy sources get merged when necessity arises. They become supplements and not supplant each other. But in the I-O frame of analysis, they are treated as different sectors, products, hence direct substitution possibility does not exist.[4] They are inputs belonging to different sectors.

The Input-output analysis also assumes fixed technical coefficients, implying that over sufficiently long period of time, the relationship between input and output remain stable.

Because of this assumption, it is possible to arrive at the proportionate increase in input requirements with a given increase in the final demand or capacity of industry

6.1.4 Energy Units in I-O table

Energy flow from the producing sectors to the consuming sectors is given in terms of monetary value in a standard input-output table provided by the official sources and not in terms of physical quantity. In physical quantity, energy flows can be expressed in terms of Btu (British Thermal Unit), Jule (J) TOE (Tone of Oil Equivalent) Kilotons of Oil Equivalent (Kgoe). After considering various options, Million tone of oil equivalent (MTOE) is adopted in this study. In order to deduce the use of energy in physical units, one has to make suitable assumptions about the price of energy. The price assumption made in this study is based on the prevailing price level at 1989-90. A comparative price analysis also has been undertaken from the data available in the energy statistics year books, and the publication from department of trade and commerce, Washington D.C. and from various issues published by CMIE on energy scene in India. There have been studies done in this regard in the past, notable among them, Wright (1974,1975) and Pich and Becker (1975).[5] They assumed that energy was purchased by different sectors at the same price to convert the monetary values of I-O table to equivalent energy flows. If this is not true, then it can introduce substantial error in the result. We assume the same principle in this study. In the next section the scenario generation using I-O technique and energy demand forecast are presented.

6.2. Sectoral Growth Rates

In order to arrive at the sectoral growth rates for the year 2005 and 2010, three different scenarios are envisaged for each time period. Case I refers to low growth rate, case II refers to normal or moderate growth rate and case III represents high growth rate. These three growth rates can also be considered in terms of policy initiatives as conservative policy, moderate policy and aggressive policy. Moderate case has been taken to reflect the decades of economy's growth rate as well the growth rate experienced in the recent past. Since, the recent past growth rate may not be an accurate reflection of the trend in the growth rate that the economy is likely to follow in the ensuing future, an upper and lower growth rate cases for the moderate have been developed which are viz conservative and aggressive cases. These are also refereed to as low growth normal growth and high growth, in the discussion followed.

Growth rates have been calculated, first assigning weights to different sector on the basis of certain criteria. The weights assigned are determined by the contributions of different sectors to the Gross Domestic Product over a period of time. Then the assigned weight is used to calculate the future possible growth rates for the economy as a whole. A growth rate attained by the economy is the weighted growth of its subsectors.

The Input-output table contains 60 sectors. We have aggregated different sectors on the basis of commodity group to represent four major economic sectors, agriculture & allied

(1 to 14) mining and quarrying (15-19), manufacturing (20-53) and services (54-60) While assigning and calculating the growth rate, individual sector is not considered. The weight is assigned to the group as a whole. It is possible that individual sector may grow at a faster/slower rate than other sectors within a group. Such individual sector's growth rate is not being considered as it could lead to numerous combinations for attaining a specific growth rate in the economy. In order to reflect both the dualistic nature of our economy in transition, agriculture has been assigned 4.5 high growth rate and 2.5 percent low growth rate. Agricultural growth rate depends very much upon the accelerated application of modern technology. As any further accelerated growth in agriculture cannot come about without increased application of modern technology. Hence growth in industrial sector sets the limit to the growth in agriculture and its growth is also conditioned by agricultural growth, as even to this day large proportion of industries are agro based. Industrial sector expected to grow at a high of 10.5 percent and a low of 6.5 percent. In case of mining and quarrying, the growth rate envisaged are a high of 4.5 percent and a low of 3.5 percent. Table below represents the different scenario growth rates for 2005-2010.

Sector	Weight	Scenario		
		Low	Normal	High
Agri & Allied (1-14)	0.239	2.50	3.50	4.50
Mining & Quarrying (15-19)	0.017	3.50	4.00	4.50
Manufacturing (20-53)	0.345	6.50	9.25	10.50
Services (54-60)	0.399	4.00	6.00	7.00
Economy	1.00	4.50	6.50	7.50

6.2.1 Derivation of Final Demand and Gross Output

The final demand has been derived from 1989-90 Input Output table for the different growth rates for the year 2005 and 2010. A low case growth for an year is calculated by the weighted average growth. However for estimating the final demand for the year say 2005, we have used the following formula $F_{2005} = F_i (1+g_i)^{16}$. Where F_i gives the final demand for specific industry in the year 1989-90, gi gives attainable growth for a sector under given scenario (reffered above) and 16 indicates the intervening time period (i.e., 1989-90 to 2005). Using this final demand Fi, Final demand vectors are forecasted for various scenarios. These estimates of final demands are used to project requisite gross output refer table 6.1. The final demand vectors thus derived are used for the future projection of energy demand for generating the required income. In all six sets of final demands for 60 sectors are generated based on 1989-90 final demand from I-O table The final demand for the year 1989-90 is derived from the following:

$$\{A\}*\{X\} + \{F\} = \{X\} \text{ ---- (1)}$$

where ,

X = The vector of output quantities Xi produced by sector i

A = Matrix of input-output coefficients aij

F = Vector of final demands (Fi) for sector i

TABLE : 8 1 SECTORWISE AND TOTAL GROSS OUTPUT UNDER DIFFERENT SCENARIOS (Rs million at 1980-90 prices)

COMMODITY SECTOR\SCENARIO	2005Low	2010Low	2005Normal	2010Normal	2005High	2010High
1 PADDY	456991	521705	541608	654177	632243	801775
2 WHEAT	231407	266219	277235	339552	324017	416992
3 OTHER CEREALS	113994	129893	134467	161833	157016	198441
4 PULSES	139350	160388	167110	204844	195304	251554
5 SUGARCANE	139106	178301	191984	276598	228276	347877
6 JUTE	13597	18095	19838	29872	23661	37687
7 COTTON	140221	191754	210391	326777	252319	414825
8 TEA	51040	69459	76155	117657	91257	149230
9 COFFEE	4534	5480	5790	7688	6825	9565
10 RUBBER	10989	15093	16648	25957	19951	32917
11 OTHER CROPS	800931	961478	1015687	1334943	1195425	1656961
12 ANIMAL HUSBANDRY	704679	827667	867535	1101060	1017630	1359965
13 FORESTRY & LOGGING	139657	168992	181590	241466	213092	298363
14 FISHING	61384	71388	74745	93299	87475	114825
15 COAL & LIGNITE	134958	175246	194192	283998	230603	356198
16 CRUDE PETROLEUM & N GAS	116976	161805	193054	305165	237983	397755
17 IRON ORE	7812	9575	9445	12454	10626	14628
18 OTHER METALLIC MINERALS	14396	18682	20144	29326	23710	36444
19 NON MET.& MINOR MINERALS	34564	48979	70917	114868	91035	155183
20 SUGAR	153057	209304	229741	356799	275488	452860
21 KHANDSARI BOORA	73285	99894	109550	169552	131311	215112
22 HYDROGENATED OIL	49993	68255	74933	116160	89818	147368
23 OTH.FOOD & BERERAGE IND	646976	880460	965334	1491417	1156775	1891632
24 COTTON TEXTILES	592506	810062	888726	1380001	1065806	1751781
25 WOOLLEN TEXTILE	48882	66944	73470	114292	88131	145120
26 ART SILK & SYNTH.FIBRE	497557	681517	747951	1163736	897235	1477692
27 JUTE,HEMP,MESTA TEXTILES	64690	85784	94045	141025	112086	177759
28 OTHER TEXTILE	401918	549695	603218	937008	723410	1189431
29 WOOD & WOOD PRODUCTS	58721	75169	83067	119149	97983	148228
30 PAPER & PAPER PRODUCTS	203111	267473	294656	437898	350126	549882
31 LEATHER & LEATHER PROD.	97656	133779	146821	228473	176130	290119
32 RUBBER PRODUCTS	116918	158148	173715	266472	207783	337253
33 PLASTIC PRODUCTS	42495	57531	63143	96971	75564	122804
34 PETROLEUM PRODUCTS	387218	507582	556785	823667	662403	1035916
35 COAL TAR PRODUCTS	43889	55487	61432	86711	72253	107446
36 FERTILIZERS	93123	108267	113216	141246	132537	173917
37 PESTICIDES	22001	28479	30816	44936	36669	56561
38 SYNTH.FIBRE & RESIN	83793	114523	125698	195098	150715	247602
39 OTHER CHEMICALS	458065	607355	667471	1000494	795059	1260119
40 CEMENT	51816	64511	71608	99014	83870	121976
41 OTH.NON MET.MINERAL PROD	209497	282568	310690	475001	371350	600647
42 IRON & STEEL	373848	481357	531546	768231	628133	957967
43 NON FERROUS METALS	85984	113166	124655	185154	148156	232565
44 TRACTORS & OTH.AGRL.MACH	51717	68499	74491	111670	88965	141145
45 MACHINE TOOLS	19930	27256	29919	46470	35879	58985
46 OTH.NON ELECTRICAL MACH.	275284	373950	411355	634214	492882	804189
47 ELECTRICAL MACHINERY	314391	421939	463968	705240	553861	890509
48 COMMUNICATIONS EQUIPMENT	79738	108442	119104	183823	142630	232960
49 ELECTRONIC EQUIPMENT	36778	50287	55197	85712	66187	108786
50 RAIL EQUIPMENT	103685	136558	150384	223014	178633	279931
51 MOTOR VEHICLES	195592	264387	290469	445215	347370	563351
52 OTH.TRANSPORT EQUIP	99396	134293	147307	225717	176225	285744
53 OTH. MANUFACTURING	416466	556686	612423	926649	730639	1169230
54 CONSTRUCTION	1060601	1297174	1441076	1943497	1679080	2376321
55 ELECTRICITY ETC.	459866	593283	652780	946246	772694	1182577
56 RAIL TRANSPORT SERVICE	197389	246490	272641	378530	319693	467112
57 OTHER TRANSPORT SERVICE	638869	804098	889095	1247481	1044499	1543472
58 COMMUNICATION	94133	117959	130763	182336	153310	224997
59 TRADE	1226059	1540563	1701416	2382054	1998508	2946715
60 OTHER SERVICES	2283268	2829589	3143328	4317527	3673993	5303638
TOTAL	15726860	20078940	21998528	31485436	[illegible]	

