



सत्यमेव जयते

ENERGY STATISTICS

2017



CENTRAL STATISTICS OFFICE

MINISTRY OF STATISTICS AND PROGRAMME IMPLEMENTATION

GOVERNMENT OF INDIA

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2017
(Twenty Fourth Issue)

CENTRAL STATISTICS OFFICE
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GOVERNMENT OF INDIA
NEW DELHI

FOREWORD

Energy being a strategic commodity plays a significant role in economic development of a country. Energy systems in India have evolved over last six decades along with country's economic development, supporting the aspiration of 1.2 billion people, within the framework of democratic polity, globally integrated economy and environmentally sensitive regime. Ever increasing demand of energy has posed tremendous pressure on its limited resources and has necessitated optimum use of its resources. India pursued a reformed development agenda since 1991. Significant effort has gone into improving energy availability, as support to country's development initiatives.

For proper planning, statistics plays a vital role. This publication, 24th in the series is an annual publication of CSO and is a continued effort to provide a comprehensive picture of Energy Sector in India. **Energy Statistics** is an integrated and updated database of reserves, installed capacity, production, consumption, import, export and whole sale prices of different sources viz. coal, crude petroleum, natural gas and electricity. Energy Balance and Sankey Diagram (Energy flow diagram) further aims to enhance its utility. Some of the data may not match with the previous issues owing to definition or data revision by source ministries.

This is for the first time that theme wise energy indicators are being brought out by CSO as part of **Energy Statistics** for the use of policy makers as well as for comprehensive reporting. Indicators play a vital role by turning data into information for policy makers and help in decision-making. They also simplify a complex and large information base, thus providing a "synthesis" view of prevailing situation.

Identification of list of indicators depends on various factors as transparency, scientific validity, robustness, sensitivity and the extent to which they are linkable to each other. However no single factor can decide all indicators and all situations since each indicator needs different data sets. The indicators are selected on the guidelines/approach followed by IAEA in their publication "Energy Indicators for Sustainable Development: Guidelines and Methodologies", which was brought out in corporation with United Nations Department of Economic and Social Affairs (UNDESA), International Energy Agency (IEA), Eurostat and European Environmental Agency (EEA).

The data in the publication has been sourced from the subject Ministries of the Government of India. The co-operation and support provided by these Ministries/Departments in compiling this publication is appreciated. I also appreciate the efforts of the officers of Economic Statistics Division, Central Statistics Office in bringing out this publication in a time bound manner. I hope the publication will prove to be useful to the policy makers, planners and researchers working in field of Energy. It shall be CSO's endeavour to continuously improve the publication both in content and design with the help of user feedback and data source agencies.

March
New Delhi

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DIRECTOR GENERAL, CSO

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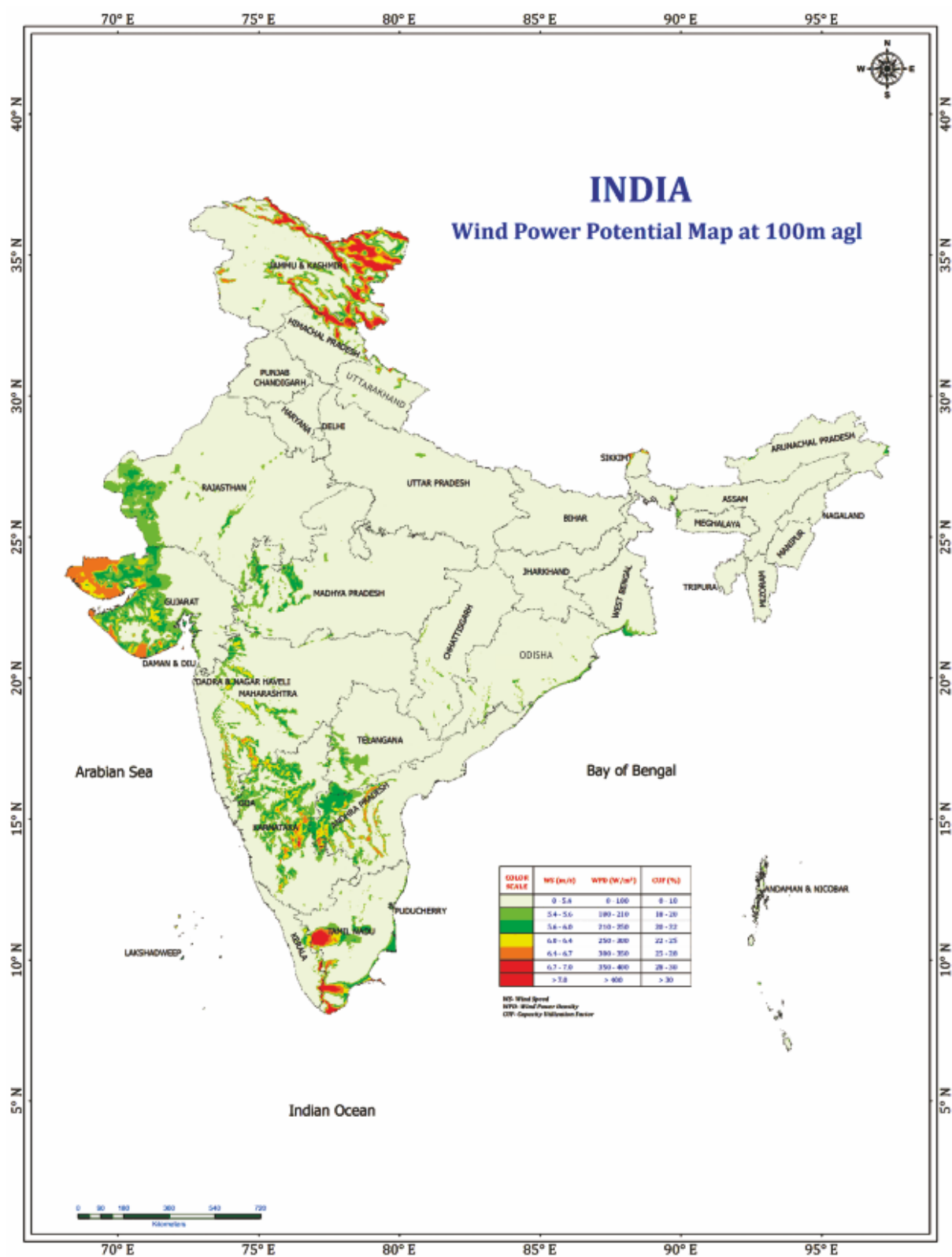
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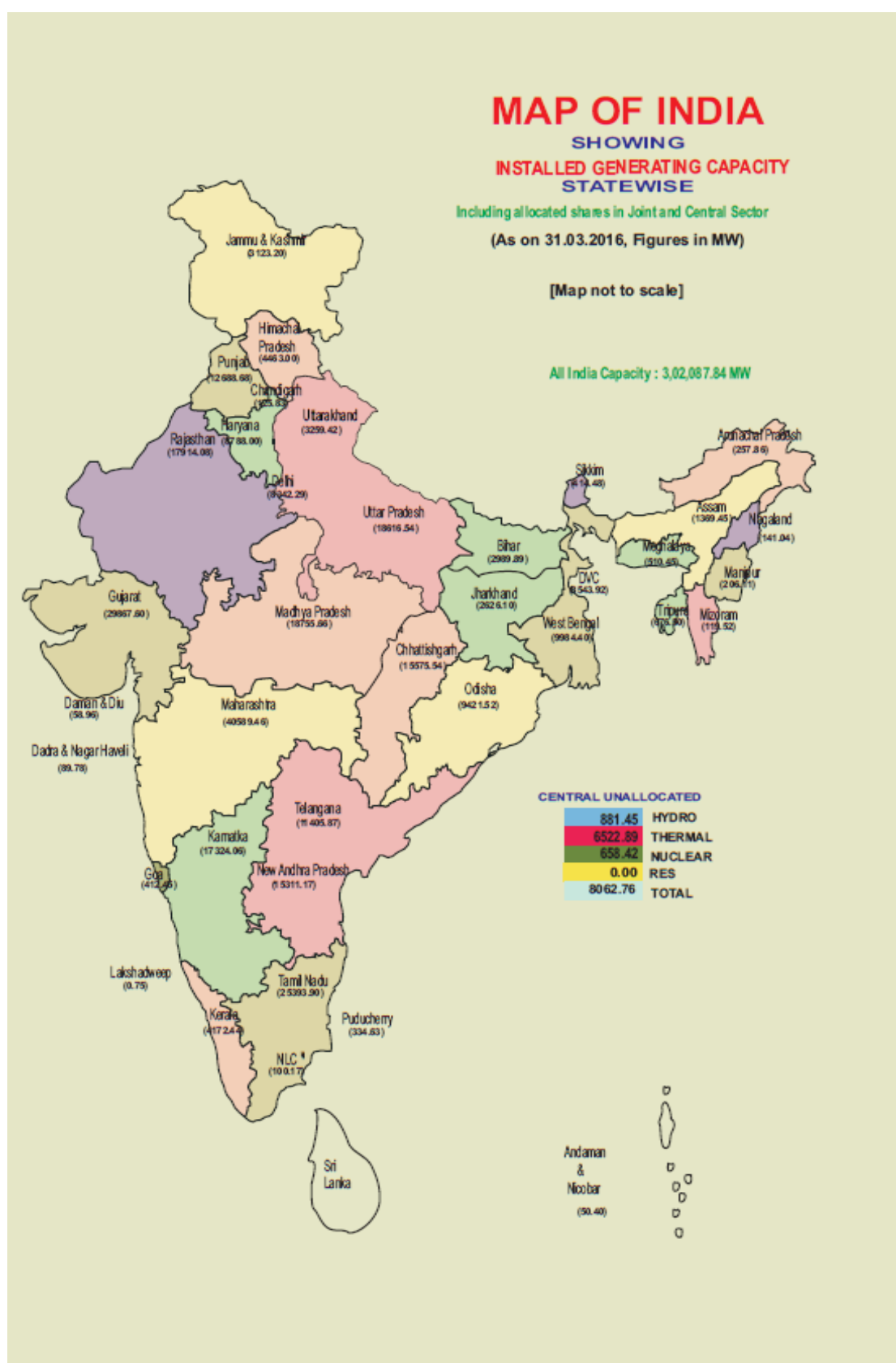
ENERGY MAPS OF INDIA

Map 1: Wind Power Potential at 100m agl



Source: Ministry of New and Renewable Energy

Map 2: Installed Generating Capacity in India



Source: Central Electricity Authority

METADATA-ENERGY STATISTICS

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2. Statistical presentation	
2.1 Data sources	
The data contained in this publication has been sourced from the Ministry of Petroleum and Natural Gas, Central Electricity Authority, Office of Coal Controller, Ministry of New and Renewable Energy and Office of the Economic Advisor, Ministry of Commerce and Industry.	
2.2. Data description	
The statistics present information about the reserves, installed capacity, potential for generation, production, consumption, import, export and wholesale price of different energy commodities.	
2.3. Sector coverage	
Coal & Lignite, Petroleum & Natural Gas, Renewable Energy Resources and Electricity. (Data collection Mechanism is given in Annex:V.)	
2.4. Data content	
The Statistics are given by type of fuel and energy source. The publication includes analytical indicators viz. Growth Rates, Compound Annual Growth Rates (CAGR), Percentage Distributions and Economics Energy Indicators.	
2.5. Statistical unit	
Data are aggregated appropriately at national and state level.	
2.6. Statistical population	
Data covers all the energy commodity sources.	
2.7. Reference area	
The energy industries of the entire country are covered.	
2.8. Time coverage	
In the current publication the data given is for the period 2006-07 to 2015-16 and is based on statistics compiled by the Ministry of Petroleum and Natural Gas, Central Electricity Authority, Office of Coal Controller, Ministry of New and Renewable Energy and Office of the Economic Advisor, Ministry of Commerce and Industry.	
2.9. Base period	
2004-05 for WPI and 2011-12 for GDP data pertaining to 2011-12 to 2015-16	
2.10. Statistical concepts and definitions	
The main Concepts and Definitions are given in Annex: I. (Annex: II & Annex: III respectively give certain Conversion Factors and Abbreviations used.) Annex IV gives categorization of coal in India Annex V gives details of definitions and concepts of Economic Energy Indicators.	

3. Unit of measure

Energy quantities data are recorded in physical units relevant to the product in question (GWh for electricity, 1000 Tonne for petroleum products etc.). Prices are indicated by Wholesale Price Index. The Energy Balance is given in Kilo Tonne of oil equivalent. Consumption and Production of the Energy resources is also given in petajoules.

4. Reference period

Reference period of the Publication of "Energy Statistics -2017" is the financial year 2015-16 and the previous financial years since 2006-07.

5. Institutional mandate**5.1. Legal acts and other agreements**

No legal acts, however this statistics is collected in view of the mandate of the Ministry in allocation of Business rules.

5.2. Data sharing

The publication is disseminated on the website of the Ministry (MOSPI) and is available free of cost.

6. Confidentiality**6.1. Confidentiality – policy and data treatment**

Confidentiality of the data is maintained by the data source ministries.

7. Release policy**7.1. Release calendar**

Publication of Energy Statistics is released on MOSPI's web-site in March every year.

7.2. User access

MOSPI disseminates Economic statistics on its website in an objective, professional and transparent manner in which all users are treated equitably. The detailed arrangements are governed by the dissemination policy of Government of India.

8. Dissemination format**8.1. News release**

Publication on Energy Statistics is released annually.

8.2. Publications

Annual publication in pdf format is available on the website of MOSPI.

9. Accessibility of documentation**9.1. Documentation on methodology**

Information on the relevant Energy indicators methodology can be found in the publication.

10. Accuracy and reliability**10.1. Overall accuracy**

Data on energy is published on the basis of information received from the source agencies. CSO compiles and analyses data received from the source agencies and then presents in the form of publication.

11. Timeliness and punctuality**11.1. Timeliness**

Preliminary data on energy production and consumption and few energy indicators are available 12 months after the reference year. Final data for the year are published 24 months after the end of the reference year.

11.2. Punctuality

Annual publication on Energy Statistics is released by the end of March every year.

12. Data revision**12.1. Data revision - policy**

The annual publication provides data on the last reference year and revisions for the year before. Revisions of entire time series when made by source agencies due to specific survey or data revision are incorporated in due time. The data revision by source Ministries is incorporated in the subsequent edition and hence some of the values may not match with the previous issues of this publication.

12.2. Data revision - practice

Preliminary data on energy production and consumption statistics for the year 2015-16 is published in current publication. Final data will be given in the next publication in March 2018.

13. Statistical processing**13.1. Source data**

Energy data are collected from the source agencies at national level and presented in the publication. It is published in the ministry's web-site.

13.2. Frequency of data collection

Annual.

13.3. Data collection

Data is collected through e-mail or by post from the source agencies.

13.4. Data validation

Checks are carried out to the data before publishing it.

13.5. Data compilation

National figures are compiled by aggregating the data received from the source agencies.

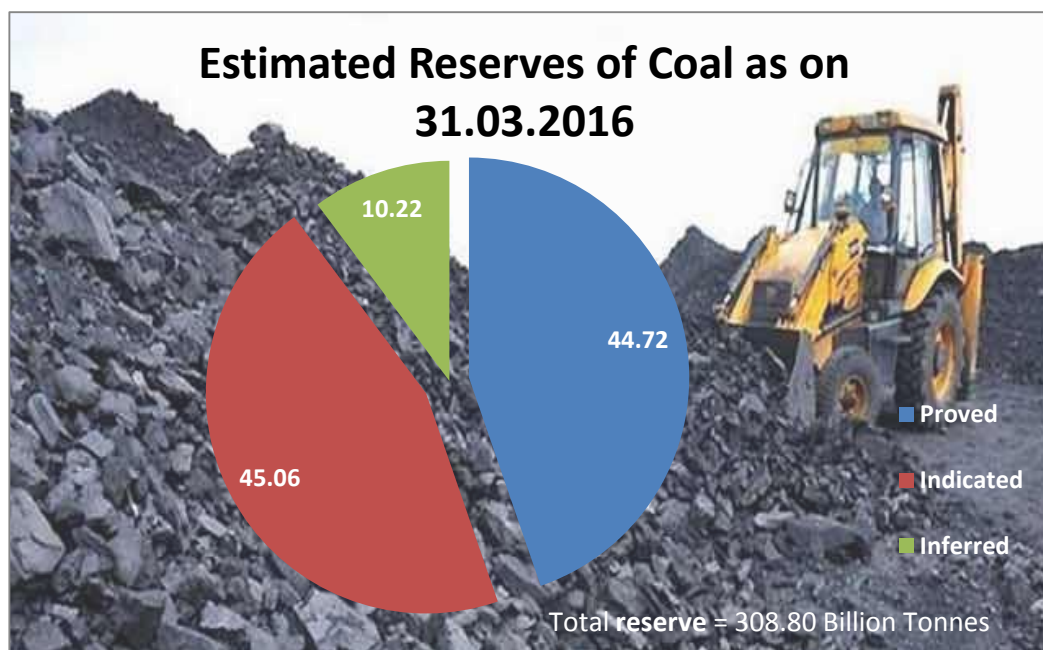
13.6. Adjustment

No seasonal adjustment or temperature correction of the energy consumption is applied.

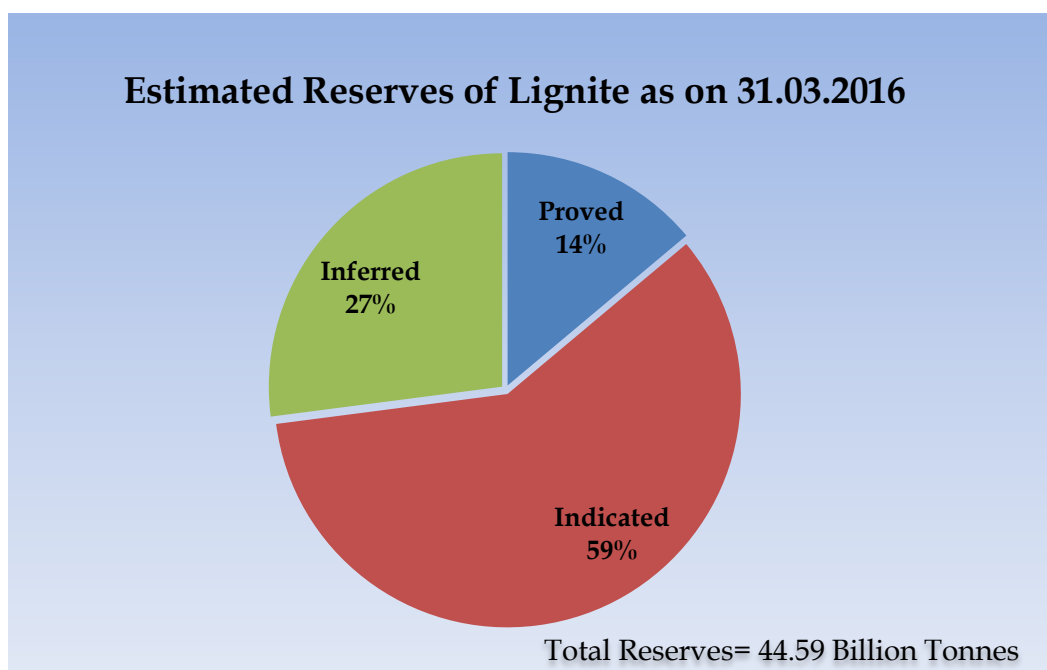
CHAPTER 1: RESERVES AND POTENTIAL FOR GENERATION

1.1 Coal and Lignite

- ❖ Coal deposits are mainly confined to eastern and south central parts of the country. The states of Jharkhand, Odisha, Chhattisgarh, West Bengal, Madhya Pradesh, Telangana and Maharashtra account for 98.58 % of the total coal reserves in the country. The State of Jharkhand had the maximum share (26.29%) in the overall reserves of coal in the country as on 31st March 2016 followed by the State of Odisha (24.58%) (Table 1.1).
- ❖ As on 31.03.16, the estimated reserves of coal were 308.80 billion tonnes, an addition of 2.20 billion tonnes over the last year (Table 1.1). There has been an increase of 0.7% in the estimated coal reserves during the year 2015-16 with Chattisgarh accounting for the maximum increase of 2.05%.