Equation system (1), known as the balance equations, reveals that the total gross output of a commodity is equal to interindustrial requirements and outside consumption, Gross fixed investment and net foreign trade. The final demand itself can be aggregated from several distinct components described above.

$$\{C\} + \{G\} + \{I\} + \{E\text{-}M\} = \{F\} \text{ --- (2)}$$

Where, C = Private consumption vector

G = Government consumption vector

I = Gross Capital Formation vector

E = Vector of Exports

M = Vector of Imports

Given the vector of final demand {F}, we can obtain the gross output required to satisfy the given final demand.

$$\{1\text{-}A\}^{-1} \{F\} = \{X\} \text{ --- (3)}$$

Where, the Matrix $(I\text{-}A)^{-1}$ is called the Leontief inverse which captures direct and indirect effects of a change. It can be presented as:

$$(I\text{-}A)^{-1} = (I+A+A^2+A^3+\text{----})$$

For an I-O analysis, a complete knowledge of A is an imperative, since this reflects the technology matrix derived from actual intersectoral transactions for base year (See Appendix I for [A] matrix for the year 1989-90).

6.2.2 Energy Demand Scenario for Different Growth Rates

Once equipped with the Leontief inverse the analysis essentially consists of deriving gross output for different scenarios. By multiplying gross output of each sectors by its energy coefficient matrix (ei) we get the final energy consumption. The total energy consumed in the economy is the sum of sectoral energy consumptions.(Table 6.2)

The sectorwise energy requirement for different scenarios presented in Table 6.2 are in monetary units expressed at 1989-90 prices. The aim of this excercise is to estimate the demand for different fuels in real terms. As stated earlier, the present study expresses all the fuels in MTOE. To arrive at these figures the monetary values derived for different scenarios are broken down in the proportion of the fuelwise energy coefficients expressed in Table 5.2. Having derivred the fuelwise energy requirement by sector for different scenarios (in monetary terms), they are deflated by the respective prices/TOE, prevailing at 1989-90. Thus we derive the real energy requirement fuelwise for different scenarios. These results are presented in tables (6.3A thru 6.3F). These tables also present aggregate energy demand for the economy as a whole and the scenario wise - aggregate sectorwise. The summary results are presented in table 6.4 for the economy as a whole. Table 6.5 presents the energy demand for the aggregate sectors by scenario.

It can be seen from table 6.1 that the gross output for the Economy for the year 2005 can vary between Rs. 15726950 Million (Low growth scenario) to Rs. 26022287 Million (for high growth scenario). The gross output for the year 2010 vary between Rs. 20078940 Million under low growth scenario to Rs. 38322604 Million under high growth scenario. The energy requirement to produce these levels of output are presented in table 6.2. The figures in this table are expressed at 1989-90 prices and are in Rs. Million.

The monetary values (Table 6.2) when broken down in terms of share of different constituents of energy fuels and deflated by their corresponding prices of 1989-90 give the quantities of energy requirement in MTOE (Million tonnes of oil equivalent). The fuel wise energy forecast are generated for different scenarios.

The forecast for coal and lignite vary from 117.18 MTOE (Low) to 198.16 MTOE (High) for the year 2005. For the same fuel the forecasts for the year 2010 vary between 150.99 MTOE (Low) to 306.10 MTOE (High). (Refer tables 6.3A to 6.3F).

In case of Electricity the forecast varies between 24.95 MTOE (Low) to 42.27 MTOE (High) for the year 2005. For the same fuel the forecast for the year 2010 varies between 32.24 MTOE (Low) to 65.62 MTOE (High) scenarios.

In case of Oil and Gas the forecast varies between 60.10 MTOE (Low) to 99.89 MTOE (High) for the year 2005. For the same fuel the forecast for the year 2010 varies between 76.34 MTOE (Low) to 152.55 MTOE (High).

The aggregated results presented in table 6.4 gives a comprehension picture. Coal and Lignite will continue dominate the Indian energy scene as its share in energy demand is more than 50 % for all scenarios. This picture emerges when adjusted for the conversion factors.

Table 6.5 presents the aggregate sectorwise energy demand forecast for different scenarios. However these shares would undergo change when sectoral composition charges over a period of time and in the long run energy intensities too are expected to change.

The results presented above give us a detailed account of the possible limits of energy demand for different sectors, fuelwise. These results can guide the policy makers in selecting an appropriate growth path in view of local production potential and import capability.

TABLE 6.2 SECTORWISE ENERGY REQUIRMENT FOR DIFFERENT SCENARIOS (Rs million at 1989-90 Prices)

SN	COMMODITY SECTOR	2005LOW	2010LOW	2005NORMAL	2010NORMAL	2005HIGH	2010HIGH
1	PADDY	10488 43	11973 68	12430 47	15014 06	14510 64	18401 57
2	WHEAT	11473 98	13200 10	13746 33	16836 23	16065 93	20675 99
3	OTHER CEREALS	1839 22	2095 73	2169 54	2611 07	2533 35	3201 72
4	PULSES	1815 05	2089 07	2176 62	2668 12	2543 85	3276 51
5	SUGARCANE	2853 23	3657 15	3937 82	5673 35	4682 20	7135 36
6	JUTE	0 00	0 00	0 00	0 00	0 00	0 00
7	COTTON	5090 07	6960 74	7637 26	11862 12	9159 26	15058 27
8	TEA	0 00	0 00	0 00	0 00	0 00	0 00
9	COFFEE	0 00	0 00	0 00	0 00	0 00	0 00
10	RUBBER	0 00	0 00	0 00	0 00	0 00	0 00
11	OTHER CROPS	15222 50	18273 85	19304 16	25371 93	22720 25	31492 20
12	ANIMAL HUSBANDRY	0 00	0 00	0 00	0 00	0 00	0 00
13	FORESTRY & LOGGING	788 33	953 92	1025 03	1363 02	1202 86	1684 19
14	FISHING	617 00	717 54	751 29	937 78	879 24	1154 15
15	COAL & LIGNITE	17968 51	23332 45	25854 95	37811 88	30702 80	47424 78
16	CRUDE PETROLEUM & N.GAS	2771 62	3833 79	4574 21	7230 56	5638 75	9424 37
17	IRON ORE	1324 15	1622 90	1601 01	2110 92	1801 14	2479 50
18	OTHER METALLIC MINERALS	1895 83	2460 20	2652 75	3861 91	3122 34	4799 32
19	NON MET.& MINOR MINERALS	1834 50	2599 55	3763 92	6096 59	4831 68	8236 30
20	SUGAR	2598 38	3553 26	3900 21	6057 21	4676 84	7687 99
21	KHANDSARI BOORA	5739 52	7823 45	8579 72	13278 92	10263 96	16847 06
22	HYDROGENATED OIL	1722 08	2351 11	2581 14	4001 28	3093 88	5076 27
23	OTH.FOOD & BERERAGE IND.	13454 13	18309 53	20074 51	31014 64	24055 62	39337 28
24	COTTON TEXTILES	37843 95	51739 43	56763 79	88141 99	68074 04	111887 95
25	WOOLLEN TEXTILE	2046 03	2802 05	3075 20	4783 84	3688 85	6074 21
26	ART SILK & SYNTH.FIBRE	51212 01	70146 41	76984 21	119779 65	92349 59	152094 24
27	JUTE,HEMP,MESTA TEXTILES	4318 77	5727 00	6278 50	9414 95	7482 99	11867 38
28	OTHER TEXTILE	8477 33	11594 26	12723 18	19763 54	15258 30	25087 70
29	WOOD & WOOD PRODUCTS	711 34	910 59	1006 27	1443 36	1186 96	1795 62
30	PAPER & PAPER PRODUCTS	14787 34	19473 20	21452 25	31880 92	25490 70	40033 81
31	LEATHER & LEATHER PROD.	1499 89	2054 71	2255 02	3509 10	2705 17	4455 92
32	RUBBER PRODUCTS	2686 38	3633 71	3991 39	6122 62	4774 15	7748 93
33	PLASTIC PRODUCTS	2095 16	2836 51	3113 19	4781 06	3725 62	6054 72
34	PETROLEUM PRODUCTS	224626 12	294449 58	322992 41	477810 80	384261 46	600937 10
35	COAL TAR PRODUCTS	20238 74	25586 74	28328 54	39985 54	33318 39	49546 93
36	FERTILIZERS	24354 38	28315 15	29609 29	36940 15	34662 49	45484 53
37	PESTICIDES	641 88	830 87	899 06	1311 03	1069 84	1650 16
38	SYNTH.FIBRE & RESIN	9571 82	13082 16	14358 62	22286 32	17216 34	28283 95
39	OTHER CHEMICALS	34141 90	45269 30	49750 03	74571 93	59259 79	93923 14
40	CEMENT	8320 69	10359 17	11498 74	15899 71	13467 84	19586 87
41	OTH.NON MET.MINERAL PROD	29197 97	39382 04	43301 56	66201 85	51755 83	83713 49
42	IRON & STEEL	38535 58	49617 44	54790 79	79187 80	64746 77	98745 54
43	NON FERROUS METALS	16570 43	21808 85	24023 07	35682 24	28551 97	44818 94
44	TRACTORS & OTH.AGRI.MACH	1412 94	1871 46	2035 15	3050 92	2430 60	3856 20
45	MACHINE TOOLS	556 26	760 74	835 07	1297 02	1001 41	1646 33
46	OTH.NON ELECTRICAL MACH.	6701 14	9102 93	10013 47	15438 45	11998 05	19576 09
47	ELECTRICAL MACHINERY	6296 91	8450 98	9292 77	14125 18	11093 23	17835 91
48	COMMUNICATIONS EQUIPMENT	1032 57	1404 27	1542 34	2380 41	1846 98	3016 72
49	ELECTRONIC EQUIPMENT	209 21	286 06	313 98	487 57	376 50	618 83
50	RAIL EQUIPMENT	3316 19	4359 20	4800 55	7119 03	5702 29	8935 93
51	MOTOR VEHICLES	5715 46	7725 77	8487 92	13009 81	10150 62	16461 89
52	OTH.TRANSPORT EQUIP.	2034 13	2748 29	3014 62	4619 28	3606 43	5847 71
53	OTH. MANUFACTURING	13928 01	18617 43	20481 44	30990 21	24434 97	39102 93
54	CONSTRUCTION	19452 56	23791 54	26430 86	35645 80	30796 11	43584 26
55	ELECTRICITY ETC.	180040 46	232273 98	255567 42	370461 39	302514 73	462986 42
56	RAIL TRANSPORT SERVICE	19087 43	23835 45	26364 26	36603 64	30914 07	45169 40
57	OTHER TRANSPORT SERVICE	75825 30	95435 79	105523 75	148059 44	123968 12	183189 62
58	COMMUNICATION	777 45	974 23	1079 89	1505 92	1266 19	1858 25
59	TRADE	10737 11	13491 35	14900 01	20860 63	17501 76	25805 60
60	OTHER SERVICES	22431 72	27798 79	30881 28	42417 07	36094 74	52105 01
	TOTAL	970329.44	1238840.73	1357152.95	1942604.59	1605536.44	2426146.21

TABLE 6.3A FUELWISE ENERGY FORECAST FOR DIFFERENT SECTORS FOR 2005 LOW (MTOE)

SN	COMMODITY SECTOR	Coal&lignite	Electricity	Oil & Gas	TOTAL
1	PADDY	0 16	0 22	1.04	1 41
2	WHEAT	0.34	0 43	0 53	1.30
3	OTHER CEREALS	0 00	0 02	0 24	0.26
4	PULSES	0 00	0 03	0 20	0.24
5	SUGARCANE	0 00	0 09	0 20	0.29
6	JUTE	0 00	0 00	0 00	0 00
7	COTTON	0 00	0.12	0 47	0 59
8	TEA	0 00	0.00	0 00	0 00
9	COFFEE	0 00	0.00	0 00	0.00
10	RUBBER	0 00	0 00	0.00	0 00
11	OTHER CROPS	0.32	0 22	1.76	2.30
12	ANIMAL HUSBANDRY	0.00	0.00	0 00	0 00
13	FORESTRY & LOGGING	0 00	0 00	0.12	0.12
14	FISHING	0.00	0.00	0.10	0.10
A . TOTAL (1-14)		**0.82**	**1.13**	**4.67**	**6.62**
15	COAL & LIGNITE	1 34	0 86	0.70	2.90
16	CRUDE PETROLEUM & N.GAS	0 00	0.06	0.87	0.93
17	IRON ORE	0 00	0.04	0.11	0 16
18	OTHER METALLIC MINERALS	0.01	0.15	0.13	0 30
19	NON MET.& MINOR MINERALS	0.02	0.20	1.04	1.26
B. TOTAL (15-19)		**1.37**	**1.31**	**2.86**	**5.54**
20	SUGAR	0.28	0.05	0 23	0.56
21	KHANDSARI BOORA	0.45	0.10	0.53	1.08
22	HYDROGENATED OIL	0 38	0.06	0.03	0.47
23	OTH.FOOD & BERERAGE IND.	2.20	0.33	0.82	3.35
24	COTTON TEXTILES	3.88	1.36	1.32	6.56
25	WOOLLEN TEXTILE	0.33	0.06	0.09	0.48
26	ART SILK & SYNTH.FIBRE	1.40	2.43	0.91	4 74
27	JUTE,HEMP,MESTA TEXTILES	0.35	0.15	0.21	0.71
28	OTHER TEXTILE	0.89	0.29	0.34	1.52
29	WOOD & WOOD PRODUCTS	0.06	0.03	0.03	0.11
30	PAPER & PAPER PRODUCTS	3.14	0.48	0.36	3.98
31	LEATHER & LEATHER PROD.	0.14	0.05	0.07	0.26
32	RUBBER PRODUCTS	0.21	0.06	0.21	0.48
33	PLASTIC PRODUCTS	0.02	0.09	0.09	0.19
34	PETROLEUM PRODUCTS	0.01	0.12	14.86	14.98
35	COAL TAR PRODUCTS	15.45	0 12	0.16	15.73
36	FERTILIZERS	2.77	0.75	5.28	8.81
37	PESTICIDES	0.00	0.02	0.04	0 06
38	SYNTH.FIBRE & RESIN	0.85	0.25	0.65	1.75
39	OTHER CHEMICALS	1.25	1.02	2.60	4.87
40	CEMENT	2.81	0.23	0.10	3.15
41	OTH.NON MET.MINERAL PROD	8.05	0.31	2.21	10.57
42	IRON & STEEL	13.03	1.25	1.87	16.15
43	NON FERROUS METALS	0.71	1.29	1.67	3.67
44	TRACTORS & OTH.AGRI.MACH	0.18	0.04	0.09	0 30
45	MACHINE TOOLS	0.01	0.02	0.02	0.06
46	OTH.NON ELECTRICAL MACH.	0.21	0.25	0.37	0.83
47	ELECTRICAL MACHINERY	0.14	0.20	0.43	0.77
48	COMMUNICATIONS EQUIPMENT	0.00	0.04	0.05	0.10
49	ELECTRONIC EQUIPMENT	0.00	0 01	0.01	0.02
50	RAIL EQUIPMENT	0.17	0.10	0.22	0.49
51	MOTOR VEHICLES	0.01	0.18	0.39	0.59
52	OTH.TRANSPORT EQUIP.	0.14	0.06	0.14	0.33
53	OTH. MANUFACTURING	1.62	0.49	0.58	2.69
C. TOTAL (20-53)		**61.12**	**12.28**	**36.99**	**110.39**
54	CONSTRUCTION	0.00	1.03	0.18	1.21
55	ELECTRICITY ETC.	46.17	7.12	1.70	54.99
56	RAIL TRANSPORT SERVICE	3.02	0.38	1.48	4.88
57	OTHER TRANSPORT SERVICE	0.28	0 27	11.75	12.30
58	COMMUNICATION	0.00	0.03	0.03	0.06
59	TRADE	0 00	0.57	0.11	0.69
60	OTHER SERVICES	4.40	0 82	0.34	5.56
D. TOTAL (54-60)		**53.87**	**10.23**	**15.59**	**79.68**
GRAND TOTAL		**117.18**	**24.95**	**60.10**	**202.23**