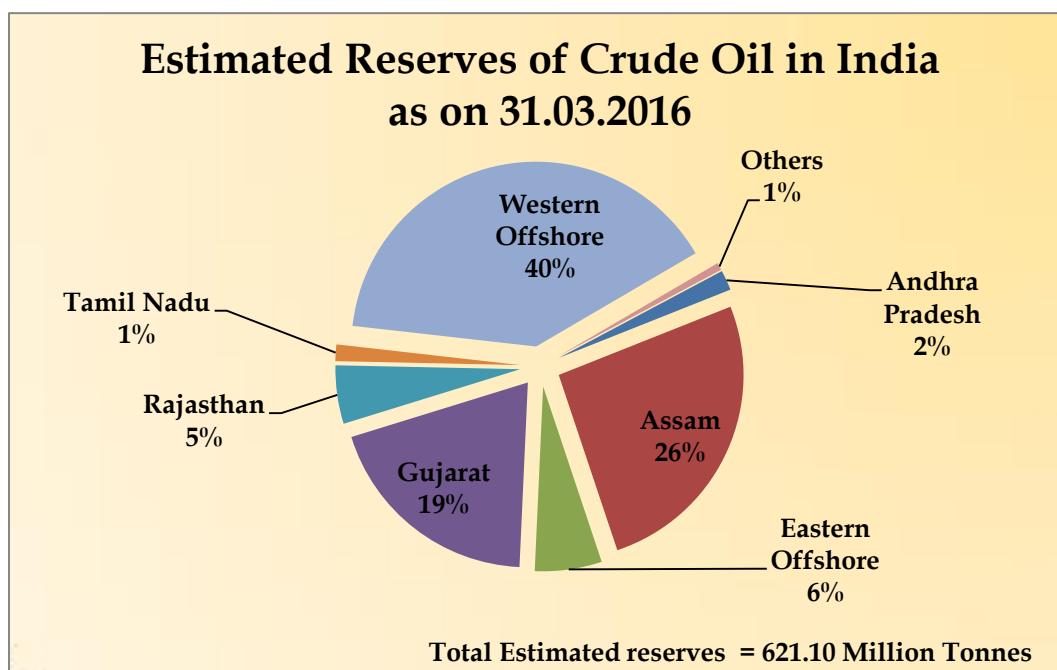


- ❖ The estimated total reserves of lignite as on 31.03.16 was 44.59 billion Tonnes against 44.12 billion tonnes on 31.03.15. (Table 1.1(A)).

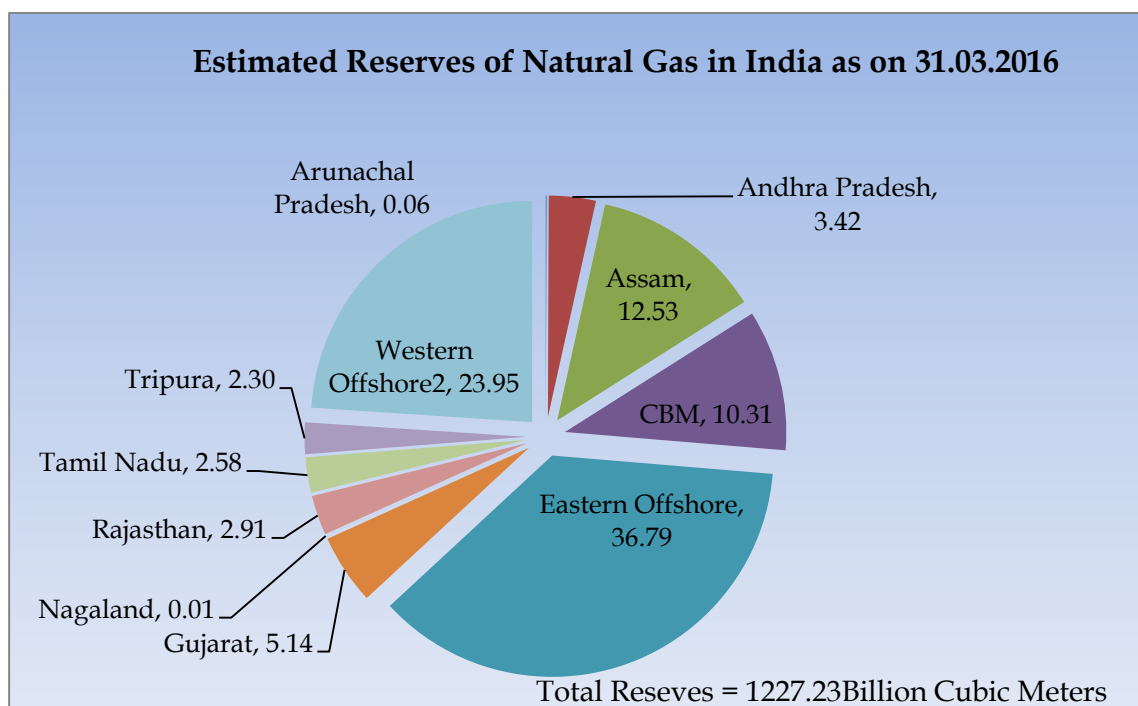


1.2 Petroleum and Natural gas

- ❖ The estimated reserves of crude oil in India as on 31.03.2016 stood at 621.10 million tonnes (MT) (Table 1.2) against 635.60 million tonnes on 31.03.2015.
- ❖ Geographical distribution of Crude oil indicates that the maximum reserves are in the Western Offshore (39.79%) followed by Assam (25.89%), whereas the maximum reserves of Natural Gas are in the Eastern Offshore (36.79%) followed by Western offshore (23.95%). (Table 1.2).



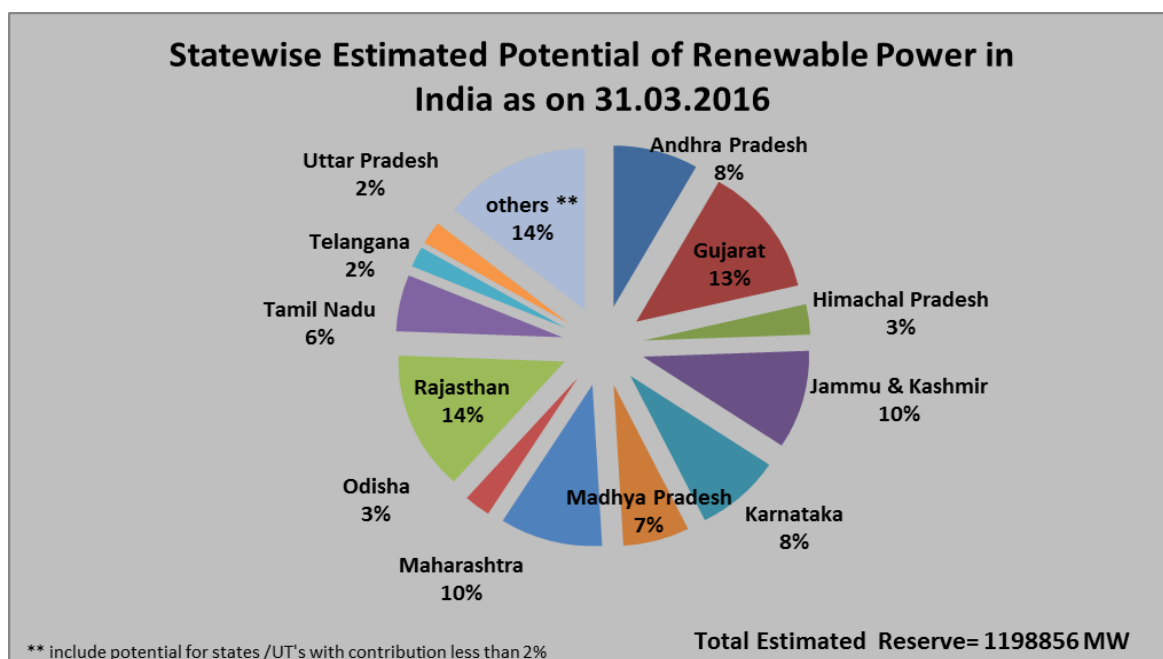
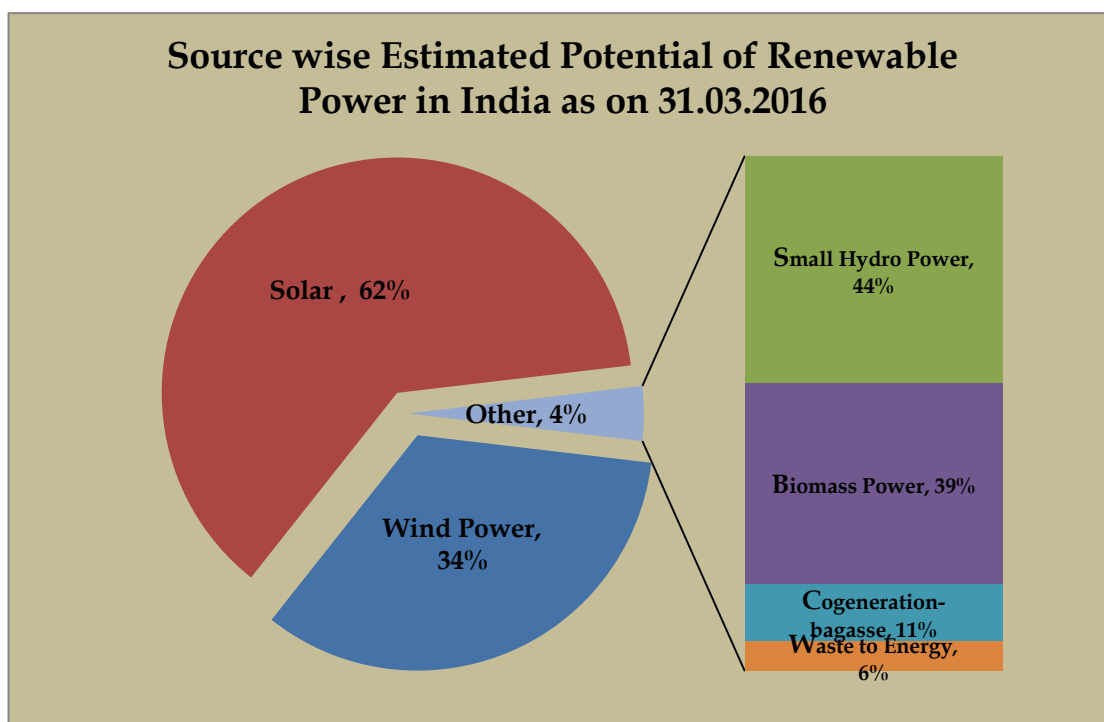
- ❖ There was decrease of 2.28% in the estimated reserve of crude oil for the country as a whole during 2015-16 as compared to the position a year ago. During the same period, estimated reserves of crude oil in Arunachal Pradesh, Rajasthan and Assam decreased by 44.75, 17.04 and 2.11 % respectively, while the same in Tamil Nadu, Andhra Pradesh, Gujarat, Western Offshore and Eastern Offshore increased by 18.42 %, 15.30% , 2.58%, 1.88% and 0.59% respectively.
- ❖ The estimated reserves of Natural Gas in India as on 31.03.2016 stood at 1227.23 Billion Cubic Meters (BCM) as against 1251.90 BCM as on 31.03.2015 (Table 1.2).



- ❖ The estimated reserves of Natural Gas decreased by 1.97% over the last year. The maximum contribution to this decrease has been from Western Offshore, followed by Eastern Offshore.

1.3 Renewable energy sources

- ❖ There is high potential for generation of renewable energy from various sources- wind, solar, biomass, small hydro and cogeneration bagasse.
- ❖ The total potential for renewable power generation in the country as on 31.03.16 is estimated at 1198856 MW (Table 1.3). This includes wind power potential of 102788 MW (8.57%) at 80m hub height, wind power potential of 302235 MW (25.21%) at 100 m hub height, SHP (small-hydro power) potential of 19749 MW (1.65%), Biomass power of 17,538 MW (1.46%), 5000 MW (0.42%) from bagasse-based cogeneration in sugar mills, 2556 MW (0.21%) from waste to energy and solar power potential of 748990 MW (62.48%).



- ❖ The geographic distribution of the estimated potential of renewable power as on 31.03.2016 reveals that Rajasthan has the highest share of about 14% (167276 MW), followed by Gujarat with 13% share (157158 MW) and Maharashtra with 10% share (119893MW), mainly on account of solar power potential.

Table 1.1: Statewise Estimated Reserves of Coal in India as on 31.03.2015 and 31.03.2016

(in Billion Tonne)

States/ UTs	Proved		Indicated		Inferred		Total		Distribution (%)	
	31.03.2015	31.03.2016	31.03.2015	31.03.2016	31.03.2015	31.03.2016	31.03.2015	31.03.2016	31.03.2015	31.03.2016
Arunachal Pradesh	0.03	0.03	0.04	0.04	0.02	0.02	0.09	0.09	0.03	0.03
Assam	0.47	0.47	0.05	0.06	0.00	0.00	0.52	0.52	0.17	0.17
Bihar	0.00	0.00	0.00	0.00	0.16	0.16	0.16	0.16	0.05	0.05
Chhattisgarh	18.24	19.14	34.39	34.61	2.29	2.29	54.91	56.04	17.91	18.15
Jharkhand	41.46	42.32	33.03	32.30	6.56	6.55	81.05	81.17	26.44	26.29
Madhya Pradesh	10.41	10.92	12.78	12.70	3.34	3.29	26.54	26.91	8.66	8.71
Maharashtra	5.95	6.21	3.19	3.15	2.11	2.08	11.25	11.44	3.67	3.70
Meghalaya	0.09	0.09	0.02	0.02	0.47	0.47	0.58	0.58	0.19	0.19
Nagaland	0.01	0.01	0.00	0.00	0.31	0.31	0.32	0.32	0.10	0.10
Odisha	30.75	34.29	36.55	33.28	8.51	8.32	75.80	75.90	24.72	24.58
Sikkim	0.00	0.00	0.06	0.06	0.04	0.04	0.10	0.10	0.03	0.03
Uttar Pradesh	0.88	0.88	0.18	0.18	0.00	0.00	1.06	1.06	0.35	0.34
West Bengal	13.52	13.60	13.01	13.02	4.91	4.91	31.44	31.53	10.25	10.21
Telangana	9.81	10.13	9.96	8.59	3.03	2.70	22.79	21.41	7.43	6.93
All India Total	131.61	138.09	143.24	139.15	31.74	31.56	306.60	308.80	100.00	100.00
Distribution (%)	42.93	44.72	46.72	45.06	10.35	10.22	100.00	100.00		

Source: Office of Coal Controller, Ministry of Coal

Table 1.1(A) :Statewise Estimated Reserves of Lignite in India as on 31.03.2015 and 31.03.2016

(in Billion Tonne)

States/ UTs	Proved		Indicated		Inferred		Total		Distribution (%)	
	31.03.2015	31.03.2016	31.03.2015	31.03.2016	31.03.2015	31.03.2016	31.03.2015	31.03.2016	31.03.2015	31.03.2016
Gujarat	1.28	1.28	0.28	0.28	1.16	1.16	2.72	2.72	6.29	6.10
Jammu & Kashmir	0.00	0.00	0.02	0.02	0.01	0.01	0.03	0.03	0.06	0.06
Kerala	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.02
Pondicherry	0.00	0.00	0.41	0.41	0.01	0.01	0.42	0.42	0.96	0.93
Rajasthan	1.17	1.17	2.67	2.67	1.89	1.90	5.73	5.73	13.23	12.85
TamilNadu	3.74	3.74	22.90	22.99	8.57	8.95	35.21	35.68	79.42	80.02
West Bengal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
All India	6.18	6.18	26.28	26.28	11.65	12.04	44.12	44.59	100.00	100.00
Distribution (%)	14.01	13.86	59.57	58.94	26.41	27.00	100.00	100.00		

Source:Office of Coal Controller, Ministry of Coal

Table 1.2 :Statewise Estimated Reserves of Crude Oil and Natural Gas in India as on in 31.03.2015 and 31.03.2016

States/ UTs/ Region	Crude Petroleum (million tonnes)				Natural Gas (billion cubic metres)			
	31.03.2015		31.03.2016		31.03.2015		31.03.2016	
		Distribution (%)	Estimated Reserves	Distribution (%)	Estimated Reserves	Distribution (%)	Estimated Reserves	Distribution (%)
Arunachal Pradesh	1.64	0.26	1.57	0.25	0.79	0.06	0.76	0.06
Andhra Pradesh	10.94	1.72	10.90	1.75	41.79	3.34	42.03	3.42
Assam	165.91	26.10	160.79	25.89	149.38	11.93	153.76	12.53
CBM	0.00	0.00	0.00	0.00	100.37	8.02	126.49	10.31
Eastern Offshore ¹	34.19	5.38	36.39	5.86	467.65	37.36	451.46	36.79
Gujarat	119.41	18.79	121.16	19.51	63.79	5.10	63.06	5.14
Nagaland	2.38	0.37	2.38	0.38	0.09	0.01	0.09	0.01
Rajasthan	37.32	5.87	31.72	5.11	36.93	2.95	35.66	2.91
Tamil Nadu	8.47	1.33	8.99	1.45	35.36	2.82	31.68	2.58
Tripura	0.07	0.01	0.07	0.01	30.74	2.46	28.28	2.30
Western Offshore ²	255.27	40.16	247.13	39.79	325.01	25.96	293.96	23.95
Total	635.60	100.00	621.10	100.00	1251.90	100.00	1227.23	100.00

CBM : Cold Bed Methane

Note:

1. Proved and indicated Balance Recoverable Reserves.
2. Western offshore includes Gujarat offshore.
3. The figures may not match previous year figure owing to the revision in definition by Ministry of Petroleum & Natural Gas.

Source: Ministry of Petroleum & Natural Gas.