TABLE 6.3B FUELWISE ENERGY FORECAST FOR DIFFERENT SECTORS FOR 2005 NORMAL (MTOE)

SN	COMMODITY SECTOR	Coal&lignite	Electricity	Oil & Gas	TOTAL
1	PADDY	0 19	0 26	1 23	1 68
2	WHEAT	0 40	0 51	0 64	1 56
3	OTHER CEREALS	0 00	0.02	0 29	0 31
4	PULSES	0 00	0 04	0 25	0 28
5	SUGARCANE	0 00	0 12	0.28	0 40
6	JUTE	0 00	0 00	0 00	0 00
7	COTTON	0 00	0.19	0.70	0 88
8	TEA	0 00	0 00	0 00	0 00
9	COFFEE	0 00	0 00	0 00	0.00
10	RUBBER	0 00	0 00	0 00	0 00
11	OTHER CROPS	0.41	0 28	2.24	2.92
12	ANIMAL HUSBANDRY	0 00	0 00	0 00	0 00
13	FORESTRY & LOGGING	0.00	0.00	0 16	0 16
14	FISHING	0.00	0 00	0 12	0.12
A . TOTAL (1-14)		**1.01**	**1.42**	**5.89**	**8.32**
15	COAL & LIGNITE	1 89	1 22	0 99	4 10
16	CRUDE PETROLEUM & N.GAS	0 00	0.08	1 17	1.25
17	IRON ORE	0.00	0 05	0.14	0.20
18	OTHER METALLIC MINERALS	0.02	0 22	0 19	0 43
19	NON MET.& MINOR MINERALS	0.02	0.25	1.33	1 60
B. TOTAL (15-19)		**1.93**	**1.82**	**3.82**	**7.57**
20	SUGAR	0.43	0.07	0.35	0.84
21	KHANDSARI BOORA	0 67	0.16	0 79	1 61
22	HYDROGENATED OIL	0 57	0.08	0 05	0.71
23	OTH.FOOD & BERERAGE IND	3.28	0.49	1.23	5.00
24	COTTON TEXTILES	5.82	2.04	1.98	9.84
25	WOOLLEN TEXTILE	0.49	0.09	0.13	0.71
26	ART SILK & SYNTH.FIBRE	2 11	3 65	1.37	7 13
27	JUTE,HEMP,MESTA TEXTILES	0.51	0.22	0.30	1.03
28	OTHER TEXTILE	1.33	0.43	0.51	2.27
29	WOOD & WOOD PRODUCTS	0.08	0.04	0.04	0.15
30	PAPER & PAPER PRODUCTS	4.56	0.70	0.52	5.77
31	LEATHER & LEATHER PROD.	0.21	0 07	0 11	0.39
32	RUBBER PRODUCTS	0.30	0.09	0.31	0.71
33	PLASTIC PRODUCTS	0.03	0.13	0.13	0.29
34	PETROLEUM PRODUCTS	0.01	0.17	21.33	21.50
35	COAL TAR PRODUCTS	21.77	0.17	0.23	22.16
36	FERTILIZERS	3.67	1.00	6.79	11.46
37	PESTICIDES	0.00	0.03	0 05	0.09
38	SYNTH.FIBRE & RESIN	1.27	0.37	0.98	2.62
39	OTHER CHEMICALS	1.82	1.48	3.79	7.08
40	CEMENT	3.87	0.32	0.14	4.33
41	OTH NON MET.MINERAL PROD	11.92	0.46	3.28	15.65
42	IRON & STEEL	18.75	1.80	2.69	23.23
43	NON FERROUS METALS	1.04	1.91	2.46	5.41
44	TRACTORS & OTH.AGRI.MACH	0.26	0.05	0 12	0 43
45	MACHINE TOOLS	0.02	0.03	0.03	0.08
46	OTH.NON ELECTRICAL MACH.	0.31	0.37	0 55	1.23
47	ELECTRICAL MACHINERY	0.21	0.29	0.64	1.14
48	COMMUNICATIONS EQUIPMENT	0.01	0.06	0.08	0.15
49	ELECTRONIC EQUIPMENT	0.00	0.01	0.01	0.03
50	RAIL EQUIPMENT	0.25	0.15	0.31	0.71
51	MOTOR VEHICLES	0.01	0.27	0.58	0.87
52	OTH.TRANSPORT EQUIP.	0.20	0 08	0 21	0 49
53	OTH. MANUFACTURING	2 37	0.72	0.85	3.95
C. TOTAL (20-53)		**88.13**	**18.01**	**52.94**	**159.09**
54	CONSTRUCTION	0 00	1.40	0.24	1.64
55	ELECTRICITY ETC.	65.58	10.11	2.42	78.10
56	RAIL TRANSPORT SERVICE	4.18	0.52	2.05	6 75
57	OTHER TRANSPORT SERVICE	0.39	0.38	16 35	17.11
58	COMMUNICATION	0.00	0 05	0 04	0.09
59	TRADE	0.00	0.79	0.16	0.95
60	OTHER SERVICES	6.05	1.13	0.46	7.65
D. TOTAL (54-60)		**76.19**	**14.38**	**21.72**	**112.29**
GRAND TOTAL		**167.27**	**35.64**	**84.37**	**287.27**

TABLE 6.3C FUELWISE ENERGY FORECAST FOR DIFFERENT SECTORS FOR 2005 HIGH (MTOE)

SN	COMMODITY SECTOR	Coal&lignite	Electricity	Oil & Gas	TOTAL
1	PADDY	0.23	0 30	1 43	1.96
2	WHEAT	0 47	0.60	0.75	1.82
3	OTHER CEREALS	0.00	0 03	0.33	0 36
4	PULSES	0.00	0 04	0.29	0.33
5	SUGARCANE	0 00	0.15	0 33	0.48
6	JUTE	0.00	0 00	0.00	0.00
7	COTTON	0.00	0.22	0 84	1.06
8	TEA	0.00	0 00	0.00	0 00
9	COFFEE	0.00	0.00	0 00	0.00
10	RUBBER	0.00	0 00	0 00	0 00
11	OTHER CROPS	0.48	0 32	2.63	3.44
12	ANIMAL HUSBANDRY	0.00	0.00	0.00	0 00
13	FORESTRY & LOGGING	0.00	0 00	0.18	0.19
14	FISHING	0.00	0.00	0.14	0 14
A . TOTAL (1-14)		**1.18**	**1.67**	**6.93**	**9.78**
15	COAL & LIGNITE	2.24	1.44	1.17	4 84
16	CRUDE PETROLEUM & N.GAS	0.00	0.10	1.36	1.46
17	IRON ORE	0.00	0.06	0.16	0.22
18	OTHER METALLIC MINERALS	0.02	0.26	0.23	0.51
19	NON MET.& MINOR MINERALS	0.02	0.29	1.52	1 83
B. TOTAL (15-19)		**2.29**	**2.14**	**4.44**	**8.87**
20	SUGAR	0.51	0.08	0.42	1.01
21	KHANDSARI BOORA	0.80	0.19	0.95	1.94
22	HYDROGENATED OIL	0.69	0.10	0.06	0.85
23	OTH.FOOD & BERERAGE IND.	3.94	0.58	1.47	5.99
24	COTTON TEXTILES	6.97	2.45	2 38	11.80
25	WOOLLEN TEXTILE	0.59	0.11	0.16	0.86
26	ART SILK & SYNTH.FIBRE	2.53	4.38	1.65	8.56
27	JUTE,HEMP,MESTA TEXTILES	0.60	0.27	0.36	1.23
28	OTHER TEXTILE	1.60	0.52	0.61	2.73
29	WOOD & WOOD PRODUCTS	0.09	0.04	0.04	0.18
30	PAPER & PAPER PRODUCTS	5.41	0.83	0.62	6.86
31	LEATHER & LEATHER PROD.	0.25	0.09	0.13	0.46
32	RUBBER PRODUCTS	0.36	0.11	0.37	0.85
33	PLASTIC PRODUCTS	0.04	0.15	0.15	0.35
34	PETROLEUM PRODUCTS	0.01	0.20	25.36	25.57
35	COAL TAR PRODUCTS	25.65	0.20	0.27	26.12
36	FERTILIZERS	4.34	1.18	8.00	13.53
37	PESTICIDES	0.00	0.04	0.06	0.10
38	SYNTH.FIBRE & RESIN	1.52	0.44	1.18	3.14
39	OTHER CHEMICALS	2.16	1.76	4.51	8.43
40	CEMENT	4.53	0.37	0.17	5.07
41	OTH.NON MET.MINERAL PROD	14.24	0.55	3.91	18.70
42	IRON & STEEL	22.22	2.13	3.19	27.54
43	NON FERROUS METALS	1.25	2.28	2.93	6.46
44	TRACTORS & OTH.AGRI.MACH	0.31	0.06	0.15	0 52
45	MACHINE TOOLS	0.02	0.04	0.04	0 10
46	OTH.NON ELECTRICAL MACH.	0.37	0.44	0.66	1.47
47	ELECTRICAL MACHINERY	0.25	0.35	0.77	1.36
48	COMMUNICATIONS EQUIPMENT	0.01	0.08	0.09	0.17
49	ELECTRONIC EQUIPMENT	0.00	0.02	0.02	0.04
50	RAIL EQUIPMENT	0.29	0.18	0.37	0.84
51	MOTOR VEHICLES	0 02	0.33	0.70	1.04
52	OTH.TRANSPORT EQUIP.	0.24	0.10	0.25	0.59
53	OTH. MANUFACTURING	2.83	0.86	1.02	4.71
C. TOTAL (20-53)		**104.65**	**21.50**	**62.99**	**189.14**
54	CONSTRUCTION	0.00	1.63	0.28	1.91
55	ELECTRICITY ETC.	77.62	11.97	2.86	92.44
56	RAIL TRANSPORT SERVICE	4.90	0.61	2.41	7.92
57	OTHER TRANSPORT SERVICE	0.45	0.44	19.21	20.11
58	COMMUNICATION	0.00	0.06	0.04	0.10
59	TRADE	0.00	0.93	0.19	1 12
60	OTHER SERVICES	7.08	1.32	0.54	8.94
D. TOTAL (54-60)		**90.05**	**16.97**	**25.53**	**132.54**
GRAND TOTAL		**198.16**	**42.27**	**99.89**	**340.33**