Table 1.3 :Sourcewise and Statewise Estimated Potential of Renewable Power in India as on 31.03.2016

(in MW)

States/ UTs	Wind Power		Small Hydro Power	Biomass Power	Cogeneration-bagasse	Waste to Energy	Solar Energy	Total	
	@ 80 m	@ 100 m						Estimated Reserves	Distribution (%)
1	2	3	4	5	6	7	8	9	10
Andhra Pradesh	14497	44228	978	578	300	123	38440	99144	8.27
Arunachal Pradesh	236	-	1341	8	-	-	8650	10235	0.85
Assam	112	-	239	212	-	8	13760	14331	1.20
Bihar	144	-	223	619	300	73	11200	12559	1.05
Chhattisgarh	314	76	1107	236	-	24	18270	20027	1.67
Goa	-	1	7	26	-	-	880	914	0.08
Gujarat	35071	84432	202	1221	350	112	35770	157158	13.11
Haryana	93	-	110	1333	350	24	4560	6470	0.54
Himachal Pradesh	64	-	2398	142	-	2	33840	36446	3.04
Jammu & Kashmir	5685	-	1431	43	-	-	111050	118209	9.86
Jharkhand	91	-	209	90	-	10	18180	18580	1.55
Karnataka	13593	55857	4141	1131	450	-	24700	99872	8.33
Kerala	837	1700	704	1044	-	36	6110	10431	0.87
Madhya Pradesh	2931	10484	820	1364	-	78	61660	77337	6.45
Maharashtra	5961	45394	794	1887	1250	287	64320	119893	10.00
Manipur	56	-	109	13	-	2	10630	10810	0.90
Meghalaya	82	-	230	11	-	2	5860	6185	0.52
Mizoram	-	-	169	1	-	2	9090	9262	0.77
Nagaland	16	-	197	10	-	-	7290	7513	0.63
Odisha	1384	3093	295	246	-	22	25780	30820	2.57
Punjab	-	-	441	3172	300	45	2810	6768	0.56
Rajasthan	5050	18758	57	1039	-	62	142310	167276	13.95
Sikkim	98	-	267	2	-	-	4940	5307	0.44
Tamil Nadu	14152	33799	660	1070	450	151	17670	67952	5.67
Telangana	-	4244	-	-	-	-	20410	24654	2.06
Tripura	-	-	47	3	-	2	2080	2132	0.18
Uttar Pradesh	1260	-	461	1617	1250	176	22830	27594	2.30
Uttarakhand	534	-	1708	24	-	5	16800	19071	1.59
West Bengal	22	2	396	396	-	148	6260	7224	0.60
Andaman & Nicobar	365	8	8	-	-	-	-	381	0.03
Chandigarh	-	-	-	-	-	6	-	6	0.00
Dadar & Nagar Haveli	-	-	-	-	-	-	-	-	0.00
Daman & Diu	4	-	-	-	-	-	-	4	0.00
Delhi	-	-	-	-	-	131	2050	2181	0.18
Lakshadweep	16	7	-	-	-	-	-	23	0.00
Puducherry	120	152	-	-	-	3	-	275	0.02
Others*	-	-	-	-	-	1022	790	1812	0.15
All India Total	102788	302235	19749	17538	5000	2556	748990	1198856	100.00
Distribution (%)	8.57	25.21	1.65	1.46	0.42	0.21	62.48	100.00	

* Industrial waste

Source: Ministry of New and Renewable Energy

CHAPTER 2: INSTALLED CAPACITY AND CAPACITY UTILIZATION

2.1 Coal Washeries

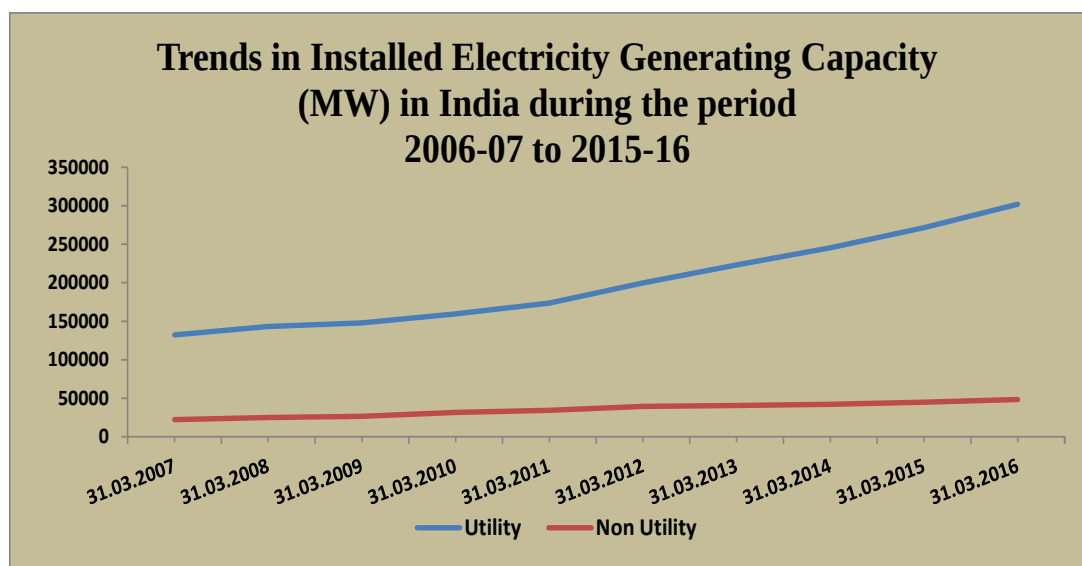
- ❖ Coal washing is an integral part of coal production. Raw coal coming from mines is washed to remove the ash contents to make them fit for feeding into boilers, particularly those of steel plants. Barring a few instances, a coal washery does not form part of a coal mine in India.
- ❖ Total installed capacity of washeries in the country is around 131.24 million tonne per year (MTY) as on 31.3.2016 (Table 2.1). As on 31.03.16, a total of 52 washeries, both PSUs and Private, were operating in the country considering both Coking (29.69 MTY) and Non-Coking Coal (101.55 MTY).

2.2 Refineries of crude oil

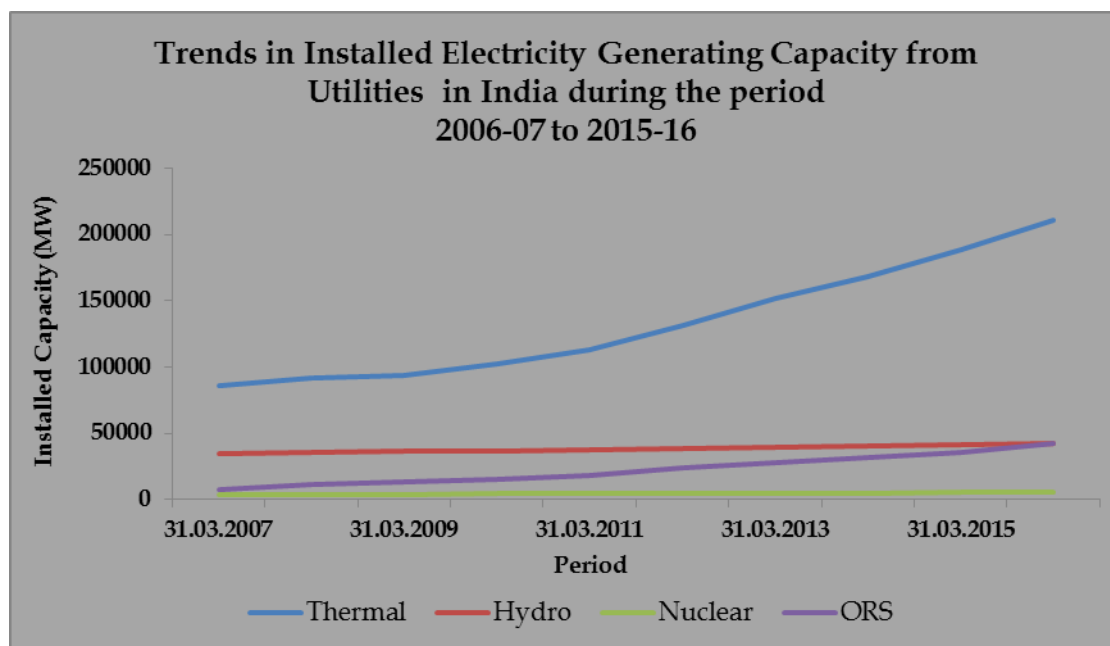
- ❖ As on 31.03.16, there were a total of 23 refineries in the country (Table 2.2) – 18 in the Public Sector, 3 in the Private sector and 2 in Joint Venture.
- ❖ The refining capacity of the country was 230 MMT on 31.03.2016 which is 15 MMT higher than the country's refining capacity (215 MMT) on 31.03.2015.
- ❖ The Refinery production (crude throughput) achievement was 232.865 MMT during 2015-16 which marks net increase of 4.31% over 2014-15 (223.242 MMT).
- ❖ Capacity utilization of the refineries was 103.8% during 2014-15 which decreased to 101.2% during 2015-16. In the Public Sector, the maximum increase in capacity utilization (31.4%) was at ONGC, Tatipaka, Andhra Pradesh. In the Private Sector the highest increase (5.1%) in capacity utilization was at RIL (DTA), Jamnagar, Gujarat.
- ❖ Indian Oil Corporation, the state owned corporation had highest refining capacity of 69.2 MMTY. All units of IOC together processed 58.007 MMT during 2015-16 as compared to 53.585 MMT during 2014-15. The capacity utilization of these refineries was 83.8% during 2015-16 as against 98.9% during 2014-15.
- ❖ All the private refineries taken together processed 88.662 MMT during 2015-16 which is higher than 88.533 MMT processed in 2014-15. The capacity utilization of these refineries during 2015-16 was 110.8% which is 0.1% higher than its capacity utilization (110.7%) in 2014-15.

2.3 Installed generating capacity of electricity

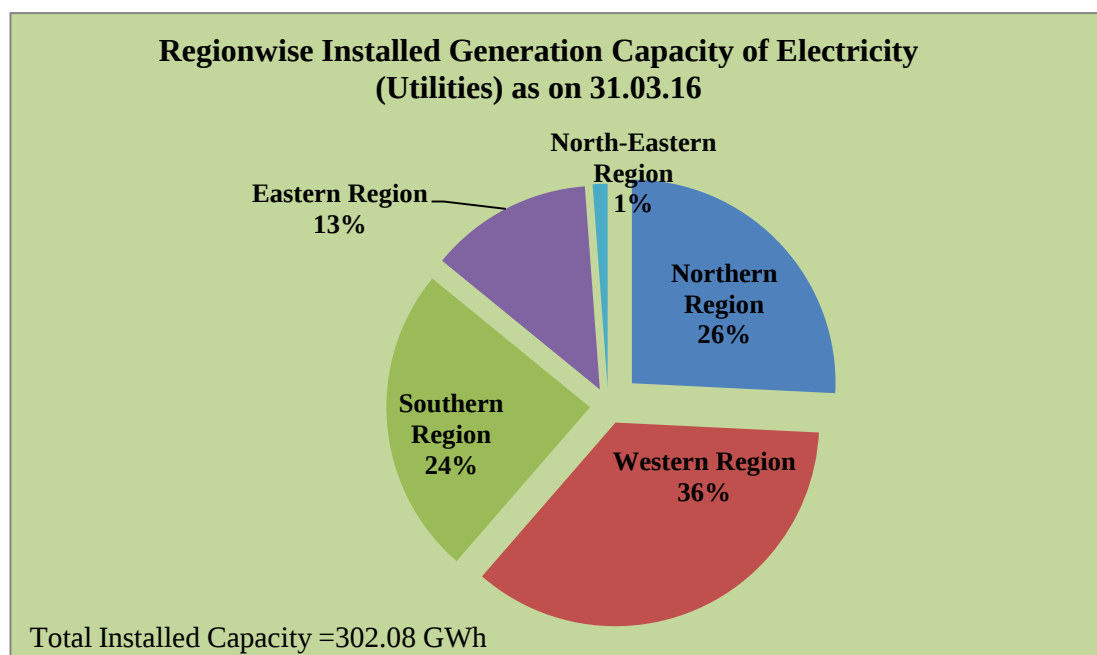
- ❖ The total installed capacity for electricity generation in the country has increased from 154664 MW as on 31.03.2007 to 350367 MW as on 31.03.2016, registering a compound annual growth rate (CAGR) of 8.52% (Table 2.3).



- ❖ Electricity generation capacity increased by 10.74% to 33987 MW in 2015-16.
- ❖ The highest rate of annual growth from 2014-15 to 2015-16 in installed capacity was for Other Renewable sources (ORS) (19.25%) followed by Thermal Power (10.91%).
- ❖ The total Installed capacity of power utilities in the country increased from 132329 MW in 31.3.2007 to 302088 MW as on 31.3.2016, with a CAGR of 8.60% over the period.
- ❖ At the end of March 2016, thermal power plants accounted for an overwhelming 73.50% of the total installed capacity in the country, with an installed capacity of 257528 MW. Other renewable Sources (excluding hydro) come next with an installed capacity of 44217 MW, accounting for 12.62% of the total installed Capacity. The share of Hydro and Nuclear energy was only 12.23% and 1.65% of total installed capacity.
- ❖ Non-utilities accounted for 13.78% (48279 MW) of the total installed electricity generation capacity.



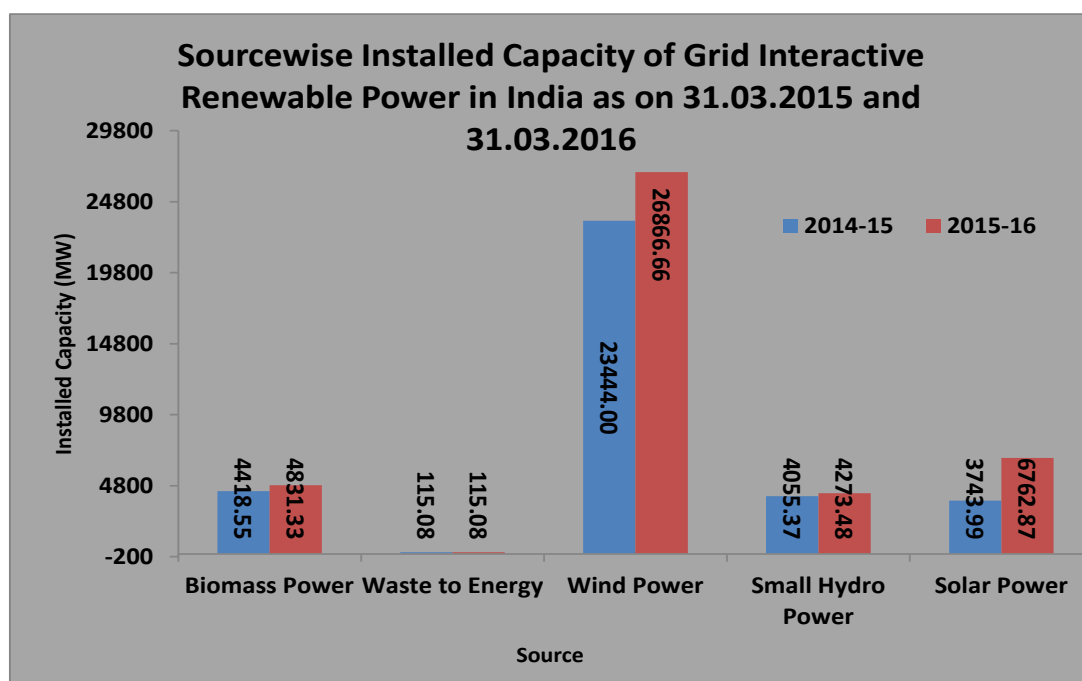
- ❖ The geographical distribution of Installed generating capacity of electricity as on 31.03.16 (Table 2.4) indicates that Western Region (both central and state sector) accounted for the highest share (36%) followed by Northern Region (26%), Southern Region (24%), Eastern Region (13%) and North Eastern Region (1%).



- ❖ Region wise growth in the installed capacity during 2015-16 reveals that Southern Region registered the highest annual growth of about 17.03%, followed by Northern Region (15.45%), Western Region (6.71%), Eastern Region (6.03%) and North Eastern Region (5.61%).
- ❖ Among all the states Telangana registered highest annual growth (97.01%) in the installed capacity followed by Nagaland (70.29%) and Sikkim (58.29%).

2.4 Grid Interactive Renewable Power

- ❖ The total installed capacity of grid interactive renewable power, which was 35776.96 MW as on 31.03.2015, had gone up to 42849.38 MW as on 31.03.2016 indicating growth of 19.77% during the period (Table 2.5).
- ❖ Out of the total installed generation capacity of renewable power as on 31-03-2016, Wind power accounted for about 62.7%, followed by Solar power (15.78%) and Biomass power (11.46%).
- ❖ Tamil Nadu had the highest installed capacity of grid connected renewable power (9448.68 MW) followed by Maharashtra (6613.28 MW) and Rajasthan (5396.03 MW), mainly on account of wind power.
- ❖ As on 31.03.2016, out of total number of Biogas plants installed (48.35 lakh) (Table 2.6), maximum number of plants installed were in Maharashtra (8.71 lakh) followed by Andhra Pradesh (5.32 lakh), Karnataka (4.79 lakh), Uttar Pradesh (4.39 lakh) and Gujarat (4.30 lakh).



- ❖ As on 31.03.2016, a total of 5,86,065 villages were electrified (Table 2.6) accounting for 98.1% of the total villages in the country.