TABLE 6.3D FUELWISE ENERGY FORECAST FOR DIFFERENT SECTORS FOR 2010 LOW (MTOE)

SN	COMMODITY SECTOR	Coal&lignite	Electricity	Oil & Gas	TOTAL
1	PADDY	0 19	0 25	1 18	1.61
2	WHEAT	0 39	0 49	0 61	1 50
3	OTHER CEREALS	0 00	0 02	0 28	0 30
4	PULSES	0 00	0 04	0 24	0 27
5	SUGARCANE	0 00	0 11	0 26	0 37
6	JUTE	0 00	0 00	0 00	0 00
7	COTTON	0 00	0 17	0 64	0 81
8	TEA	0.00	0 00	0 00	0 00
9	COFFEE	0 00	0 00	0 00	0 00
10	RUBBER	0 00	0 00	0 00	0.00
11	OTHER CROPS	0 39	0 26	2 12	2 76
12	ANIMAL HUSBANDRY	0 00	0 00	0 00	0.00
13	FORESTRY & LOGGING	0.00	0.00	0 14	0 15
14	FISHING	0.00	0 00	0.12	0 12
A . TOTAL (1-14)		**0.96**	**1.34**	**5.47**	**7.77**
15	COAL & LIGNITE	1 72	1 11	0.90	3.72
16	CRUDE PETROLEUM & N GAS	0 00	0 08	1 10	1.18
17	IRON ORE	0 00	0 05	0 14	0 20
18	OTHER METALLIC MINERALS	0.02	0.20	0.18	0.40
19	NON MET & MINOR MINERALS	0.02	0.24	1.28	1.54
B. TOTAL (15-19)		**1.76**	**1.68**	**3.59**	**7.03**
20	SUGAR	0.39	0 06	0.32	0 77
21	KHANDSARI BOORA	0.61	0 14	0.72	1.47
22	HYDROGENATED OIL	0.52	0.08	0.05	0.64
23	OTH.FOOD & BERERAGE IND.	3.00	0 44	1.12	4.56
24	COTTON TEXTILES	5.30	1.86	1.81	8.97
25	WOOLLEN TEXTILE	0.45	0.08	0.12	0.65
26	ART SILK & SYNTH.FIBRE	1.92	3.32	1.25	6.50
27	JUTE,HEMP,MESTA TEXTILES	0.46	0.20	0.27	0.93
28	OTHER TEXTILE	1.21	0.39	0.46	2 07
29	WOOD & WOOD PRODUCTS	0.07	0.03	0.03	0.14
30	PAPER & PAPER PRODUCTS	4.13	0.63	0.47	5.23
31	LEATHER & LEATHER PROD	0 19	0.07	0.10	0.35
32	RUBBER PRODUCTS	0.28	0.08	0.28	0.65
33	PLASTIC PRODUCTS	0.03	0.12	0.12	0.26
34	PETROLEUM PRODUCTS	0 01	0 15	19.37	19.53
35	COAL TAR PRODUCTS	19 70	0 15	0.20	20.05
36	FERTILIZERS	2.78	0.76	5.63	9.17
37	PESTICIDES	0.00	0.03	0.05	0.08
38	SYNTH.FIBRE & RESIN	1.16	0.34	0.89	2.39
39	OTHER CHEMICALS	1.64	1.33	3.42	6.39
40	CEMENT	3.50	0.29	0.13	3.91
41	OTH.NON MET.MINERAL PROD	10.84	0.42	2.98	14.24
42	IRON & STEEL	17.01	1.63	2.44	21.08
43	NON FERROUS METALS	0.95	1.74	2.23	4.92
44	TRACTORS & OTH.AGRI.MACH	0.24	0.05	0.11	0.40
45	MACHINE TOOLS	0.01	0.03	0.03	0.08
46	OTH.NON ELECTRICAL MACH.	0.28	0.34	0.50	1.12
47	ELECTRICAL MACHINERY	0.19	0.26	0.58	1.04
48	COMMUNICATIONS EQUIPMENT	0.01	0 06	0.07	0 13
49	ELECTRONIC EQUIPMENT	0.00	0.01	0.01	0.03
50	RAIL EQUIPMENT	0.22	0.14	0.28	0.64
51	MOTOR VEHICLES	0.01	0.25	0.53	0.79
52	OTH.TRANSPORT EQUIP.	0.18	0.08	0.19	0.45
53	OTH. MANUFACTURING	2.16	0.66	0.78	3.59
C. TOTAL (20-53)		**79.44**	**16.22**	**47.56**	**143.22**
54	CONSTRUCTION	0.00	1.26	0.22	1.48
55	ELECTRICITY ETC.	59.26	9.14	2.19	70.59
56	RAIL TRANSPORT SERVICE	3.77	0.47	1.85	6.09
57	OTHER TRANSPORT SERVICE	0.35	0.34	14.77	15 46
58	COMMUNICATION	0.00	0 04	0.03	0.08
59	TRADE	0.00	0 72	0 14	0 86
60	OTHER SERVICES	5.45	1 02	0.42	6.89
D. TOTAL (54-60)		**68.83**	**12.99**	**19.62**	**101.43**
GRANT TOTAL		**150.99**	**32.24**	**76.34**	**259.57**

TABLE 6.3E FUELWISE ENERGY FORECAST FOR DIFFERENT SECTORS FOR 2010 NORMAL (MTOE)

SN	COMMODITY SECTOR	Coal&lignite	Electricity	Oil & Gas	TOTAL
1	PADDY	0 23	0 31	1.49	2 03
2	WHEAT	0 50	0 63	0 79	1 91
3	OTHER CEREALS	0 00	0 03	0 34	0 37
4	PULSES	0.00	0 05	0 30	0 35
5	SUGARCANE	0 00	0 18	0 40	0.58
6	JUTE	0.00	0 00	0.00	0.00
7	COTTON	0 00	0.29	1 09	1.37
8	TEA	0.00	0 00	0 00	0.00
9	COFFEE	0.00	0 00	0.00	0.00
10	RUBBER	0 00	0 00	0 00	0 00
11	OTHER CROPS	0.54	0 36	2.95	3 85
12	ANIMAL HUSBANDRY	0.00	0.00	0.00	0.00
13	FORESTRY & LOGGING	0.00	0 01	0 21	0.22
14	FISHING	0.00	0 00	0.15	0.15
A . TOTAL (1-14)		**1.27**	**1.85**	**7.71**	**10.83**
15	COAL & LIGNITE	3.38	2 17	1 76	7 31
16	CRUDE PETROLEUM & N.GAS	0.00	0 11	1.47	1.58
17	IRON ORE	0.01	0.12	0.30	0 43
18	OTHER METALLIC MINERALS	0.03	0.39	0.35	0.77
19	NON MET & MINOR MINERALS	0.03	0 36	1.92	2 32
B. TOTAL (15-19)		**3.45**	**3.15**	**5.81**	**12.41**
20	SUGAR	0.66	0.11	0.54	1.31
21	KHANDSARI BOORA	1.03	0.24	1.23	2.50
22	HYDROGENATED OIL	0.89	0 13	0.08	1.10
23	OTH.FOOD & BERERAGE IND.	5.08	0.75	1.89	7.72
24	COTTON TEXTILES	9.04	3 17	3.08	15.29
25	WOOLLEN TEXTILE	0.76	0 14	0.21	1 11
26	ART SILK & SYNTH.FIBRE	3.28	5.68	2.14	11.10
27	JUTE,HEMP,MESTA TEXTILES	0.77	0.34	0.46	1 57
28	OTHER TEXTILE	2.07	0.67	0.79	3.54
29	WOOD & WOOD PRODUCTS	0.12	0.06	0.06	0.23
30	PAPER & PAPER PRODUCTS	6.89	1.05	0.78	8.73
31	LEATHER & LEATHER PROD	0.32	0 11	0 17	0.60
32	RUBBER PRODUCTS	0.47	0.14	0.48	1.09
33	PLASTIC PRODUCTS	0.05	0.20	0.20	0.45
34	PETROLEUM PRODUCTS	0.01	0.26	32.34	32.62
35	COAL TAR PRODUCTS	43.86	0.34	0.45	44.66
36	FERTILIZERS	5.08	1.38	9.07	15.53
37	PESTICIDES	0.00	0.05	0.07	0 13
38	SYNTH.FIBRE & RESIN	1.98	0.57	1.53	4 08
39	OTHER CHEMICALS	2.79	2.27	5.81	10.87
40	CEMENT	5.39	0.44	0.20	6.03
41	OTH.NON MET.MINERAL PROD	18.36	0.71	5.05	24.11
42	IRON & STEEL	58.81	5.63	8.31	72.75
43	NON FERROUS METALS	1.84	3.37	4.32	9.52
44	TRACTORS & OTH.AGRI.MACH	0.39	0.08	0.18	0 65
45	MACHINE TOOLS	0 02	0 05	0 05	0.13
46	OTH.NON ELECTRICAL MACH.	0.49	0.58	0.86	1.93
47	ELECTRICAL MACHINERY	0.32	0.45	0.99	1.75
48	COMMUNICATIONS EQUIPMENT	0.01	0.10	0.12	0.23
49	ELECTRONIC EQUIPMENT	0.01	0.02	0.02	0.05
50	RAIL EQUIPMENT	0.38	0 23	0.49	1.10
51	MOTOR VEHICLES	0.02	0.42	0.90	1.35
52	OTH.TRANSPORT EQUIP.	0.31	0.13	0.32	0.75
53	OTH. MANUFACTURING	4.02	1.23	1.45	6.69
C. TOTAL (20-53)		**175.52**	**31.11**	**84.62**	**291.25**
54	CONSTRUCTION	0.00	1.91	0.33	2.24
55	ELECTRICITY ETC.	105.42	16.25	3.78	125.44
56	RAIL TRANSPORT SERVICE	6.42	0.80	3.15	10.37
57	OTHER TRANSPORT SERVICE	0.57	0 55	23.88	24 99
58	COMMUNICATION	0.00	0 07	0 05	0.12
59	TRADE	0.00	1.16	0.23	1.39
60	OTHER SERVICES	8.48	1 59	0.65	10.72
D. TOTAL (54-60)		**120.88**	**22.33**	**32.07**	**175.28**
GRANT TOTAL		**301.12**	**58.43**	**130.22**	**489.77**

TABLE 6.3F FUELWISE ENERGY FORECAST FOR DIFFERENT SECTORS FOR 2010 HIGH (MTOE)

SN	COMMODITY SECTOR	Coal&lignite	Electricity	Oil & Gas	TOTAL
1	PADDY	0 29	0.38	1 82	2 48
2	WHEAT	0 61	0 77	0 96	2 35
3	OTHER CEREALS	0 00	0 03	0 42	0 45
4	PULSES	0 00	0 06	0 37	0 43
5	SUGARCANE	0 00	0 22	0 51	0 73
6	JUTE	0 00	0.00	0 00	0 00
7	COTTON	0 00	0 37	1 38	1 74
8	TEA	0 00	0 00	0 00	0 00
9	COFFEE	0 00	0 00	0.00	0 00
10	RUBBER	0 00	0 00	0 00	0 00
11	OTHER CROPS	0.67	0 45	3 65	4 77
12	ANIMAL HUSBANDRY	0.00	0 00	0.00	0 00
13	FORESTRY & LOGGING	0 00	0 01	0 26	0 26
14	FISHING	0.00	0 00	0 19	0.19
A. TOTAL (1-14)		**1.56**	**2.29**	**9.55**	**13.40**
15	COAL & LIGNITE	3.44	2.21	1.80	7.45
16	CRUDE PETROLEUM & N.GAS	0.00	0 15	2.04	2 19
17	IRON ORE	0 01	0 09	0 22	0.31
18	OTHER METALLIC MINERALS	0.04	0.41	0.37	0.81
19	NON MET & MINOR MINERALS	0.03	0 41	2.15	2.59
B. TOTAL (15-19)		**3.51**	**3.26**	**6.58**	**13.36**
20	SUGAR	0.84	0.13	0.69	1.66
21	KHANDSARI BOORA	1.31	0.30	1.56	3 17
22	HYDROGENATED OIL	1.13	0 16	0.10	1.39
23	OTH FOOD & BERERAGE IND	6 44	0 95	2.40	9.79
24	COTTON TEXTILES	11.46	4 03	3 91	19.40
25	WOOLLEN TEXTILE	0.97	0.18	0.26	1.41
26	ART SILK & SYNTH.FIBRE	4.17	7.21	2.72	14.09
27	JUTE,HEMP,MESTA TEXTILES	0.96	0.43	0 57	1.95
28	OTHER TEXTILE	2.63	0.85	1.01	4.49
29	WOOD & WOOD PRODUCTS	0.14	0.07	0.07	0 28
30	PAPER & PAPER PRODUCTS	8 50	1.30	0.97	10 77
31	LEATHER & LEATHER PROD.	0.41	0.14	0.21	0.76
32	RUBBER PRODUCTS	0.59	0 18	0.61	1.38
33	PLASTIC PRODUCTS	0.06	0 25	0.25	0.56
34	PETROLEUM PRODUCTS	0.02	0 31	39.65	39.97
35	COAL TAR PRODUCTS	38.68	0.30	0.40	39.39
36	FERTILIZERS	6.34	1.72	11.27	19.34
37	PESTICIDES	0.01	0.06	0.09	0.16
38	SYNTH.FIBRE & RESIN	2.50	0.73	1.93	5.17
39	OTHER CHEMICALS	3.43	2.79	7.15	13.37
40	CEMENT	6.58	0.54	0.24	7.37
41	OTH.NON MET.MINERAL PROD	23.01	0.88	6.33	30.22
42	IRON & STEEL	34.54	3.31	4.95	42.81
43	NON FERROUS METALS	2.01	3 67	4.72	10.39
44	TRACTORS & OTH.AGRI.MACH	0.49	0.10	0.23	0 82
45	MACHINE TOOLS	0.03	0.07	0.07	0 16
46	OTH.NON ELECTRICAL MACH	0.61	0.72	1.07	2.39
47	ELECTRICAL MACHINERY	0.40	0.56	1.23	2.19
48	COMMUNICATIONS EQUIPMENT	0.01	0.12	0.15	0.29
49	ELECTRONIC EQUIPMENT	0.01	0 02	0.03	0.06
50	RAIL EQUIPMENT	0.46	0.28	0.58	1.32
51	MOTOR VEHICLES	0.03	0 53	1.13	1.69
52	OTH.TRANSPORT EQUIP	0.39	0.16	0.40	0.95
53	OTH. MANUFACTURING	4.52	1.38	1.63	7.53
C. TOTAL (20-53)		**163.66**	**34.45**	**98.55**	**296.66**
54	CONSTRUCTION	0.00	2.31	0.39	2.71
55	ELECTRICITY ETC.	119.27	18.39	4.39	142.05
56	RAIL TRANSPORT SERVICE	7.19	0.90	3.53	11.62
57	OTHER TRANSPORT SERVICE	0.67	0.65	28.43	29.76
58	COMMUNICATION	0 00	0 08	0 06	0 15
59	TRADE	0.00	1.38	0.28	1.65
60	OTHER SERVICES	10.22	1.91	0 79	12.92
D. TOTAL (54-60)		**137.36**	**25.62**	**37.88**	**200.86**
GRAND TOTAL		**306.10**	**65.62**	**152.55**	**524.27**

TABLE 6.4 TOTAL ENERGY FORECAST FUELWISE FOR DIFFERENT SCENARIOS (ECONOMY)

(MTOE)

Fuel\Year	2005-LOW	2010-LOW	2005-NORMAL	2010-NORMAL	2005-HIGH	2010-HIGH
Coal & lignite	117.18	150.99	167.27	301.12	198.16	306.10
Electricity	24.95	32.24	35.64	58.43	42.27	65.62
Oil & Gas	60.10	76.34	84.37	130.22	99.89	152.55
Total	**202.23**	**259.57**	**287.27**	**489.77**	**340.33**	**524.27**