Table 2.1: Installed Capacity of Coal Washeries in India as on 31.03.16

Sl. No.	Washery & Operator	State of Location	Capacity (MTY)
			31.03.2016*
<u>COKING COAL :</u>			
1	Dudga-II, CIL	Jharkhand	2.00
2	Bhojudih, CIL	West Bengal	1.70
3	Patherdih, CIL	Jharkhand	1.60
4	Moonidih, CIL	Jharkhand	1.60
5	Sudamdih, CIL	Jharkhand	1.60
6	Mahuda, CIL	Jharkhand	0.63
7	Kathara, CIL	Jharkhand	3.00
8	Swang, CIL	Jharkhand	0.75
9	Rajrappa, CIL	Jharkhand	3.00
10	Kedla, CIL	Jharkhand	2.60
11	Nandan, CIL	Madhya Pradesh	1.20
(A) CIL			19.68
12	Durgapur, SAIL	West Bengal	1.50
13	DCOP, DPL	West Bengal	1.35
14	Chasnala, IISCO	Jharkhand	1.50
15	Jamadoba, TISCO	Jharkhand	0.90
16	West Bokaro-II, TISCO	Jharkhand	1.80
17	West Boakaro-III,TISCO	Jharkhand	2.10
18	Bhelatand	Jharkhand	0.86
(B) PSU & Private			10.01
TOTAL (A + B)			29.69
<u>NON-COKING COAL</u>			
1	Dugda-I,CIL	Jharkhand	2.50
2	Madhuban,CIL	Jharkhand	2.50
3	Gidi,CIL	Jharkhand	2.50
4	Piparwar,CIL	Jharkhand	6.50
5	Kargali,CIL	Jharkhand	2.72
6	Bina,CIL	Uttar Pradesh	4.50
(A) CIL			21.22
7	Dipka, Aryan coal beneficiation pvt. Ltd.	Chattisgarh	12.00
8	Gevra, Aryan coal beneficiation pvt. Ltd.	Chattisgarh	5.00
9	Panderpauni, Aryan coal beneficiation pvt. Ltd.	Maharashtra	3.00
10	Chakabuwa, Aryan Energy private ltd.	Chattisgarh	4.00
11	Indaram, Aryan Coal Benefication Pvt.Ltd.	Andhra Pradesh	-
12	Talcher, Aryan Energy Pvt. Ltd.	Odisha	2.00

Table 2.1(Contd.): Installed Capacity of Coal Washeries in India as on 31.03.16

Sl. No.	Washery & Operator	State of Location	Capacity (MTY)
			31.03.2016*
13	Wani, Kartikay Coal washeries pvt. ltd.(Aryan)	Maharashtra	2.50
14	Korba, ST-CLI Coal washeries ltd.	Chattisgarh	5.20
15	Ramagundam, Gupta coalfield & washeries ltd.	Andhra Pradesh	2.40
16	Sasti, Gupta coalfield & washeries ltd.	Maharashtra	2.40
17	Wani, Gupta coalfield & washeries ltd.	Maharashtra	1.92
18	Umrer, Gupta coalfield & washeries ltd.	Maharashtra	0.75
19	Bhandara, Gupta coalfield & washeries ltd.	Maharashtra	0.75
20	Gondegaon, Gupta coalfield & washeries ltd.	Maharashtra	2.40
21	Majri, Gupta coalfield & washeries ltd.	Maharashtra	2.40
22	Bilaspur, Gupta coalfield & washeries ltd.	Chattisgarh	3.50
23	Ghugus, Gupta coalfield & washeries ltd.	Maharashtra	2.40
24	Talcher, Global coal Mining (P) Ltd.	Odisha	2.50
25	Ib Valley, Global coal Mining (P) Ltd.	Odisha	3.25
26	Ramagundam, Global coal Mining (P) Ltd.	Andhra Pradesh	1.00
27	Wani, Bhatia International Ltd.	Maharashtra	3.73
28	Ghugus, Bhatia International Ltd.	Maharashtra	4.00
29	Jharsuguda, Bhatia International Ltd.	Odisha	1.50
30	Tamnar, Jindal Steel & Power Ltd.	Chattisgarh	6.00
31	Wani, Indo Unique Flame Ltd.	Maharashtra	2.40
32	Nagpur, Indo Unique Flame Ltd.	Maharashtra	0.60
33	Punwat, Indo Unique Flame Ltd.	Maharashtra	2.40
34	Dharamsthal, BLA Industries	Madhya Pradesh	0.33
(B) Private			80.33
TOTAL (A+B)			101.55
Gross Total (Coking+Non-Coking)			131.24

* Provisional

Source: Office of Coal Controller, Ministry of Coal

Table 2.2: Installed Capacity and Capacity Utilization of Refineries of Crude Oil during 2014-15 and 2015-16

Sl. No.	Refinery	Installed Capacity (TMIPA)		Crude Oil Processed (TMT)		Capacity Utilisation (%)		
		31.03.2015	31.03.2016	2014-15	2015-16*	2014-15	2015-16	Change in Utilisation
A	Public Sector Refineries	120066	135066	121182	127087	100.9	94.1	-6.8
I	IOC REFINERIES	54200	69200	53585	58007	98.9	83.8	-15.2
	IOC, Guwahati, Assam	1000	1000	1006	904	100.6	90.4	-10.1
	IOC, Barauni, Bihar	6000	6000	5944	6545	99.1	109.1	10.1
	IOC, Koyali, Gujarat	13700	13700	13285	13820	97.0	100.9	4.0
	IOC, Haldia, West Bengal	7500	7500	7650	7776	102.0	103.7	1.6
	IOC, Mathura, Uttar Pradesh	8000	8000	8515	8860	106.4	110.8	4.1
	IOC, Digboi, Assam	650	650	591	562	90.9	86.5	-4.9
	IOC, Panipat, Haryana	15000	15000	14191	15282	94.6	101.9	7.7
	IOC, Bongaigaon, Assam	2350	2350	2403	2442	102.3	103.9	1.6
	IOC, Pradip, Odisha	-	-	-	1817	-	-	-
III	BPCL REFINERIES	21500	21500	23177	24083	107.8	112.0	3.9
	BPCL, Mumbai, Maharashtra	12000	12000	12821	13371	106.8	111.4	4.3
	BPCL, Kochi, Kerala	9500	9500	10356	10712	109.0	112.8	3.4
III	HPCL REFINERIES	14800	14800	16178	17234	109.3	116.4	6.5
	HPCL, Mumbai, Maharashtra	6500	6500	7408	8013	114.0	123.3	8.2
	HPCL, Visakh, Andhra Pradesh	8300	8300	8770	9220	105.7	111.1	5.1
IV	CPCL REFINERIES	11500	11500	10782	9644	93.8	83.9	-10.6
	CPCL, Manali, Tamil Nadu	10500	10500	10251	9100	97.6	86.7	-11.2
	CPCL, Narimanam, Tamil Nadu	1000	1000	531	544	53.1	54.4	2.4
V	NRL, Numaligarh, Assam	3000	3000	2777	2520	92.6	84.0	-9.3
VI	MRPL, Mangalore, Karanataka	15000	15000	14632	15532	97.5	103.5	6.2
VII	ONGC, Tatipaka, Andhra Pradesh	66	66	51	67	77.3	101.5	31.4
B	Private Sector Refineries	80000	80000	88533	88662	110.7	110.8	0.1
I	RIL REFINERIES	60000	60000	68042	69561	113.4	115.9	2.2
	RIL, DTA, Jamnagar, Gujarat	30000	30000	30867	32428	102.9	108.1	5.1
	RIL (SEZ), Jamnagar, Gujarat	27000	27000	37174	37133	137.7	137.5	-0.1
II	Essar Oil Ltd. (EOL), Vadinar	20000	20000	20491	19101	102.5	95.5	-6.8
C	JOINT VENTURE	15000	15000	13527	17115	90.2	114.1	26.5
I	BORL, Bina***	6000	6000	6209	6402	103.5	106.7	3.1
II	HMEL, Bathinda**	9000	9000	7318	10713	81.3	119.0	46.4
	Total (A+B+C)	215066	230066	223242	232865	103.8	101.2	-2.5

* Provisional TMT:Thousand metric Tonnes TMTPA:Thousand metric Tonnes Per Annum

**: HPCL & Mittal Energy Investments Pvt. Ltd., a Joint Venture, Bathinda commissioned on April, 2012.

***: BPCL ^ Oman Oil Company, a Joint Venture, Bina Commissioned on May, 2011 (^: Revised)

Source: Ministry of Petroleum and Natural Gas

Table 2.3 : Trends in Installed Generating Capacity of Electricity in Utilities and Non-utilities in India from 2006-07 to 2015-16(in Mega Watt = 10³ Kilo Watt)

As on	Utilities							
	Thermal				Hydro	Nuclear	ORS	Total
	Steam	Diesel	Gas	Total				
1	2	3	4	5	6	7	8	9
31.03.2007	71,121	13,692	1,202	86,015	34,654	3,900	7,761	1,32,329
31.03.2008	76,019	14,686	1,202	91,907	35,909	4,120	11,125	1,43,061
31.03.2009	77,649	14,877	1,200	93,725	36,878	4,120	13,242	1,47,966
31.03.2010	84,198	17,056	1,200	1,02,454	36,863	4,560	15,521	1,59,398
31.03.2011	93,918	17,706	1,200	1,12,824	37,567	4,780	18,455	1,73,626
31.03.2012	1,12,022	18,381	1,200	1,31,603	38,990	4,780	24,503	1,99,877
31.03.2013	1,30,221	20,110	1,200	1,51,530	39,491	4,780	27,542	2,23,344
31.03.2014	1,45,273	21,782	1,200	1,68,255	40,531	4,780	31,692	2,45,259
31.03.2015	1,64,636	23,062	1,200	1,88,898	41,268	5,780	35,777	2,71,723
31.03.2016	1,85,173	24,509	994	2,10,675	42,783	5,780	42,849	3,02,088
Growth rate of 2015-16 over 2014-15(%)	12.47	6.27	-17.19	11.53	3.67	0.00	19.77	11.18
CAGR 2006-07 to 2015-16(%)	10.04	6.00	-1.88	9.37	2.13	4.01	18.63	8.60

* ORS means Other Renewable Sources

** Capacity in respect of Self Generating Industries includes units of capacity 1 MW and above.

CAGR: Compound Annual Growth Rate = $\left(\frac{\text{Current Value}}{\text{Base Value}}\right)^{\frac{1}{\text{nos. of years}}}-1 \times 100$

Source : Central Electricity Authority.

Table 2.3 (conti) : Trends in Installed Generating Capacity of Electricity in Utilities and Non-utilities in India from 2006-07 to 2015-16

(in Mega Watt = 10^3 x Kilo Watt)

As on	Non-Utilities							Grand Total
	Thermal				Hydro	ORS	Total	
	Steam	Diesel	Gas	Total				
	10	11	12	13	14	15	16	18= 9+17
31.03.2007	11,398	7,723	2,976	22,097	61	178	22,335	1,54,664
31.03.2008	11,764	8,648	4,209	24,621	61	305	24,986	1,68,048
31.03.2009	13,818	8,750	3,621	26,188	111	375	26,674	1,74,639
31.03.2010	17,183	9,457	4,368	31,008	55	454	31,517	1,90,915
31.03.2011	19,112	9,655	5,054	33,821	57	567	34,444	2,08,071
31.03.2012	22,615	9,955	5,885	38,456	48	872	39,375	2,39,252
31.03.2013	23,890	11,148	4,498	39,535	67	1,124	40,726	2,64,070
31.03.2014	24,752	11,432	4,751	40,935	64	1,259	42,258	2,87,516
31.03.2015	26,089	12,009	5,193	43,291	65	1,301	44,657	3,16,380
31.03.2016	28,688	12,347	5,819	46,853	59	1,368	48,279	3,50,367
Growth rate of 2015-16 over 2014-15(%)	9.96	2.81	12.04	8.23	-9.22	5.13	8.11	10.74
CAGR 2006-07 to 2015-16(%))	9.67	4.80	6.93	7.81	-0.24	22.64	8.01	8.52

* ORS means Other Renewable Sources

** Capacity in respect of Self Generating Industries includes units of capacity 1 MW and above.

CAGR: Compound Annual Growth Rate = $((\text{Current Value}/\text{Base Value})^{(1/\text{nos. of years})}-1)*100$

Source : Central Electricity Authority.

**Table 2.4 : Regionwise and Statewise Installed Generating Capacity of Electricity (Utilities)
in India as on 31.03.2015 and 31.03.2016**

(in GWh)											
States/UTs	Hydro		Thermal		Nuclear		RES		Total		% Growth (2014-15 to 2015-16)
	31.03.15	31.03.16	31.03.15	31.03.16	31.03.15	31.03.16	31.03.15	31.03.16	31.03.15	31.03.16	
Delhi	0.00	0.00	2.29	2.74	0.00	0.00	0.02	0.03	2.31	2.77	19.71
Haryana	0.88	0.88	4.91	5.35	0.00	0.00	0.14	0.13	5.93	6.37	7.32
Himachal Prdash	2.14	2.14	0.00	0.00	0.00	0.00	0.72	0.79	2.86	2.94	2.57
Jammu & Kashmir	0.78	1.23	0.18	0.18	0.00	0.00	0.16	0.16	1.12	1.56	39.02
Punjab	2.23	2.23	5.22	7.67	0.00	0.00	0.49	0.74	7.94	10.64	34.01
Rajasthan	0.99	0.99	8.12	8.99	0.00	0.00	4.39	5.40	13.50	15.37	13.90
Uttar Pradesh	0.52	0.52	7.77	11.25	0.00	0.00	0.99	1.04	9.29	12.82	37.99
Uttarakhand	1.65	1.98	0.00	0.10	0.00	0.00	0.24	0.33	1.89	2.41	27.24
Chandigarh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	-
Central Sector NR	7.87	8.27	13.11	13.11	1.62	1.62	0.00	0.00	22.60	23.00	1.75
Sub-Total (NR)	17.07	18.25	41.61	49.38	1.62	1.62	7.15	8.63	67.45	77.88	15.45
Chhatisgarh	0.12	0.12	11.10	13.41	0.00	0.00	0.32	0.43	11.54	13.95	20.87
Goa	0.00	0.00	0.05	0.05	0.00	0.00	0.00	0.00	0.05	0.05	0.00
Gujarat	0.77	0.77	19.84	19.99	0.00	0.00	4.72	5.23	25.33	26.00	2.62
Madhya Pradesh	1.70	1.70	10.62	9.83	0.00	0.00	1.56	3.04	13.88	14.58	4.99
Maharashtra	3.33	3.33	22.21	23.62	0.00	0.00	6.19	6.61	31.73	33.56	5.77
Central Sector WR	1.52	1.52	14.87	16.03	1.84	1.84	0.00	0.00	18.23	19.39	6.38
Sub-Total (WR)	7.45	7.45	78.69	82.93	1.84	1.84	12.79	15.31	100.77	107.53	6.71
Andhra Pradesh	1.24	1.76	9.37	9.28	0.00	0.00	1.95	2.68	12.57	13.71	9.07
Telangana	2.50	2.14	2.28	6.79	-	0.00	0.06	0.61	4.84	9.54	97.01
Karnataka	3.60	3.60	5.01	6.51	0.00	0.00	4.51	5.11	13.12	15.22	15.97
Kerala	1.88	1.88	0.43	0.41	0.00	0.00	0.20	0.26	2.51	2.55	1.34
Lakshadweep	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	-93.00
Puducherry	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.03	0.03	0.00
Tamil Nadu	2.18	2.18	7.36	8.56	0.00	0.00	8.40	9.51	17.94	20.25	12.88
Central Sector SR #	0.00	0.00	9.95	10.45	2.32	2.32	0.00	0.00	12.27	12.77	4.07
Sub-Total (SR)	11.40	11.56	34.46	42.03	2.32	2.32	15.12	18.15	63.29	74.07	17.03
A & N Island	0.00	0.00	0.06	0.04	0.00	0.00	0.01	0.01	0.07	0.05	-28.41
Bihar	0.00	0.00	0.21	0.21	0.00	0.00	0.11	0.12	0.32	0.33	1.57
Jharkhand	0.13	0.13	2.09	2.09	0.00	0.00	0.02	0.02	2.24	2.24	0.01
Odisha	2.06	2.06	5.07	5.42	0.00	0.00	0.12	0.15	7.25	7.63	5.33
Sikkim	0.10	0.20	0.00	0.00	0.00	0.00	0.05	0.05	0.16	0.25	58.29
West Bengal	0.98	0.98	7.27	7.60	0.00	0.00	0.13	0.13	8.38	8.71	3.96
DVC	0.14	0.14	7.94	9.04	0.00	0.00	0.00	0.00	8.08	9.18	13.61
Central Sector ER	0.70	0.78	9.64	9.89	0.00	0.00	0.00	0.00	10.34	10.67	3.19
Sub-Total (ER)	4.11	4.29	32.28	34.29	0.00	0.00	0.44	0.49	36.84	39.06	6.03
Arunachal Prd.	0.00	0.00	0.02	0.00	0.00	0.00	0.10	0.10	0.12	0.10	-12.46
Assam	0.10	0.10	0.38	0.36	0.00	0.00	0.03	0.03	0.52	0.49	-4.01
Manipur	0.00	0.00	0.05	0.04	0.00	0.00	0.01	0.01	0.05	0.04	-18.50
Meghalaya	0.28	0.28	0.00	0.00	0.00	0.00	0.03	0.03	0.32	0.31	-0.65
Mizoram	0.00	0.00	0.05	0.00	0.00	0.00	0.04	0.04	0.09	0.04	-59.37
Nagaland	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.02	0.03	70.29
Tripura	0.00	0.00	0.17	0.17	0.00	0.00	0.02	0.02	0.19	0.19	0.08
Central Sector NER	0.86	0.86	1.19	1.48	0.00	0.00	0.00	0.00	2.05	2.34	14.05
Sub-Total (NER)	1.24	1.24	1.87	2.04	0.00	0.00	0.26	0.26	3.36	3.55	5.61
Total States	30.32	31.36	140.13	159.72	0.00	0.00	35.77	42.85	206.23	233.92	13.43
Total Central	10.95	11.43	48.76	50.96	5.78	5.78	0.00	0.00	65.49	68.16	4.08
Total All India	41.28	42.78	188.89	210.68	5.78	5.78	35.77	42.85	271.72	302.08	11.18

RES: Other Renewable sources excluding hydro

includes NLC-Central capacity also

Sub-totals/Totals may not tally due to conversion to GW and rounding off.

Source : Central Electricity Authority.