TABLE 6.5 TOTAL ENERGY FORECAST FOR AGGREGATE SECTORS FOR DIFFERENT SCENARIOS (MTOE)

Sector\fuel	Coal & lignite	Electricity	Oil & Gas	Total
		A. 2005LOW		
Agri(1-14)	0.82	1.13	4.67	6.62
Inter(15-19)	1.37	1.31	2.86	5.54
Mfg(20-53)	61.12	12.28	36.99	110.39
Services(54-60)	53.87	10.23	15.59	79.68
Total	**117.18**	**24.95**	**60.10**	**202.23**
		B. 2010LOW		
Agri(1-14)	0.96	1.34	5.47	7.77
Inter(15-19)	1.76	1.68	3.59	7.03
Mfg(20-53)	79.44	16.22	47.56	143.22
Services(54-60)	68.83	12.99	19.62	101.43
Total	**150.99**	**32.24**	**76.34**	**259.57**
		C. 2005NORMAL		
Agri(1-14)	1.01	1.42	5.89	8.32
Inter(15-19)	1.93	1.82	3.82	7.57
Mfg(20-53)	88.13	18.01	52.94	159.09
Services(54-60)	76.19	14.38	21.72	112.29
Total	**167.27**	**35.64**	**84.37**	**287.27**
		D. 2010NORMAL		
Agri(1-14)	1.27	1.85	7.71	10.83
Inter(15-19)	3.45	3.15	5.81	12.41
Mfg(20-53)	175.52	31.11	84.62	291.25
Services(54-60)	120.88	22.33	32.07	175.28
Total	**301.12**	**58.43**	**130.22**	**489.77**
		E. 2005HIGH		
Agri(1-14)	1.18	1.67	6.93	9.78
Inter(15-19)	2.29	2.14	4.44	8.87
Mfg(20-53)	104.65	21.50	62.99	189.14
Services(54-60)	90.05	16.97	25.53	132.54
Total	**198.16**	**42.27**	**99.89**	**340.33**
		F. 2010HIGH		
Agri(1-14)	1.56	2.29	9.55	13.40
Inter(15-19)	3.51	3.26	6.58	13.36
Mfg(20-53)	163.66	34.45	98.55	296.66
Services(54-60)	137.36	25.62	37.88	200.86
Total	**306.10**	**65.62**	**152.55**	**524.27**

The results thus derived can be compared with that of other studies and the government of India forecasts. The results estimated give a detailed forecast. The total energy forecast for 2005 low is 202.23 MTOE and 2005 high is 340.23 MTOE. The energy requirements could be anywhere between these, depending on the growth path taken by the Indian Economy.

6.3 Input - Output and Linear Programming Model

As discussed in chapter V, many economic planners have recognized that interindustry analysis can be used within the context of Linear Programming models. The integration of Input - Output analysis and linear programming technique can provide much information not available from separate application of either technique. The interindustry model derives the technical interrelationships between economic sectors and linear programming algorithm strives to achieve a stated objective. Here the objective is to maximize the value added while minimizing the energy consumption, given the existing technological and energy constraints.

The Model

$$\text{Max } Z = (GDP)$$

$$= (VX)$$

subject to

$$(I - A+M)X >= F$$

$$RX <= B$$

Where,

V = 1 x n vector of direct income coefficients, i.e., ratio of sectoral income to total sales for each sector.

X = n x 1 Vector of sector outputs, i.e., the dependent variable of the model

R = m x n matrix of energy coefficients.

B = m x 1 vector of available energy resources.

I = n x n unit matrix

A = n x n matrix of technical coefficients.

F = n x 1 vector of final demand.

M = Import Coefficient Matrix (Diagonal matrix)

In the model, (VX) is the objective to be maximized. The first set of constraints indicates that the sum of the domestic output and importation in each industry sector must be equal to the intermediate requirements by other sectors and the final demand sector. The second constraint R <= B represents the total supply of energy resources. After satisfying the final consumption demand, the remaining amount of energy is available for production. The results are provided in table 6.5 in an aggregated 37 sector level (Table 6.6). If the production process allowed to take its course according to economic principle, there are nearly fourteen industries that are economically unviable to continue the production process. The objective on of these industries carried a value of zero, indicating the inefficient use of energy resources. When we run the sensitivity analysis, their allowable decrease was infinity,

TABLE : 6.6 Estimated Output for different Scenarios by Industrial Group, (Rs. Million)

L.Prog Ind.Code	I-O Table Ind.Code	Sector	SCENARIO 2005Low	2010Low	2005Nor	2010Nor	2005High	2010High
S1	[1,2,3]	CEREALS	3507309	4635742	5485046	4338955	6373566	7975376
S2	[4]	PULSES	123678.2	145926	170393	140940.9	175657.4	215391.2
S3	[5]	SUGARCANE	117110.2	159213.6	189043.2	148447.3	226131.9	283939
S4	[6]	JUTE	667.786	992.123	1188.672	906.2062	1528.303	1938.244
S5	[7]	COTTON	853.2422	1349.119	1626.113	1216	2184.42	2786.197
S6	[8]	TEA	48772.12	72907.44	87412.54	66515.02	112914.6	143300
S7	[9]	COFFEE	4466.827	5692.977	6710.796	5391.924	7546.541	9387.849
S8	[10]	RUBBER	7987.266	12175.31	14600.46	11025.5	19081.75	24205.67
S9	[11]	OTHER CROPS	716360 4	898339.6	1056524	853732.4	1167564	1448595
S10	[12]	ANIMALHUSBANDRY	615875.7	743134.9	870213.2	713616.3	921632.7	1135395
S11	[13]	FORESTRY & LOG	83281.63	101302.7	116680	94307.54	121652.5	150066.1
S12	[14]	FISHING	55582 64	66748.91	78122.93	64184.83	82287.34	101280.8
S13	[15,55]	COAL,LIG & ELECT	7256.227	10924.25	12585.68	8065.11	13458 82	16792.53
S14	[16]	CRUDE & N.GAS	16911.33	37076.89	48337.15	26382.62	64610.33	88216.48
S15	[17,18,42]	IRON ORE & STEEL	56696.87	73264.63	79644.56	59921.87	78248.26	84212.2
S16	[19,41,43]	NON MET MIN.PROD	9648.605	13624.73	15797.68	11984.78	17799.67	17104.15
S17	[20,21]	SUGAR & KHANDSA	145245.6	218367.3	261962.7	198978.3	339819.1	431517.7
S18	[22,23]	OTH FOOD & OIL	597052.2	892508.9	1070075	814254.9	1382263	1754231
S19	[24 TO 28]	TEXTILE COT&SYN	395787.1	594514.2	713113.8	541790.2	924391.3	1173611
S20	[29,30]	WOOD&PAPERPROI	25574.39	35568.01	40796.21	30917.64	47677.95	59974.92
S21	[31]	LEATHER & PROD	97535.25	146651.1	175928.4	133624.4	228218	289759.8
S22	[32,33]	RUBBER&PL PROD	97830.35	145745.4	174377.5	132632.3	224103.7	283617.8
S23	[34]	PETRO.PROD	209093.9	299378.3	355627.3	273080.1	440661.2	552750.4
S24	[35]	COAL TAR PROD	5551.092	6091.135	5728.594	4235.406	3156.073	3387.512
S25	[36 TO 39]	CHEM.FERT&PESTI	45357.42	49796.25	57512.68	48932.77	53648.37	64619.74
S26	[40]	CEMENT	6464.407	6278.805	5075.581	3611.621	132.4092	199.4789
S27	[44,45,46]	NON.ELEC.MECH .	115657.4	173742.1	208323.1	158033	269590.7	342187.7
S28	[47]	ELEC.MECH	214759.2	319487	380968.1	289231.3	487769.8	618098.4
S29	[48]	COM.EQUIPMENT	61424.4	92102.34	110396.8	83881.65	142680	180378.5
S30	[49]	ELECTRONICEQUIP	15871.71	23857.17	28615.87	21734.87	37106.55	47101.02
S31	[50]	RAIL EQUIPMENT	48577.01	73008.01	87569.96	66515.34	113326.3	142809.4
S32	[51,52]	MOTAR VEH&OTH	63939.99	95160.21	113952.1	86771.56	146476.7	185285.4
S33	[53]	OTH .MFG	219542 8	326739	390535.8	296922.6	479321.8	501985.7
S34	[54]	CONSTRUCTION	159935.6	153849.3	123276.1	88906.39	0	0
S35	[56,57]	RAIL&OTHER TRANS	407905	555942.6	647458.5	499790.1	752003	921638.8
S36	[58]	COMMUNICATION	57817.6	79144.6	92221.49	71070.93	107351	130762.3
S37	[59,60]	TRADE & SERVICES	847229.5	1152237	1342018	1037043	1556742	1909368
TOTAL(ALL SECTORS)			**9210610**	**12418584**	**14619460**	**11427551**	**17122303**	**21291272**

meaning, the operation of the industry could be reduced infinity or till they are closed down. There have been serious efforts and reform measures to increase efficiency, productivity and competitiveness of PSU's (public sector units). But serious institutional, legal and political bottlenecks obstruct a comprehensive overhaul of India's industrial structure. PSU reform is necessary to improve overall industrial growth and productivity, since the weightage of the public sector in the country's GDP is substantial, and vital sectors including energy, power and telecommunications, as well as chemicals, refining and mining are concentrated in this sector. These are some of the sectors which are highly energy intensive. If the policy measures strive to attain maximum economics growth with minimum energy uses then a viable exit policy is an imperative.

6.4 Policy Implications

Given the various scenarios (Tables 6.3, 6.4, 6.5), the policy makers can trade off between the cost and the benefit. If the policy is to incur heavy expenditure on energy supply in order to maintain a higher growth rate in GDP or it can trade off for a lower growth rate or making a very conservative policy. The implication here is that the enhanced required energy need to be imported (petroleum products) on the domestic crude expected not to exceed the highest level achieved in 1989-90, 34.5 million tones — continues to 2010.

6.4.1 Achieving a certain Economic Growth Rate with Minimum consumption of supply.

Theoretically, when the marginal revenue products of energy input to each sector are all equal, the economy achieves its best allocation of energy resources. Put it differently, to achieve this allocation of energy resources on marginal cost and marginal revenue principle, energy should be allocated to these sectors efficient in energy use. The key is to define realistic amount of energy for allocation and to identify the potential capacity of each sector able to absorb these available energy resources. These aspect can be reviewed from the I-O - LP model.

6.4.2 Relationship between Energy Demand/Supply and Economic Development/Growth

Since the 'lead time' or the time lag and the cost of energy project investment are significant, projection of energy supply and demand is an important task. For example, the central Electricity Authority (CEA) has forecasted additional generation capacity of 30,537 MW during the 8th plan, however, the total generation capacity added so far lags far behind the projected target. Faced with shortage of funds the Department of Power (DOP) revised the target to 19,000 MW in 1994. A confidential internal exercise undertaken by DOP in August 1995 has revealed that only 50% of even this revised target will be commissioned.

Against a target of 12,958 MW, only 9,500 MW will be produced by the Government of India (GOI) owned units, i.e., the National Thermal Power corporation, National Hydropower Corporation and the Atomic Energy commission With all these plans, projections and concerted effort the power shortage will continue to be identical with present scenario, i.e., 9% in energy and 21% in peak time power. The CEA in its 15th electric power survey (to be published shortly), has computed the additional generation capacity target during 1999-2002 (Ninth plan) at 56,800 MW this is based on the assumption that the additional capacity generated during eighth plan would be 20,000 MW. GOI officials are of the opinion that both the central and state governments might not be able to find resources for more than 20,000 MW and the rest is expected to come from private sectors and the cost is estimated to be Rs. 147 billion over next seven years, and an average of Rs. 21 billion each year from now.[6] This is almost equal to the entire gross domestic investment in electricity, gas, and water sector where all investment so far has been made by the government sector. This type of problem requires an effective tool for projection and analysis such as to contain the projections within the resource constrain.

Descriptive, predictive and normative models discussed in section 3.1 are all capable of making such projections. For example, the input-output multipliers and coefficients models used in this study are typical descriptive models. The Leontief Matrix $(I-A+M)^{-1}$, describes detailed information on the economy. Econometrics models such as the one discussed earlier are predictive in nature. Based on past trend it is predicted that the economy will continue to perform as it has done previously. The I-O-LP models are normative models.

As argued in chapter three, in the field of energy economics and policy, the managerial approach serves as a research tool better than other approaches. In the process of energy planning, the managerial role of the government should legitimately be taken into account. The energy-economy could perform better if the government were appropriately involved in accordance with certain fundamental economic principles. However, one point should be borne in mind, i.e., solution and conclusions of this type of model imply an "optimal" which is generally "better" than the real situation. In reality, the economy may always perform less than the optimum due to poor management of unmanageable factors. Hence, any solution arrived at with different types of models can only be taken as a pointer towards a better solution by the government effort.

6.4.3 Lowering Energy Elasticity

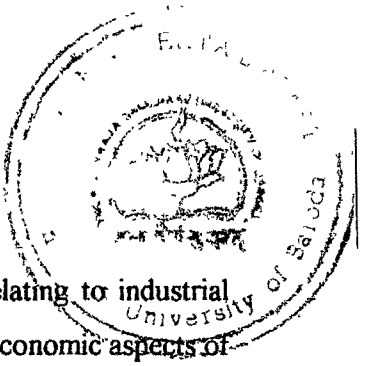
Lowering energy elasticity depends on both non-economic and economic constraints. The non economic aspects relates to the institutional and political arrangement and configuration of the political system. As mentioned earlier, Indian industrial sector needs a structural revamp on the basis of marginal cost and marginal benefit principle, to that extent, viable exit policy is a must. Energy pricing needs to be rationalized. This point will be further developed in the next chapter. The economic aspects focusses on two major points.

(1) The energy intensity of each sector

(2) the proportional weights of energy intensive sectors as compared with less-energy-intensive sectors.

Agriculture, machinery, household electrical appliances electronic products other transport equipments and service sectors (refer table 5.1) have relatively low energy/income final demand coefficients while fertilizer, chemical products, petroleum products, cement, non-metallic mineral products, iron and steel, electricity are relatively energy intensive with high energy/income final demand coefficients. Taking the weights of each industry in relation to their energy/income coefficients, the government could direct the economy toward the optimal production patterns.

A relevant point regarding a lowered energy elasticity should be noted. A feature of the Indian power scene that causes concern is the decreasing share of hydro power as compared to thermal. The share of hydro capacity was 42 percent of the total capacity in 1980 but only 27 percent as on March 1994. The central government has initiated action for evolving ways and means to increase the share of hydro power in the total installed capacity to 40 percent by the year 2002. As seen from table 2.1, India's hydro potential at 84,044 MW with 60 percent load factor, which would mean an annual energy generation of 600 Billion units. Development of hydro power would reduce the energy intensity of electricity and provide energy with in a cleaner environment.



6.5 Industrial Restructuring

We have already discussed certain institutional bottlenecks relating to industrial restructuring. In the following section attention is focussed on certain economic aspects of industrial restructuring.

In an input-output frame of analysis, each sector of the economy is evaluated within the larger perspective of the whole economy not related as an independent body. When a summary look of the I-O table may give an impression that certain sectors have no connection with other sectors as they do not receive output from the former sector. On the other hand a close scrutiny of the $(I-A)^{-1}$ Matrix reveal how all the sectors of the economy connected and interconnected and the chain goes on. For example, fertilizers (No.36), electricity (No.55), coal and tar products (35) are both relatively energy-intensive activities and units of energy-income final coefficients. This is because, these industries produce products which are important intermediate inputs for other energy efficient sectors of the economy. For example, industries communication (58), Trade (59) and other services have very low energy coefficients. This is because, these industries productions are influenced by the "derived demand" forces from other sectors.

Forward and Backward Linkages: The "derived demand" depends upon how strong the forward and backward linkages of each sector tied other sectors of the economy. Rasmussen(1957). In an input-output methodology this is being captured with the $(I-A)^{-1}$ matrix higher the value, greater the resonance that sector has with rest of the economy. Depending upon the economies of scale from the producing sector, greater inputs are given to the supplying sector. Through these two factors we can determine the key sectors in the economy and promote them in order to promote the whole sectors of the economy.

6.6 Strategic Reserves

Promoting the producing and supplying sectors of the economy requires the uninterrupted supply of energy sources, mainly for sources with high dependency ratio. The event of 1973 oil embargo left with two arguments : one that goes well with the monopoly power of OPEC and the other is pure whimsical and non economic attitude to inflict more damage upon OPEC themselves in order to inflict upon the non-OPEC countries. Given the perpetual political turbulence in the middle east, from where India relies for most of her petroleum imports, any crisis in the middle east can lead to a greater impact on the national economy.

Energy security has two parts:

(a) Development of long term policies to avoid situations in which a limited disruption in supplies can do serious damage; and

(b) the mitigation of the consequences if a disruption should occur.

One of the alternatives for maintenance of strategic reserves could be that the stocks are managed by a common agency. This option is followed in Denmark, Germany, Netherlands and France. From the point of view of economies of scale and operating flexibility, this option seems to be suitable for India. It is suggested that strategic reserves are developed only for mass consumption products such as HSD, MS, SKO and LPG.

Since maintaining strategic reserves involves equation of additional tankage calling for major investment in infrastructure, development of strategic reserve in respect of MS, HSD and SKL is suggested in three phased manner (see table below)

Requirement of Strategic Reserves for MS, HSD and SKO

Phase	Period	Days cover	Strategic Tankage(MMT)
I	1996-2000	-	-
	2001-2005	-	5
II	2006-2010	60	13
III	Beyond 2010	90	24

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