Table 2.5: Statewise and Sourcewise Installed Capacity of Grid Interactive Renewable Power as on 31.03.2015 and 30.03.2016

States/ UTs	Bio-Power				(In MW)	
	Biomass Power		Waste to Energy		Wind Power	
	31.03.15	31.03.16	31.03.15	31.03.16	31.03.15	31.03.16
Andhra Pradesh	389.75	380.75	58.16	58.16	1032.00	1431.45
Arunachal Pradesh	-	-	-	-	-	-
Assam	-	-	-	-	-	-
Bihar	43.42	43.42	-	-	-	-
Chhattisgarh	264.90	279.90	-	-	-	-
Goa	-	-	-	-	-	-
Gujarat	55.90	56.30	-	-	3645.00	4037.50
Haryana	52.30	45.30	-	-	-	-
Himachal Pradesh	-	-	-	-	-	-
Jammu & Kashmir	-	-	-	-	-	-
Jharkhand	-	-	-	-	-	-
Karnataka	664.28	872.18	1.00	1.00	2638.00	2869.15
Kerala	-	-	-	-	35.00	43.50
Madhya Pradesh	36.00	35.00	3.90	3.90	880.00	2141.10
Maharashtra	1033.40	1220.78	12.72	12.72	4446.00	4654.15
Manipur	-	-	-	-	-	-
Meghalaya	-	-	-	-	-	-
Mizoram	-	-	-	-	-	-
Nagaland	-	-	-	-	-	-
Odisha	20.00	20.00	-	-	-	-
Punjab	140.50	155.50	10.25	10.25	-	-
Rajasthan	111.30	108.30	-	-	3309.00	3993.95
Sikkim	-	-	-	-	-	-
Tamil Nadu	662.30	641.90	8.05	8.05	7455.00	7613.86
Telangana	-	-	-	-	-	77.70
Tripura	-	-	-	-	-	-
Uttar Pradesh	888.50	870.00	5.00	5.00	-	-
Uttarakhand	30.00	76.00	-	-	-	-
West Bengal	26.00	26.00	-	-	-	-
Andaman & Nicobar	-	-	-	-	-	-
Chandigarh	-	-	-	-	-	-
Dadar & Nagar Haveli	-	-	-	-	-	-
Daman & Diu	-	-	-	-	-	-
Delhi	-	-	16.00	16.00	-	-
Lakshadweep	-	-	-	-	-	-
Puducherry	-	-	-	-	-	-
Others	-	-	-	-	4.00	4.30
All India Total	4418.55	4831.33	115.08	115.08	23444.00	26866.66
Distribution (%)	12.35	11.46	0.27	0.27	65.53	62.70

- Denotes non availability or indeterminant value

Source: Ministry of New and Renewable Energy

Table 2.5 (contd): Statewise and Sourcewise Installed Capacity of Grid Interactive Renewable Power as on 31.03.2015 and 30.03.2016

(In MW)

States/ UTs	Small Hydro Power		Solar Power		Total		Growth* Rate(2014-15 to 2015-16)
	31.03.15	31.03.16	31.03.15	31.03.16	31.03.15	31.03.16	
Andhra Pradesh	223.23	232.98	242.86	572.96	1946.00	2676.30	37.53
Arunachal Pradesh	104.61	104.61	0.03	0.27	104.63	104.87	0.23
Assam	34.11	34.11	-	-	34.11	34.11	0.00
Bihar	70.70	70.70	-	5.10	114.12	119.22	4.47
Chhattisgarh	52.00	52.00	7.60	93.58	324.50	425.48	31.12
Goa	0.05	0.05	-	0.00	0.05	0.05	0.00
Gujarat	16.60	16.60	1000.05	1119.17	4717.55	5229.57	10.85
Haryana	71.50	73.50	12.80	15.39	136.60	134.19	-1.77
Himachal Pradesh	723.91	793.31	-	0.20	723.91	793.51	9.61
Jammu & Kashmir	156.53	156.53	-	1.00	156.53	157.53	0.64
Jharkhand	4.05	4.05	16.00	16.19	20.05	20.24	0.93
Karnataka	1129.73	1217.73	77.22	145.46	4510.23	5105.52	13.20
Kerala	168.92	198.92	0.03	13.05	203.95	255.47	25.26
Madhya Pradesh	86.16	86.16	558.58	776.37	1564.64	3042.53	94.46
Maharashtra	335.43	339.88	360.75	385.76	6188.30	6613.28	6.87
Manipur	5.45	5.45	-	-	5.45	5.45	0.00
Meghalaya	31.03	31.03	-	-	31.03	31.03	0.00
Mizoram	36.47	36.47	-	0.10	36.47	36.57	0.27
Nagaland	29.67	30.67	-	-	29.67	30.67	3.37
Odisha	64.63	64.63	31.76	66.92	116.39	151.55	30.21
Punjab	157.40	170.90	185.27	405.06	493.42	741.71	50.32
Rajasthan	23.85	23.85	942.10	1269.93	4386.25	5396.03	23.02
Sikkim	52.11	52.11	-	-	52.11	52.11	0.00
Tamil Nadu	123.05	123.05	142.58	1061.82	8390.98	9448.68	12.61
Telangana	-	-	61.25	527.84	61.25	605.54	888.64
Tripura	16.01	16.01	5.00	5.00	21.01	21.01	0.00
Uttar Pradesh	25.10	25.10	71.26	143.50	989.86	1043.60	5.43
Uttaranchal	209.32	209.33	5.00	41.15	244.32	326.48	33.63
West Bengal	98.50	98.50	7.21	7.77	131.71	132.27	0.43
Andaman & Nicobar	5.25	5.25	5.10	5.10	10.35	10.35	0.00
Chandigarh	-	-	4.50	6.81	4.50	6.81	51.24
Daman & Diu	-	-	-	4.00	0.00	4.00	-
Delhi	-	-	5.47	14.28	21.47	30.28	41.07
Lakshadweep	-	-	0.75	0.75	0.75	0.75	0.00
Puducherry	-	-	0.03	0.03	0.03	0.03	0.00
Others	-	-	0.79	58.31	4.79	62.61	1207.12
All India Total	4055.37	4273.48	3743.99	6762.87	35776.96	42849.38	19.77
Distribution (%)	11.34	9.97	10.46	15.78	100.00	100.00	

- Denotes non availability or indeterminant value

Source: Ministry of New and Renewable Energy

Table 2.6 : Installation of Off-grid / Decentralised Renewable Energy Systems/ Devices as on 31.03.2016

Sl. No.	State/UT	Biogas Plants (Nos.)	Water Pumping/ Wind Mills # (Nos.)	SPV Pumps (Nos.)	(Nos. in lakhs)			
					Solar Photovoltaic (SPV) Systems			
					SLS (Nos.)	HLS (Nos.)	SL (Nos.)	PP (KWP)
1	2	3	4	5	6	7	8	9
1	Andhra Pradesh	5.32	6.0	615	0.1	0.2	0.5	3632.6
2	Arunachal Pradesh	0.03	0.0	18	0.0	0.2	0.1	600.1
3	Assam	1.14	3.0	45	0.0	0.1	0.0	1605.0
4	Bihar	1.30	46.0	1,666	0.0	0.1	0.5	1021.6
5	Chhattisgarh	0.51	1.0	435	0.0	0.1	0.0	22898.7
6	Goa	0.04	0.0	15	0.0	0.0	0.0	32.7
7	Gujarat	4.30	945.0	268	0.0	0.1	0.3	13576.6
8	Haryana	0.61	0.0	543	0.2	0.6	0.9	2321.3
9	Himachal Pradesh	0.47	0.0	6	0.3	0.2	0.4	1512.5
10	Jammu & Kashmir	0.03	0.0	39	0.1	0.7	0.5	7561.9
11	Jharkhand	0.07	0.0	-	0.0	0.1	0.2	3539.9
12	Karnataka	4.79	28.0	551	0.0	0.5	0.1	4676.4
13	Kerala	1.44	79.0	810	0.0	0.4	0.5	3894.4
14	Madhya Pradesh	3.54	0.0	87	0.1	0.0	0.1	2726.0
15	Maharashtra	8.71	26.0	251	0.1	0.0	0.7	3857.7
16	Manipur	0.02	-	40	0.0	0.0	0.0	1241.0
17	Meghalaya	0.10	-	19	0.0	0.1	0.2	884.5
18	Mizoram	0.05	-	37	0.0	0.1	0.1	1185.0
19	Nagaland	0.08	-	3	0.0	0.0	0.1	1292.0
20	Odisha	2.66	-	57	0.1	0.1	0.1	567.5
21	Punjab	1.72	-	1,857	0.1	0.1	0.2	1202.0
22	Rajasthan	0.70	222.0	27,323	0.1	1.4	0.0	15540.0
23	Sikkim	0.09	-	-	0.0	0.2	0.2	795.0
24	Tamil Nadu	2.22	60.0	1,245	0.4	1.3	0.2	7297.6
25	Telangana	0.10	-	-	-	-	-	1833.0
26	Tripura	0.03	-	155	0.0	0.3	0.6	369.0
27	Uttar Pradesh	4.39	-	1,516	1.8	2.4	0.6	6263.5
28	Uttarakhand	0.18	-	26	0.2	0.9	0.9	628.0
29	West Bengal	3.67	-	48	0.1	1.5	0.2	1126.0
30	Andaman & Nicobar	0.00	2.0	5	0.0	0.0	0.1	167.0
31	Chandigarh	0.00	-	12	0.0	0.0	0.0	730.0
32	Dadar & Nagar Haveli	0.00	-	-	-	-	-	0.0
33	Daman & Diu	-	-	-	-	-	-	0.0
34	Delhi	0.01	-	90	0.0	-	0.0	1269.0
35	Lakshadweep	-	-	-	0.0	-	0.1	1090.0
36	Puducherry	0.01	-	21	0.0	0.0	0.0	40.0
37	Others*	-	-	-	0.1	1.3	1.3	23885.0
	Total	48.35	1,418.08	37,803.00	3.96	12.86	10.01	1,40,862.44

Data reported for the year 2012

* Others includes installations through NGOs/IREDA in different states

SLS = Street Lighting System; HLS = Home Lighting System; SL = Solar Lantern; PP = Power Plants; SPV = Solar Photovoltaic; SHP = Small Hydro Power; MW = Mega Watt; KWP = Kilowatt peak; BOV = Battery Operated Vehicles

Source : Ministry of New and Renewable Energy

Table 2.6(contd..) : Installation of Off-grid / Decentralised Renewable Energy Systems/ Devices as on 31.03.2016

Sl. No.	State/UT	Aerogen. Hybrid System	Solar Cooker #	Biomass Gasifiers (Rural+ Industrial)	Biomass (non bagasse)	Waste to Energy	Village Electrification	
							Villages	Percentage of village electrified
		(KW)	(MW)	(KW)	(MW)	(MW)	(Nos.)	%
1	2	3	4	5		6	7	8
1	Andhra Pradesh	16.00	23.15	22914	99.0	23.01	16,158	100.0
2	Arunachal Pradesh	6.80	0.03	750	-	-	3,854	73.3
3	Assam	6.00	-	2,933	-	-	23,422	92.3
4	Bihar	-	-	11688	8.2	1.00	38,080	97.5
5	Chhattisgarh	-	4.00	1210	2.5	0.33	18,892	96.6
6	Goa	193.80	1.69	-	-	-	320	100.0
7	Gujarat	20.00	824.09	21530	-	15.83	17,843	100.0
8	Haryana	10.00	7.80	5423	77.1	4.00	6,642	100.0
9	Himachal Pradesh	-	-	-	7.2	1.00	17,848	99.8
10	Jammu & Kashmir	46.40	-	200	-	-	6,230	98.3
11	Jharkhand	-	16.00	500	4.3	-	27,717	94.0
12	Karnataka	39.20	14.00	7447	15.2	9.63	27,358	99.9
13	Kerala	8.00	0.03	-	0.7	-	1,017	100.0
14	Madhya Pradesh	24.00	11.75	11618	12.4	0.47	51,674	99.5
15	Maharashtra	1613.60	34.50	7,150	16.4	22.05	40,956	100.0
16	Manipur	140.00	-	-	-	-	2,178	91.6
17	Meghalaya	191.50	-	250	13.8	-	4,458	85.9
18	Mizoram	-	-	250	-	-	662	94.0
19	Nagaland	20.00	-	2,100	-	-	1,318	94.1
20	Odisha	13.10	13.00	270	8.2	0.02	45,452	95.3
21	Punjab	50.00	9.33	-	123.1	7.98	12,168	100.0
22	Rajasthan	14.00	222.90	3088	2.0	3.70	42,944	99.3
23	Sikkim	15.50	-	-	-	-	425	100.0
24	Tamil Nadu	157.90	17.06	16262	24.1	13.10	15,049	100.0
25	Telangana	-	-	-	-	-	846	98.0
26	Tripura	2.00	-	1050	-	-	10,128	100.0
27	Uttar Pradesh	-	12.38	35852	170.4	46.18	97,589	99.8
28	Uttarakhand	24.00	5.05	2,150	47.5	5.02	15,669	99.5
29	West Bengal	74.00	2.00	36368	19.9	1.16	37,449	100.0
30	Andaman & Nicobar	-	-	-	-	-	341	86.1
31	Chandigarh	-	-	-	-	-	5	100.0
32	Dadar & Nagar Haveli	-	-	-	-	-	65	100.0
33	Daman & Diu	-	-	-	-	-	19	100.0
34	Delhi	-	2.53	-	-	-	103	100.0
35	Lakshadweep	-	-	250	-	-	6	100.0
36	Puducherry	5.00	-	-	-	-	90	100.0
37	Others*	-	-	-	-	-	-	-
Total		2690.80	1221.26	191253	651.9	154.48	586065	98.1

Data reported for the year 2012

* Others includes installations through NGOs/IREDA in different states

SLS = Street Lighting System; HLS = Home Lighting System; SL = Solar Lantern; PP = Power Plants; SPV = Solar Photovoltaic; SHP = Small Hydro Power; MW = Mega Watt; KWP = Kilowatt peak; BOV = Battery Operated Vehicles

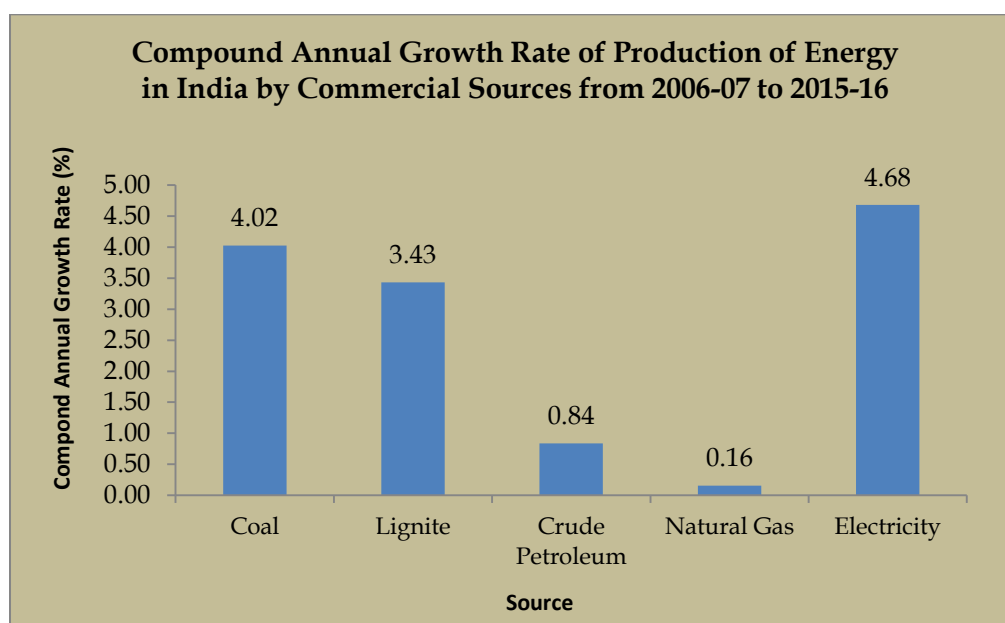
Source : 1. Ministry of New and Renewable Energy

2. Central Electricity Authority

CHAPTER 3: PRODUCTION OF COMMERCIAL SOURCES OF ENERGY

3.1 Production of Coal, lignite, crude petroleum, natural gas & electricity

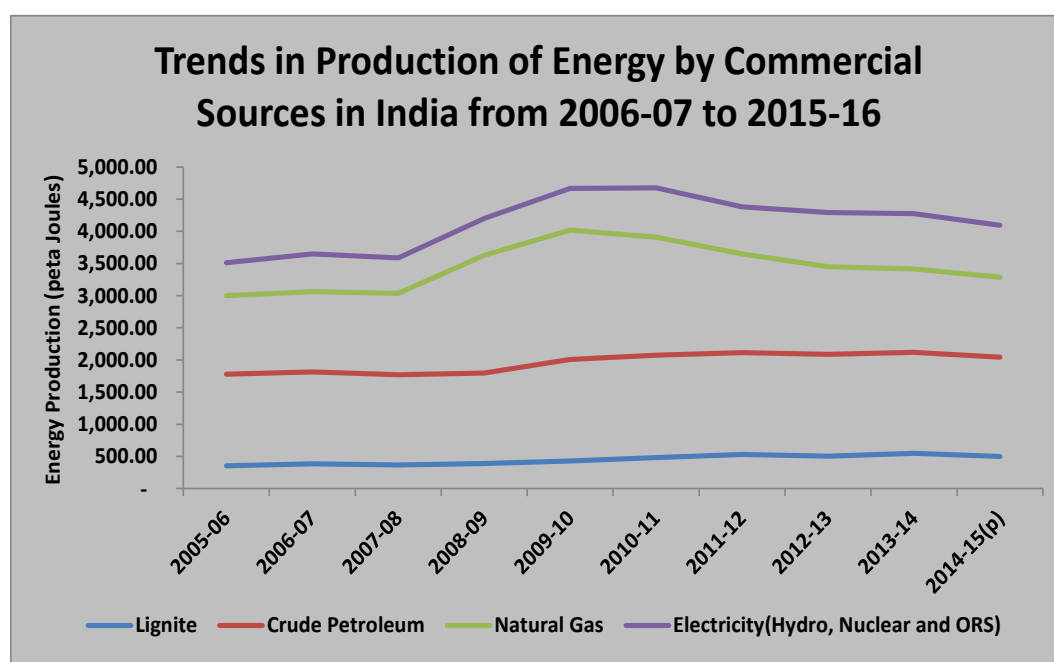
- ❖ Coal production in the country during the year 2015-16 was 639.23 million tonne (MTs) as compared to 609.18 MTs during 2014-15, registering a growth of 4.93% (Table 3.1).
- ❖ The Lignite production during 2015-16 was 43.84 million tonnes which is 9.18% lower than the production during 2014-15 (48.27 million tonnes).
- ❖ Considering the trend of production from 2006-07 to 2015-16, it is observed that coal production in India was about 430.83 MTs during 2006-07, which increased to 639.23 MTs during 2015-16 with a CAGR of 4.02%.
- ❖ During the same period, the CAGR of Lignite was about 3.43% with production increasing from 31.29 MTs in 2006-07 to 43.84 MTs in 2015-16.
- ❖ Production of crude petroleum increased from 33.99 MTs during 2006-07 to 36.95 MTs during 2015-16, a CAGR of about 0.84%.
- ❖ The CAGRs for natural gas and electricity were 0.16% and 4.68% respectively for the period 2006-07 to 2015-16. Electricity has experienced the highest CAGR i.e. 4.68% among all the commercial sources of energy since 2006-07 to 2015-16.



- ❖ For more meaningful comparison in the trends and patterns of growth of different energy resources, it is desirable to convert all the resources to their energy

equivalents by applying appropriate conversion factors and express them in energy units (Joules/ Peta Joules/ Terra Joules).

- ❖ The total production of energy from commercial sources decreased from 14090.50 peta joules during 2014-15 to 13767.83 peta joules during 2015-16, showing a decrease of 2.29 % (Table 3.2).
- ❖ The production of energy in peta joules by commercial sources shows that Coal was the major source of energy, accounting for about 70.25% of the total production during 2015-16. Crude Petroleum was the second (11.24%), while Natural Gas (9.02%) was the third major source. Electricity and lignite contributed 5.87% and 3.62% respectively.

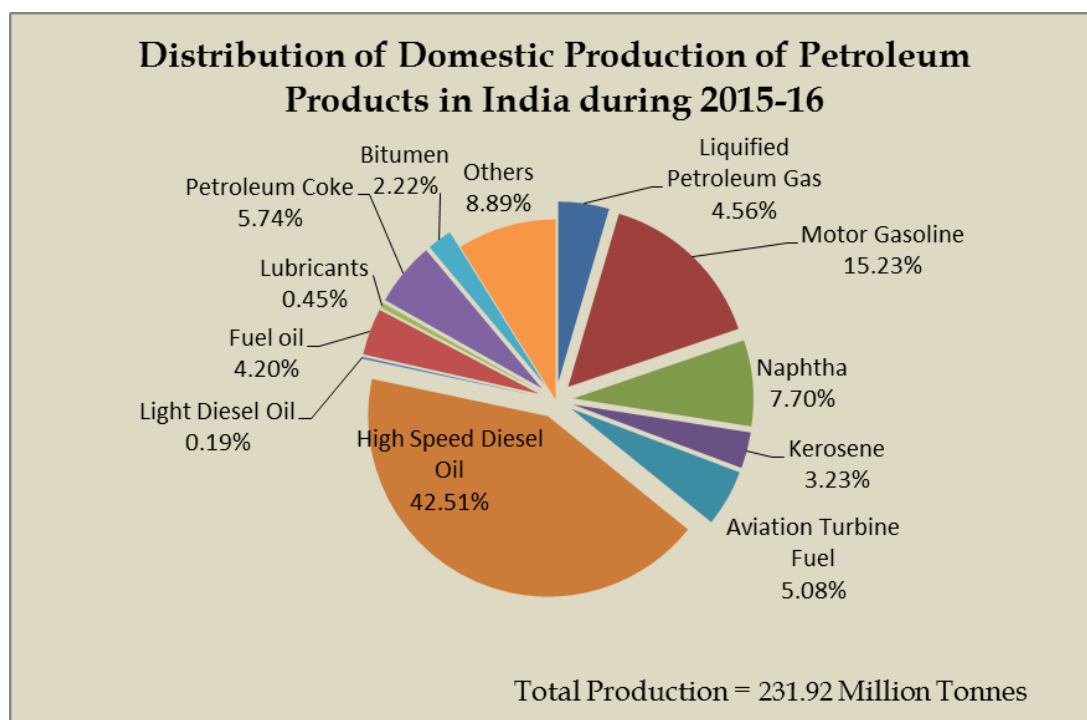


- ❖ Out of the total coking coal production of 60.89 MT in the country, 89.78% is produced by public sector, whereas for the private sector, the share of production is 10.22%. A similar pattern is observed for the production of non-coking coal in the country, where the public sector contributes a significant 95.45% (552.02 MTs) of the total production (578.35) and the private sector producing only 4.55% of non-coking coal in the country (26.33 MTs).

3.2 Production of Petroleum Products and Natural Gas

- ❖ In the year 2015-16, the production of Petroleum Products in the country was 231.92 MTs as against 221.13 during 2014-15, an increase of 4.88% (Table 3.4).
- ❖ In the total production of Petroleum products during 2015-16, High speed diesel oil accounted for the maximum share (42.51%), followed by Motor Gasoline (15.23%). (Table 3.4).

- ❖ Net production of Natural Gas decreased from 26.91 billion cubic meters (BCM) in 2014-15 to 25.46 BCM in 2015-16 registering a negative growth of 5.41% and a CAGR of -0.37 from 2006-07 to 2015-16 (Table 3.5).



3.3 Generation of electricity

- ❖ The all India gross electricity generation from utilities, excluding that from the captive generating plants, was 6,70,654 Giga Watt-Hours (GWh) during 2006-07 (Table 3.6). It rose to 11,67,584 GWh during 2015-16.
- ❖ The production of electricity from utilities has increased from 11,16,850 GWh during 2014-15 to 11,67,584 GWh during 2015-16, registering an annual growth rate of about 4.54%.
- ❖ Total Electricity generation in the country, from utilities and non-utilities taken together during 2015-16 was 13,35,956 GWh. Out of the total electricity generated through utilities, 9,43,013 GWh was generated from thermal and 1,21,377 GWh was from hydro and 37,414 GWh was generated from nuclear sources. Total output from non-utilities was 1,68,372 GWh.

Table 3.1 : Trends in Production of Commercial Sources of Energy in India

Year	Coal (million tonnes)	Lignite (million tonnes)	Crude Petroleum (million tonnes)	Natural Gas (Billion Cubic Metres)	Electricity* (GWh)
1	2		3	4	5
2006-07	430.83	31.29	33.99	31.75	1,42,163.75
2007-08	457.08	33.98	34.12	32.42	1,62,553.72
2008-09	492.76	32.42	33.51	32.85	1,52,886.00
2009-10	532.04	34.07	33.69	47.50	1,59,642.84
2010-11	532.69	37.73	37.68	52.22	1,79,926.46
2011-12	539.95	42.33	38.09	47.56	2,14,024.08
2012-13	556.40	46.45	37.86	39.83	2,04,035.31
2013-14	565.77	44.27	37.79	35.41	2,34,595.01
2014-15	609.18	48.27	37.46	33.66	2,38,908.43
2015-16(P)	639.23	43.84	36.95	32.25	2,24,571.11
Growth rate of 2015-16 over 2014-15(%)	4.93	-9.18	-1.36	-4.19	-6.00
CAGR 2006-07 to 2015-16(%)	4.02	3.43	0.84	0.16	4.68

(p): provisional

* Electricity from Hydro, Nuclear and other Renewable energy sources.

Sources:

1. Ministry of Coal
2. Ministry of Petroleum & Natural Gas
3. Central Electricity Authority

Table 3.2 : Trends in Production of Energy in India by Commercial Sources

(in Peta Joules) @

Year	Coal	Lignite	Crude Petroleum	Natural Gas	Electricity *	Total
1	2	3	4	5	6	7= 2 to 6
2006-07	6,518.49	355.71	1,423.08	1,222.89	511.79	10,031.96
2007-08	6,915.65	386.35	1,428.52	1,248.70	585.19	10,564.42
2008-09	7,455.41	368.63	1,402.90	1,265.19	550.39	11,042.52
2009-10	8,049.80	387.39	1,410.64	1,829.55	574.71	12,252.09
2010-11	8,059.66	429.02	1,577.83	2,011.48	647.74	12,725.72
2011-12	8,169.44	481.31	1,594.83	1,831.97	770.49	12,848.05
2012-13	8,418.36	528.17	1,585.28	1,534.25	734.53	12,800.59
2013-14	8,560.02	503.36	1,582.27	1,363.99	844.54	12,854.19
2014-15	9,216.89	548.83	1,568.45	1,296.58	860.07	14,090.50
2015-16(p)	9,671.55	498.46	1,547.10	1,242.27	808.46	13,767.83
Growth rate of 2015-16 over 2014-15(%)	4.93	-9.18	-1.36	-4.19	-6.00	-2.29
CAGR 2006-07 to 2015-16(%)	4.02	3.43	0.84	0.16	4.68	3.22

(P): provisional

* Electricity from hydro, Nuclear and other Renewable energy sources.

@ Conversion factors have been applied to convert production of primary sources of energy into peta joules

Sources:

1. Office of Coal Controller, Ministry of Coal
2. Ministry of Petroleum & Natural Gas
3. Central Electricity Authority

Table 3.3 : Trends in Production of Coal and Lignite in India.

(Million Tonnes)

Year	Coal			Lignite	Grand Total
	Coking	Non-coking	Total		
1	2	3	4=(2)+(3)	5	6=(4)+(5)
2006-07	32.10	398.74	430.83	31.29	462.12
2007-08	34.46	422.63	457.08	33.98	491.06
2008-09	33.81	457.95	491.76	32.42	524.18
2009-10	44.41	487.63	532.04	34.07	566.11
2010-11	49.55	483.15	532.69	37.73	570.43
2011-12	51.65	488.29	539.94	42.33	582.27
2012-13	51.83	505.87	557.71	46.60	604.31
2013-14	56.82	508.95	565.77	44.27	610.04
2014-15	57.45	551.73	609.18	48.27	657.45
2015-16(p)	60.89	578.35	639.23	43.84	683.08
Growth rate of 2015-16 over 2014-15(%)	5.98	4.82	4.93	-9.17	3.90
CAGR 2006-07 to 2015-16(%)	6.61	3.79	4.02	3.43	3.99

(P): Provisional

Source : Ministry of Coal.Office of Coal Controller

Table 3.3 A: Grade Wise Production of Coking Coal by Companies in 2014-15 & 2015-16

(Million Tonnes)

Grade of Coking Coal	Public		Private		All India		Percentage Change
	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	
Steel-I	0.052	0.037	0	0	0.052	0.037	-28.85
Steel-II	0.327	1.051	0	0	0.327	1.051	221.41
SC-1	0.132	0.135	0	0	0.132	0.135	2.27
Wash-I	0.102	0.414	0	0	0.102	0.414	305.88
Wash-II	1.452	2.36	0.242	0.134	1.694	2.494	47.23
Wash-III	10.897	11.919	1.038	1.049	11.935	12.968	8.66
Wash-IV	37.386	38.746	4.986	5.042	42.372	43.788	3.34
SLV1	0	0	0	0	0	0	-
Met.Coal	7.115	8.617	6.266	6.225	13.381	14.842	10.92
Non Met	43.233	45.642	0	0	43.233	45.642	5.57
Total Coking Coal	50.348	54.662	6.266	6.225	56.614	60.887	7.55

Source: Office of Coal Controller of India

Table 3.3 B: Grade Wise Production of Non-Coking Coal by Companies in 2014-15 & 2015-16

(Million Tonnes)

Grade of Non-Coking Coal	Public		Private		All India		Percentage Change
	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	
1	0.248	0.118	5.732	3.715	5.732	3.833	-33.13
2	1.456	0.342	0	0	1.456	0.342	-76.51
3	4.698	5.188	0	0	4.698	5.188	10.43
4	19.116	17.665	0	0	19.116	17.665	-7.59
5	16.663	16.3	0	0	16.663	16.3	-2.18
6	19.443	13.123	0.796	0	20.239	13.128	-35.14
7	38.693	39.037	0.012	0	38.705	39.037	0.86
8	27.658	28.884	0.929	0.165	28.587	29.049	1.62
9	51.899	48.561	1.416	0.12	53.315	48.681	-8.69
10	67.618	72.118	9.752	10.738	77.37	82.856	7.09
11	115.903	136.432	3.979	11.029	119.882	147.461	23.01
12	76.345	90.574	5.957	0.003	82.302	90.577	10.05
13	68.98	77.448	1.262	0.171	70.242	77.619	10.50
14	0.33	1.049	3.875	0.39	4.205	1.439	-65.78
15	1.424	4.073	2.022	0	3.446	4.073	18.20
16	0	0.418	0.475	0	0.475	0.418	-12.00
17	0.36	0.668	3.269	0	3.269	0.668	-79.57
UNG	0.706	0.013	0	0	0.706	0.013	-98.16
Non-Coaking	511.54	552.016	39.476	26.331	551.016	578.347	4.96

Source: Office of Coal Controller of India

Table 3.4 : Trends in Domestic Production of Petroleum Products In India

(Million Tonnes)

Year	Light distillates			Middle distillates			
	Liquified Petroleum Gas	Motor Gasoline	Naphtha\$	Kerosene	Aviation Turbine Fuel	High Speed Diesel Oil	Light Diesel Oil
1	2	3	4	5	6	7	8
2006-07	8.41	12.54	18.14	8.63	7.81	53.48	0.80
2007-08	8.79	14.17	17.96	7.97	9.11	58.38	0.67
2008-09	9.16	16.02	16.45	8.39	8.07	62.91	0.61
2009-10	10.33	22.54	18.79	8.70	9.30	73.30	0.47
2010-11	9.71	26.14	19.20	7.81	9.59	78.06	0.59
2011-12	9.55	27.19	18.83	7.86	10.06	82.88	0.50
2012-13	9.82	30.12	17.35	7.87	10.08	91.08	0.40
2013-14	10.03	30.28	18.51	7.42	11.22	93.76	0.42
2014-15	9.84	32.33	17.39	7.56	11.10	94.43	0.36
2015-16(p)	10.57	35.32	17.86	7.50	11.79	98.59	0.43
Growth rate of 2015-16 over 2014-15(%)	7.42	9.27	2.70	-0.78	6.22	4.41	20.11
CAGR 2006-07 to 2015-16(%)	2.31	10.91	-0.16	-1.40	4.21	6.31	-6.05

(p) : Provisional

Source : Ministry of Petroleum & Natural Gas.

Table 3.4 (Contd.): Trends in Domestic Production of Petroleum Products in India

(Million Tonnes)

Year	Heavy ends				Others *	Total
	Fuel oil	Lubricants	Petroleum Coke	Bitumen		
1	9	10	11	12	13	14= 2 to 13
2006-07	15.70	0.83	3.78	3.89	5.75	139.75
2007-08	15.81	0.88	4.13	4.51	7.10	149.47
2008-09	17.68	0.87	4.24	4.71	6.03	155.15
2009-10	18.35	0.95	3.71	4.89	13.28	184.61
2010-11	20.52	0.88	2.71	4.48	15.14	194.82
2011-12	18.43	1.03	7.84	4.61	14.43	203.20
2012-13	15.05	0.90	10.94	4.67	19.45	217.74
2013-14	13.41	0.94	12.07	4.79	17.93	220.78
2014-15	11.92	0.95	12.45	4.63	18.19	221.13
2015-16(p)	9.73	1.04	13.32	5.16	20.63	231.92
Growth rate of 2015-16 over 2014-15(%)	-18.37	9.94	6.99	11.45	13.38	4.88
CAGR 2006-07 to 2015-16(%)	-4.67	2.34	13.43	2.86	13.63	5.20

(P): Provisional

\$: Includes other Light distillates from 2006-07

*: Includes those of light & middle distillates and heavy ends.

Source : Ministry of Petroleum & Natural Gas.

Table 3.5 :Trends in Gross and Net Production of Natural Gas

(in Billion Cubic Metres)

Year	Gross Production	Flared	Reinjected	Net Production #
2006-07	31.75	0.96	4.37	26.42
2007-08	32.42	0.94	4.50	26.98
2008-09	32.84	1.10	4.68	27.07
2009-10	47.50	0.97	5.66	40.86
2010-11	52.22	0.97	5.21	46.04
2011-12	47.56	1.08	5.31	41.17
2012-13	40.68	0.90	5.43	34.35
2013-14	35.41	0.77	5.59	29.05
2014-15	33.66	0.87	5.87	26.91
2015-16(p)	32.25	1.01	5.79	25.46
Growth rate of 2015-16 over 2014-15	-4.18	15.27	-1.43	-5.41
CAGR 2006-07 to 2015-16(%)	0.16	0.51	2.84	-0.37

(P) : Provisional

#: Net availability = Gross Production- Flared- Reinjected

Source: Ministry of Petroleum and Natural Gas

Table 3.6 :Trends in Gross Generation of Electricity from utilities and non-utilities in India(Giga Watt hour=10⁶ Kilo Watt hour)

Year	Utilities							
	Thermal				Hydro	Nuclear	ORS	Total
	Steam	Diesel	Gas	Total				
1	2	3	4	5	6	7	8	9
2006-07	4,61,794	2,539	64,157	5,28,490	1,13,502	18,802	9,860	6,70,654
2007-08	4,86,998	3,357	69,716	5,60,072	1,20,387	16,957	25,210	7,22,625
2008-09	5,11,895	4,789	71,597	5,88,281	1,10,099	14,927	27,860	7,41,167
2009-10	5,39,586	4,248	96,373	6,40,208	1,04,059	18,636	36,947	7,99,851
2010-11	5,61,298	3,181	1,00,342	6,64,822	1,14,416	26,266	39,245	8,44,748
2011-12	6,12,497	2,649	93,281	7,08,427	1,30,511	32,287	51,226	9,22,451
2012-13	6,91,341	2,448	66,664	7,60,454	1,13,720	32,866	57,449	9,64,489
2013-14	7,45,533	1,998	44,522	7,92,054	1,34,848	34,228	65,520	10,26,649
2014-15	8,35,291	1,576	41,075	8,77,941	1,29,244	36,102	73,563	11,16,850
2015-16(P)	8,95,340	551	47,122	9,43,013	1,21,377	37,414	65,781	11,67,584
Growth rate of 2015-16 over 2014-15(%)	7.19	-65.03	14.72	7.41	-6.09	3.63	-10.58	4.54
CAGR 2006-07 to 2015-16(%)	6.84	-14.17	-3.04	5.96	0.67	7.12	20.90	5.70

(P)-Provisional

Source : Central Electricity Authority.

**Table 3.6 (Conti) :Trends in Gross Generation of Electricity
from utilities and non-utilities in India**

(Giga Watt hour= 10⁶ x Kilo Watt hour)

Year	Non-Utilities							Grand Total
	Thermal				Hydro	ORS	Total	
	Steam	Diesel	Gas	Total				
1	10	11	12	13	14	15	16	
2006-07	56,184	9,975	15,207	81,366	218	216	81,800	7,52,454
2007-08	53,569	10,738	25,585	89,891	202	383	90,477	8,13,102
2008-09	73,626	10,082	15,306	99,015	146	560	99,721	8,40,888
2009-10	77,416	8,217	19,739	1,05,372	152	609	1,06,133	9,05,984
2010-11	96,657	7,754	15,435	1,19,846	149	922	1,20,917	9,65,665
2011-12	1,04,863	6,244	21,972	1,33,079	131	1,178	1,34,388	10,56,839
2012-13	1,13,167	8,205	20,769	1,42,141	118	1,750	1,44,010	11,08,499
2013-14	1,18,178	8,866	19,912	1,46,957	129	1,903	1,48,988	11,75,637
2014-15	1,28,401	9,720	21,135	1,59,256	145	2,656	1,62,057	12,78,907
2015-16(P)	1,36,721	8,412	21,083	1,66,216	110	2,046	1,68,372	13,35,956
Growth rate of 2015-16 over 2014-15(%)	6.48	-13.45	-0.25	4.37	-23.92	-22.98	3.90	4.46
CAGR 2006-07 to 2015-16(%)	9.30	-1.69	3.32	7.40	-6.60	25.22	7.49	5.91

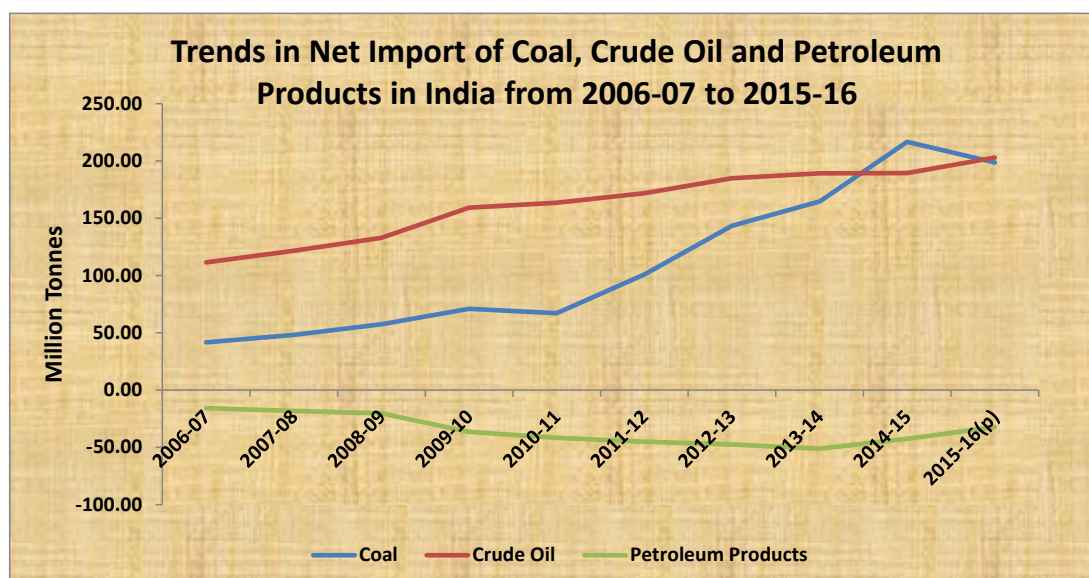
CHAPTER 4: FOREIGN TRADE IN COMMERCIAL SOURCES OF ENERGY

4.1 Import and export of coal

- ❖ The average quality of the Indian coal is not very high and this necessitates the import of high quality coal to meet the requirements of steel plants. There has been an increasing trend in the import of coal.
- ❖ Import of coal has steadily increased from 43.08 MTs during 2006-07 to 199.88 MTs during 2015-16 (Table 4.1). During this period, the quantum of coal exported increased from 1.55 MTs during 2006-07 to 2.45 MT during 2009-10 and then decreased to 1.25 MTs during 2015-16.
- ❖ The gross import decreased at 8.22% and net Import of coal decreased at 8.27% in 2015-16 over the previous year. However there was an increase of 0.81% in export of coal during the same period.

4.2 Crude oil and petroleum products

- ❖ India is highly dependent on import of crude oil. Net imports of crude oil have increased from 111.50 MTs during 2006-07 to 202.85 MTs during 2015-16.



- ❖ There has been an increase of 7.08% in the net imports of crude oil during 2015-16 over 2014-15, as the net import increased from 189.43 MTs to 202.85 MTs (Table 4.1).
- ❖ The export of petroleum product has increased from 33.62 MT during 2006-07 to 60.53 MTs during 2015-16. During 2015-16, exports recorded a decrease of 5.32% from previous year (Table 4.1).

- ❖ The import of petroleum products has increased from 17.76 MT in 2006-07 to 28.30 MT during 2015-16, although there are some fluctuations in the trend (Table 4.1). There is growth rate of 32.86% in import of petroleum products over the previous year.

4.3 Natural Gas

- ❖ The gross import of natural gas has increased from 6.81 BCM in 2006-07 to 16.58 BCM in 2015-16, recording a CAGR of 9.3%.

4.4 Electricity

- ❖ The gross import of electricity has increased with a CAGR 5.90% during the period 2006-07 (2957 GWh) to 2015-16 (5244 GWh). Similarly, the export of electricity has increased from 216 GWh in 2006-07 to 5150 GWh in 2015-16.
- ❖ There was decrease in net import of electricity during 2006-07 to 2015-16 and the CAGR for this period is (-) 28.64%.

Table 4.1: Trends of Foreign Trade in Coal, Crude Oil, Petroleum Products, Natural Gas and Electricity in India

('Million Tonnes)

Year	Coal			Crude Oil			Petroleum Products		
	Gross Imports	Exports	Net Imports	Gross Imports	Exports	Net Imports	Gross Imports	Exports	Net Imports
1	2	3	4=(2)-(3)	5	6	7=(5)-(6)	8	9	10=(8)-(9)
2006-07	43.08	1.55	41.53	111.50	0.00	111.50	17.76	33.62	-15.86
2007-08	49.79	1.63	48.17	121.67	0.00	121.67	22.46	40.75	-18.29
2008-09	59.00	1.66	57.35	132.78	0.00	132.78	18.59	38.94	-20.36
2009-10	73.26	2.45	70.81	159.26	0.00	159.26	14.67	51.16	-36.49
2010-11	68.92	1.88	67.04	163.60	0.00	163.60	17.38	59.08	-41.70
2011-12	102.85	2.02	100.84	171.73	0.00	171.73	15.85	60.84	-44.99
2012-13	145.79	2.44	143.34	184.80	0.00	184.80	15.77	63.41	-47.63
2013-14	166.86	2.19	164.67	189.24	0.00	189.24	16.72	67.86	-51.15
2014-15	217.78	1.24	216.54	189.43	0.00	189.43	21.30	63.93	-42.63
2015-16(p)	199.88	1.25	198.63	202.85	0.00	202.85	28.30	60.53	-32.23
Growth rate of 2015-16 over 2014-15(%)	-8.22	0.81	-8.27	7.08	-	7.08	32.86	-5.32	-24.39
CAGR 2006-07 to 2015-16(%)	16.59	-2.15	16.94	6.17	-	6.17	4.77	6.06	7.35

Table 4.1 (Conti): Trends of Foreign Trade in Coal, Crude Oil, Petroleum Products, Natural Gas and Electricity in India

Year	Natural Gas (Billion Cubic Metres)			Electricity(GWh)		
	Gross Imports	Exports	Net Imports	Gross Imports	Exports	Net Imports
1						
2006-07	6.81	0.00	6.81	2957	216	2741
2007-08	8.32	0.00	8.32	5230	290	4940
2008-09	8.06	0.00	8.06	5897	58	5838
2009-10	9.15	0.00	9.15	5359	105	5254
2010-11	9.93	0.00	9.93	5611	128	5482
2011-12	13.21	0.00	13.21	5253	135	5118
2012-13	13.14	0.00	13.14	4795	154	4641
2013-14	12.99	0.00	12.99	5598	1651	3947
2014-15	14.09	0.00	14.09	5008	4433	575
2015-16(p)	16.58	0.00	16.58	5244	5150	94
Growth rate of 2015-16 over 2014-15(%)	17.67	-	17.67	4.72	16.19	-83.67
CAGR 2006-07 to 2015-16(%)	9.31	-	9.31	5.90	37.29	-28.64

1. Office of Coal Controller, Ministry of Coal

2. Ministry of Petroleum & Natural Gas.

3. Central Electricity Authority

CHAPTER 5: AVAILABILITY

5.1 Availability of Coal and Lignite

- ❖ The total availability of raw coal in India in 2015-16 stood at 843.27 MTs and that of lignite at 45.47 MTs (Table 5.1).
- ❖ The availability of coal in the year 2015-16 increased by 1.60% compared to 2014-15. The availability of lignite decreased by 8.27% during the same period.
- ❖ The availability of coal has increased at a CAGR of about 5.74% during the period from 2006-07 to 2015-16. This increased availability might be attributed to the increase in the coal production (482.37 MTs during 2006-07 to 843.27 MTs during 2015-16) supplemented by imports (Table 5.2).
- ❖ The availability of lignite has increased at a CAGR of about 3.65% during the period from 2006-07 to 2015-16 (Table 5.1).

5.2 Availability of Natural Gas

- ❖ The production of natural gas has steadily increased from a mere 37.60 BCM during 2006-07 to 48.83 BCMs during 2015-16, registering a CAGR of 2.65%. Most of this increase in the indigenous production is due to discovery of new reserves.(Table 5.1)

5.3 Availability of Crude Oil and Petroleum Products

- ❖ The availability of crude oil in the country increased from 145.49 MTs in 2006-07 to 239.80 MTs during 2015-16 (Table 5.3).
- ❖ During this period, crude oil production increased from 33.99 MTs to 36.95 MTs and the net import increased from 111.50 MTs to 202.85 MTs between 2006-07 and 2015-16. There was increase of 5.69% in availability of crude oil during 2015-16 over 2014-15.

5.4 Availability of Electricity

- ❖ Electricity available for supply increased from 6,39,008 Gwh in 2006-07 to 11,04,228 Gwh in 2015-16, thus recording a CAGR of 5.62% during this period. The availability of electricity increased at 4.73% in 2015-16 over its value in 2014-15.

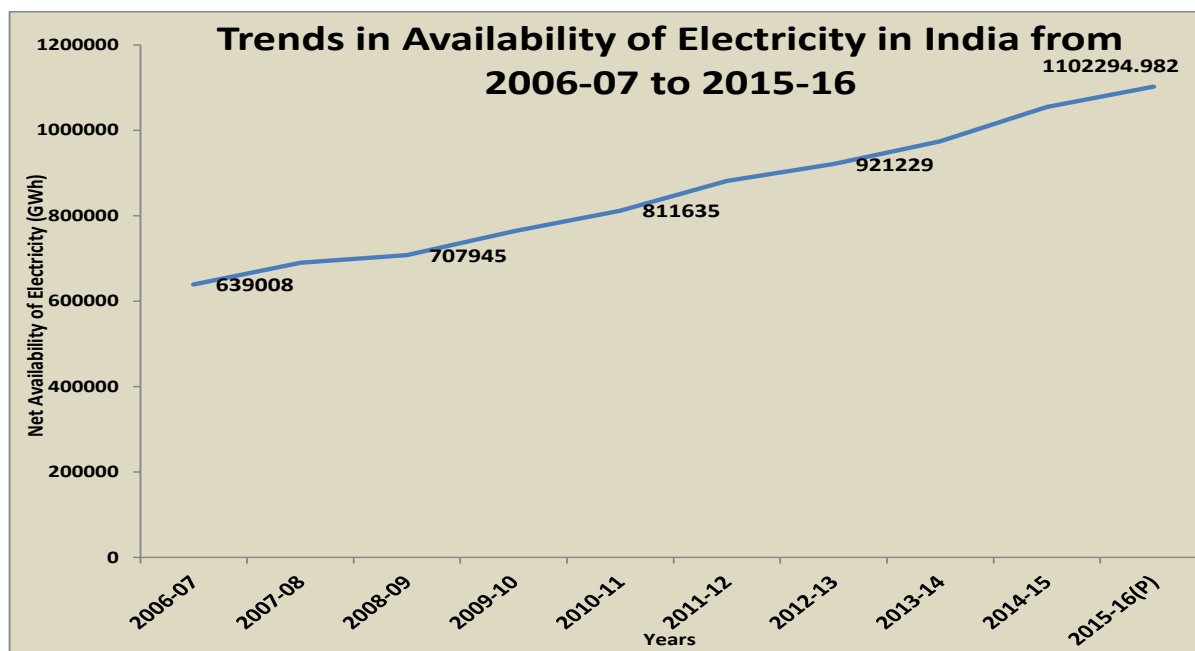


Table 5.1 : Trends in Availability of Primary Energy Sources in India

Year	Coal (Million Tonnes)	Lignite (Million Tonnes)	Crude Petroleum (Million Tonnes)	Natural Gas (Billion Cubic Metres)
2006-07	482.37	31.76	145.49	37.60
2007-08	507.68	33.31	155.79	39.80
2008-09	550.64	33.00	166.28	40.90
2009-10	620.39	33.73	192.95	56.65
2010-11	604.53	37.78	201.28	62.75
2011-12	642.64	42.77	209.82	60.77
2012-13	680.14	46.89	222.66	53.82
2013-14	724.19	44.64	227.03	48.44
2014-15	830.00	49.57	226.89	47.75
2015-16(p)	843.27	45.47	239.80	48.83
Growth rate of 2015-16 over 2014-15(%)	1.60	-8.27	5.69	2.26
CAGR 2006-07 to 2015-16(%)	5.74	3.65	5.12	2.65

(p) - Provisional

Sources:

1. Office of Coal Controller, Ministry of Coal
2. Ministry of Petroleum & Natural Gas
3. Central Electricity Authority

Table 5.2 : Trends in Availability of Raw Coal and Lignite in India

(Million Tonnes)

Year	Coal					Lignite		
	Production (Coking + Non-coking)	Change of Vendible Stock (closing stock-Opening stock)	Imports	Exports	Availability for Consumption	Production	Change of Vendible Stock (closing stock-Opening stock)	Availability for Consumption
1	2	3	4	5	6=2+3+4-5	7	8	9=7+8
2006-07	430.83	10.01	43.08	1.55	482.37	31.29	0.48	31.76
2007-08	457.08	2.43	49.79	1.63	507.68	33.98	-0.67	33.31
2008-09	492.76	0.54	59.00	1.66	550.64	32.42	0.58	33.00
2009-10	532.04	17.55	73.26	2.45	620.39	34.07	-0.34	33.73
2010-11	532.69	7.33	68.92	4.41	604.53	37.73	0.05	37.78
2011-12	539.95	1.85	102.85	2.02	642.64	42.33	0.44	42.77
2012-13	556.40	-10.99	137.56	2.83	680.14	46.45	0.44	46.89
2013-14	565.77	-7.87	168.44	2.15	724.19	44.27	0.37	44.64
2014-15	609.18	4.27	217.78	1.24	830.00	48.26	1.32	49.57
2015-16(p)	639.23	5.40	199.88	1.25	843.27	43.84	1.63	45.47
Growth rate of 2015-16 over 2014-15(%)	4.93	26.56	-8.22	0.97	1.60	-9.15	24.09	-8.27

(P): Provisional

Source : Office of the Coal Controller, Ministry of Coal

Table 5.3 : Trends in Availability of Crude Oil, Petroleum Products and Natural Gas in India

Year	Crude Oil (Million Tonne)			Petroleum Products (Million Tonne)			Natural Gas (Billion Cubic Meter)		
	Production	Net Imports	Availability	Production	Net Imports	Availability	Production	Net Imports	Availability
1	2	3	4=2+3	5	6	7=5+6	8	9	10=8+9
2006-07	33.99	111.50	145.49	139.75	-15.96	123.78	30.79	6.81	37.60
2007-08	34.12	121.67	155.79	149.47	-18.38	131.10	31.48	8.32	39.80
2008-09	33.51	132.78	166.28	155.15	-20.38	134.77	32.84	8.06	40.90
2009-10	33.69	159.26	192.95	184.61	-36.31	148.30	47.50	9.15	56.65
2010-11	37.68	163.60	201.28	194.82	-42.26	152.56	52.22	9.93	62.75
2011-12	38.09	171.73	209.82	203.20	-44.99	158.21	47.56	13.21	60.77
2012-13	37.86	184.80	222.66	217.74	-47.63	170.10	40.68	13.14	53.82
2013-14	37.79	189.24	227.03	220.76	-51.15	169.61	35.41	13.00	48.44
2014-15	37.46	189.43	226.89	221.14	-42.63	178.51	33.66	14.09	47.75
2015-16(p)	36.95	202.85	239.80	231.92	-32.23	199.69	32.25	16.58	48.83
Growth rate of 2015-16 over 2014-15(%)	-1.36	7.08	5.69	4.88	-24.40	11.87	-4.19	17.67	2.26

Note: For Natural gas, production and availability is Net and for Crude Oil and Petroleum Products, the Gross availability is taken equivalent to Net.

(P): Provisional

Source : Ministry of Petroleum & Natural Gas.

Table 5.4 : Trends in Availability of Electricity in India from 2006-07 to 2015-16

(in Giga Watt hour = 10⁶ Kilo Watt hour)

Year	Gross Electricity Generated from Utilities	Consum- ption in Power Station Auxiliaries	Net Electricity Generated from Utilities	Purchases from Non-Utilities + Imported from Other Countries	Net Electricity Available for Supply
1	2	3	4=2-3	5	6=4+5
2006-07	6,70,654	43,577	6,27,077	11,931	6,39,008
2007-08	7,22,626	45,531	6,77,095	12,685	6,89,780
2008-09	7,41,168	47,404	6,93,764	14,181	7,07,945
2009-10	7,99,851	50,723	7,49,128	14,391	7,63,519
2010-11	8,44,748	52,952	7,91,796	19,839	8,11,635
2011-12	9,22,451	56,499	8,65,952	15,514	8,81,466
2012-13	9,64,489	64,109	9,00,380	20,849	9,21,229
2013-14	10,26,649	70,161	9,56,488	17,948	9,74,436
2014-15	11,16,850	76,268	10,40,582	13,773	10,54,355
2015-16(P)	11,67,584	79,302	10,88,282	15,947	11,04,228
Growth rate of 2015-16 over 2014-15(%)	4.54	3.98	4.58	15.78	4.73
CAGR 2006-07 to 2015-16(%)	5.70	6.17	5.67	2.94	5.62

(P): Provisional

Source: Central Electricity Authority.

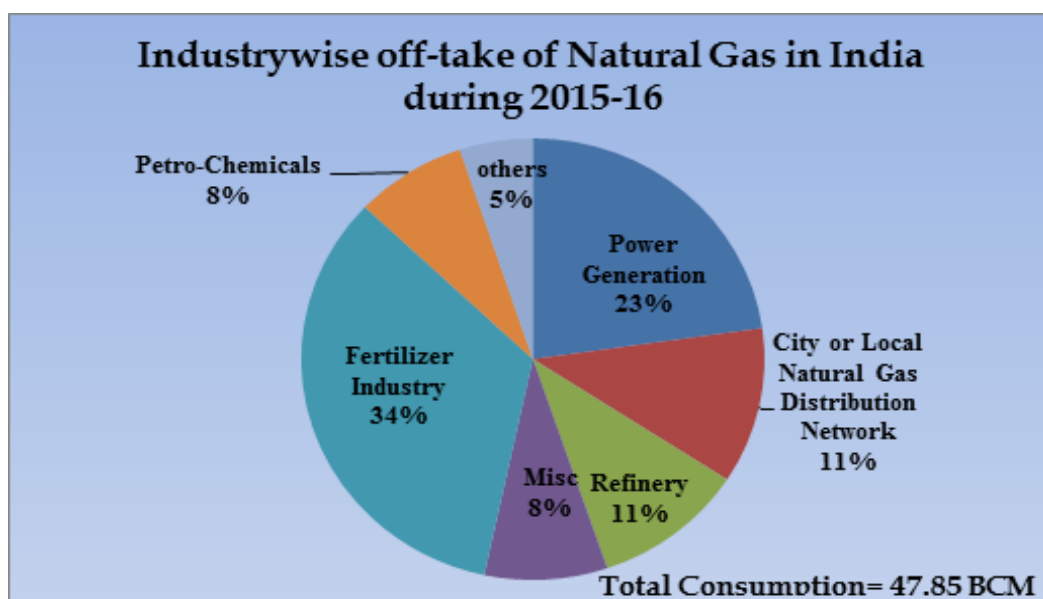
CHAPTER 6: CONSUMPTION OF ENERGY RESOURCES

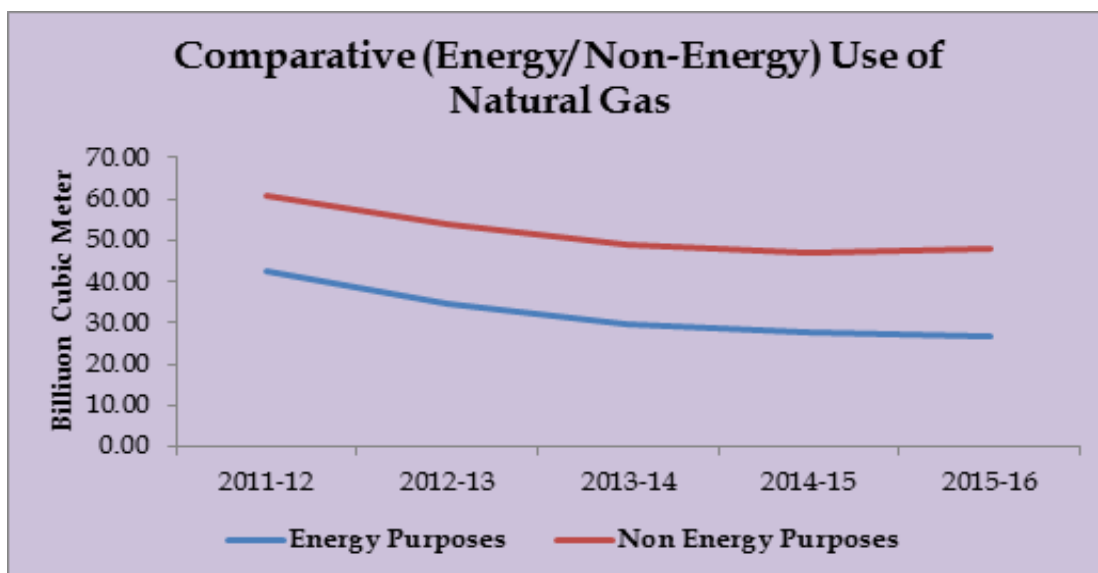
6.1 Consumption of Coal and Lignite

- ❖ The estimated total consumption of raw coal by industry has increased from 462.35 MT during 2006-07 to 832.46 MT during 2015-16 with a CAGR of 6.06% (Table 6.1). The annual growth rate from 2014-15 to 2015-16 is 1.29%.
- ❖ Consumption of Lignite increased from 30.81 MT in 2006-07 to 42.52 MT in 2015-16 registering a compound growth of 3.28%. Consumption of Lignite in Electricity Generation sector is the highest, accounting for about 89.57% of the total lignite consumption (Table 6.1).
- ❖ The maximum consumption of raw coal is in Electricity generation, followed by steel industries. Industry-wise estimates of consumption of coal (Table 6.4) shows that during 2015-16, electricity generating units consumed 508.25 MT of coal, followed by steel & washery industries (56.45 MT), cement industries (8.93 MT) and sponge iron industries (7.76 MT).

6.2 Consumption of Crude Oil and Natural Gas

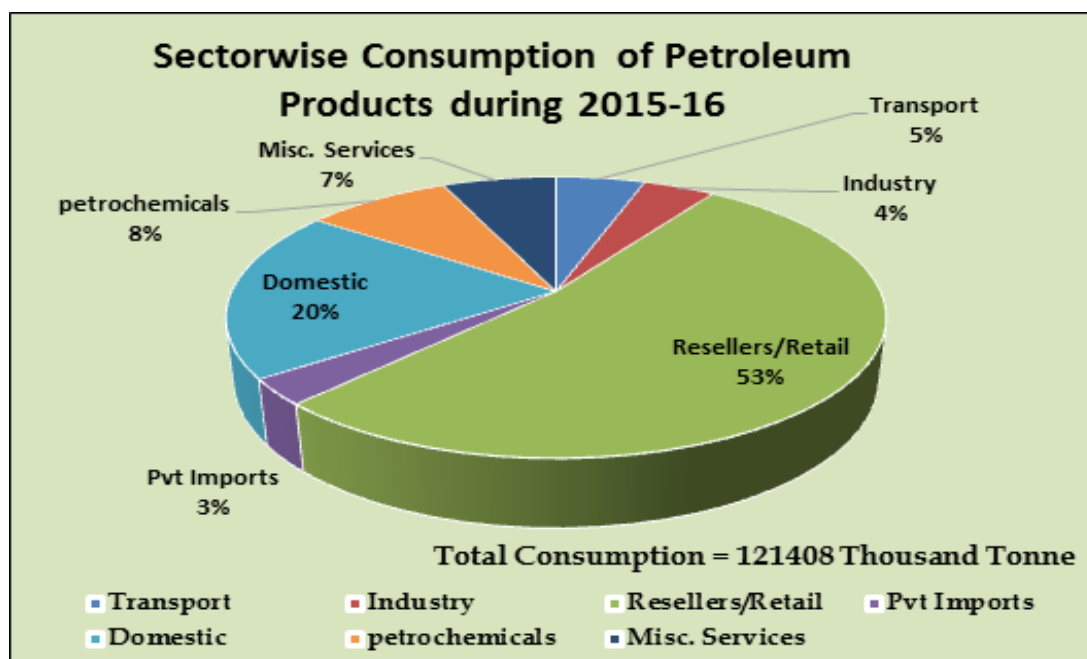
- ❖ The estimated consumption of crude oil has a steady increase, from 146.55 MMT during 2006-07 to 232.87 MMT during 2015-16 with CAGR of 4.74%. It increased from 223.24 MMT in 2014-15 to 232.87 MMT in 2015-16 (Table 6.1).
- ❖ The maximum use of Natural Gas is in fertilizers industry (33.72%) followed by power generation (22.76%) and 11.42% natural gas was used for domestic fuel (Table 6.8).
- ❖ Industry wise off-take of natural gas shows that natural gas has been used both for Energy (55.76%) and Non-energy (44.24%) purposes (Table 6.8).





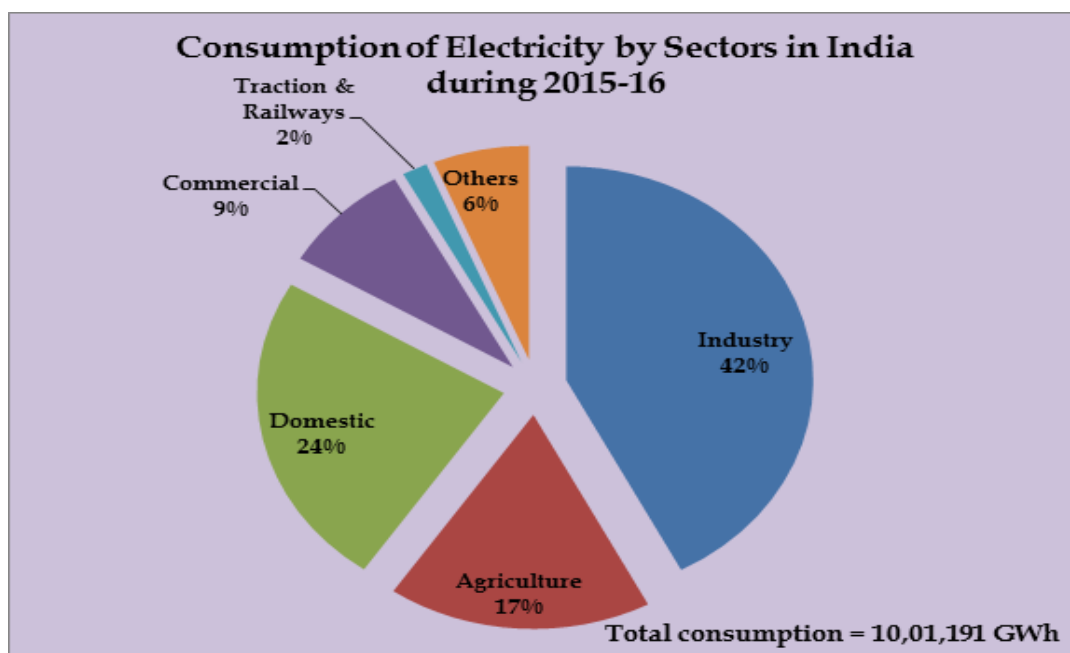
6.3 Consumption of Petroleum Products

- ❖ High speed diesel oil accounted for 40.42% of total consumption of all types of petroleum products in 2015-16. This was followed by Petrol (11.83%), LPG (10.63%), Petroleum Coke (10.45%) and Naphtha (7.19%). Consumption of Light Diesel oil continuously decreased from 2006-07 (0.72 MT) to 2015-16 (0.41 MT) (Tables 6.6 & 6.7).
- ❖ Sector-wise consumption of different petroleum products reveals that Reseller/Retail contributes 53% in the total consumption followed by Domestic sector with contribution 20%(Table 6.7).

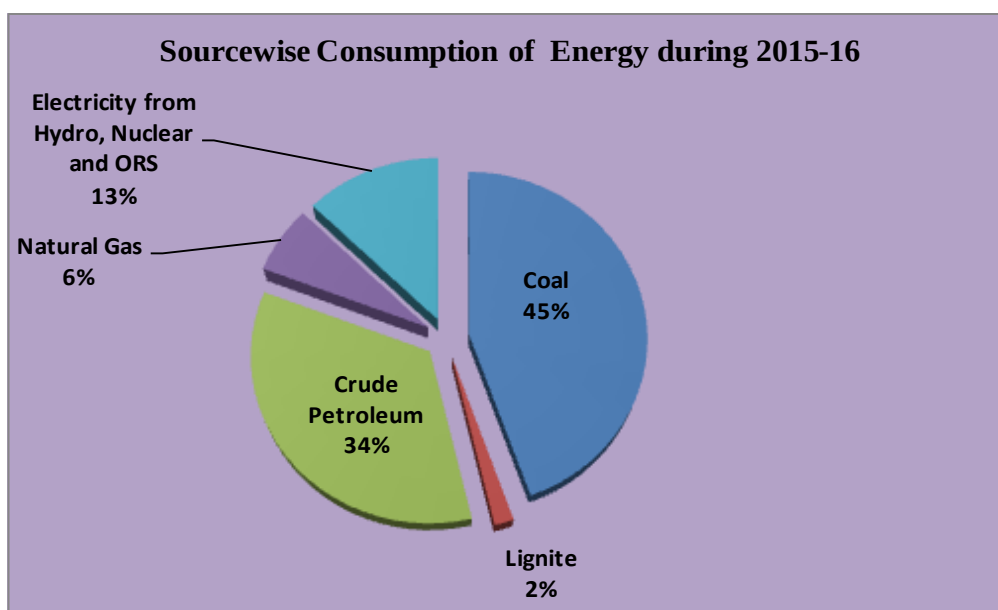


6.4 Consumption of Electricity

- ❖ The estimated electricity consumption increased from 4,55,749 GWh during 2006-07 to 10,01,191 GWh during 2015-16, showing a CAGR of 8.19% (Table 6.9). The increase in electricity consumption is 5.55% from 2014-15 (9,48,522 GWh) to 2015-16 (10,01,191 GWh).
- ❖ Of the total consumption of electricity in 2015-16, industry sector accounted for the largest share (42.30%), followed by domestic (23.86%), agriculture (17.30%) and commercial sectors (8.59%).

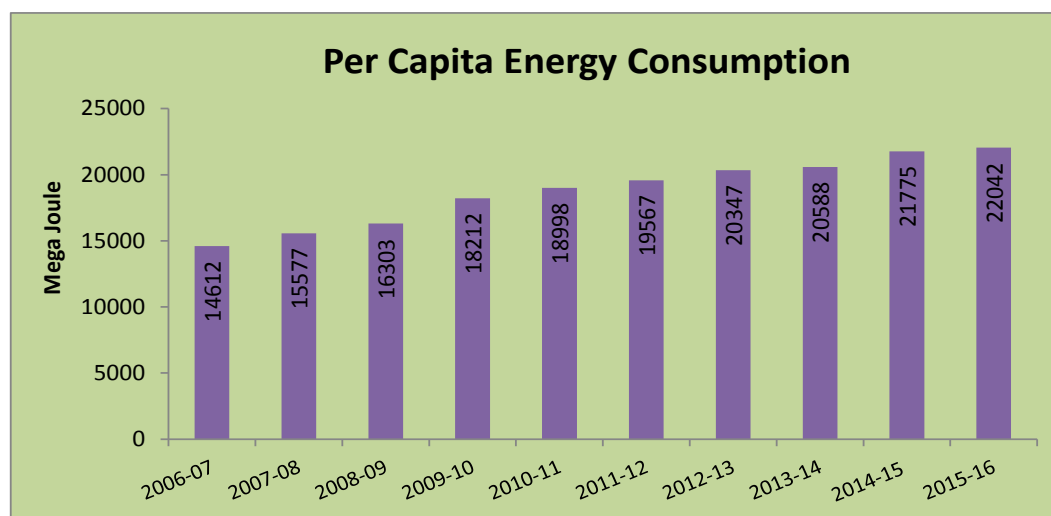


- ❖ The electricity consumption in Industry sector and domestic sector has increased at a much faster pace compared to other sectors during 2006-07 to 2015-16 with CAGRs of 9.47% and 7.97% respectively (Table 6.9).
- ❖ Loss of electricity due to transmission has decreased from 28.64% during 2006-07 to 21.81% during 2015-16 (Table 6.10).

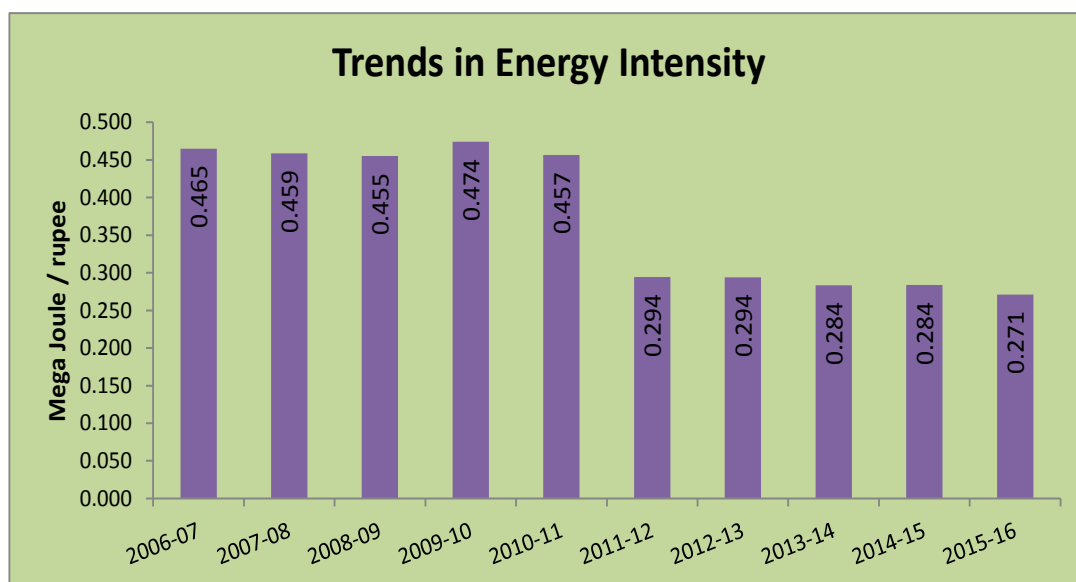


6.5 Per-Capita Energy Consumption & Energy Intensity

- ❖ The consumption of energy in petajoules in the form of Coal and Lignite which accounted for about 46.28% of the total consumption during 2015-16. Crude Petroleum was second (34.48%), while Electricity (12.75%) was third.(Table 6.2)
- ❖ The total consumption of energy from conventional sources increased from 27,589 petajoules during 2014-15 to 28,276 petajoules during 2015-16, showing an increase of 2.49%..(Table 6.2)
- ❖ Per-capita Energy Consumption (PEC) during a year is computed as the ratio of the estimate of total energy consumption during the year to the estimated mid-year population of that year.
- ❖ Per-capita Energy Consumption (PEC) increased from 14,612 Mega Joules in 2006-07 to 22,042 Mega Joules in 2015-16, a CAGR of 4.2% (Table 6.3). The annual increase in PEC for 2015-16 over 2014-15 was 1.23%.



- ❖ Energy Intensity is defined as the amount of energy consumed for generating one unit of Gross Domestic Product (at constant prices).
- ❖ PEC and Energy intensity are the most used policy indicators, both at national and international levels. In the absence of data on consumption of non-conventional energy from various sources, particularly in rural areas these two indicators are generally computed on the basis of consumption of conventional energy.



- ❖ The Energy Intensity (at 2004-05 prices) decreased from 0.465 Mega Joules per rupee in 2006-07 to 0.284 Mega Joules per rupee in 2014-15 to 0.271 Mega Joules in 2015-16 (Table 6.3).
- ❖ Energy intensity has decreased over the last decade. This decline may be attributed to faster growth of GDP than energy demand, the services sector having a growing share of the economy, use of energy efficiency programmes, etc.

Table 6.1: Trends in Consumption of Energy Sources in India

Year	Coal #	Lignite	Crude Oil** MMT	Natural Gas (Billion Cubic Metres)	Electricity (GWh)
	(Million Tonnes)				
1	2	3	4	5	6
2006-07	462.35	30.81	146.55	37.60	4,55,749.00
2007-08	502.82	34.65	156.10	39.80	5,01,977.00
2008-09	549.57	31.85	160.77	39.81	5,53,994.71
2009-10	585.30	34.41	186.55	48.34	6,12,644.99
2010-11	589.87	37.69	196.99	52.02	6,94,392.00
2011-12	642.64	41.89	204.12	60.68	7,85,194.00
2012-13	688.75	46.01	219.21	53.91	8,24,300.99
2013-14	724.18	43.90	222.50	48.99	8,74,208.57
2014-15	821.85	46.94	223.24	46.95	9,48,521.67
2015-16(p)	832.46	42.52	232.87	47.85	10,01,190.93
Growth rate of 2015-16 over 2014- 15(%)	1.29	-9.41	4.31	1.92	5.55
CAGR 2006- 07 to 2015- 16(%)	6.06	3.28	4.74	2.44	8.19

(p): Provisional

Data on electricity has been revised as per the inputs from CEA and hence may not match with the previous year data.

GWh = Giga Watt hour = 10^6 x Kilo Watt hour

**Crude oil in terms of refinery crude throughput.

Does not include Lignite

Sources:

1. Office of Coal Controller, Ministry of Coal
2. Ministry of Petroleum & Natural Gas.
3. Central Electricity Authority.

Table 6.2 Trends in Consumption of Energy Sources

(In Peta Joules)

Year	Coal	Lignite	Crude Petroleum *	Natural Gas	Electricity #	Total
1	2	3	4	5	6	7
2006-07	6995	350	6136	1448	1641	16571
2007-08	7608	394	6536	1533	1807	17878
2008-09	8315	362	6731	1533	1994	18936
2009-10	8856	391	7811	2144	2206	21408
2010-11	8925	429	8248	2357	2500	22458
2011-12	9723	476	8547	2299	2827	23872
2012-13	10421	523	9178	2038	2967	25128
2013-14	10957	499	9316	1836	3147	25756
2014-15	12435	534	9347	1859	3415	27589
2015-16(P)	12595	483	9750	1843	3604	28276
Growth rate of 2015-16 over 2014-15(%)	1.29	-9.41	4.31	-0.84	5.55	2.49
CAGR 2006-07 to 2015-16(%)	6.06	3.28	4.74	2.44	8.19	5.49

*: Crude oil in terms of refinery crude throughput.

(p): Provisional.

#: Include Hydro, Nuclear and other renewable sources electricity from utilities

Note: Here the value of energy in peta joules relates to the production value from Hydro and Nuclear only. Due to non availability of the data the consumption value is taken equivalent to production value

Sources:

1. Office of Coal Controller, Ministry of Coal
2. Ministry of Petroleum & Natural Gas.
3. Central Electricity Authority.

**Table 6.3 : Trends in Per-Capita Energy Consumption (PEC)
and Energy intensity in India**

Year	Energy Consumption in peta joules	Mid year population (in Million)	GDP (Rs. crore)	Per Capita Energy Consumption (in Mega Joules)	Energy Intensity (Mega Joules per rupee)
2006-07	16571	1134	3564364	14612	0.4649
2007-08	17878	1148	3896636	15577	0.4588
2008-09	18936	1161	4158676	16303	0.4553
2009-10	21408	1175	4516071	18212	0.4740
2010-11	22458	1182	4918533	18998	0.4566
2011-12	23872	1220	8106656	19567	0.2945
2012-13	25128	1235	8546552	20347	0.2940
2013-14	25755	1251	9084369	20588	0.2835
2014-15	27589	1267	9727490	21775	0.2836
2015-16 (P)	28258	1282	10427191	22042	0.2710
Growth rate of 2015-16 over 2014-15(%)	2.43	1.18	7.19	1.23	-4.45
CAGR 2006-07 to 2014-15(%)	5.48	1.23	11.33	4.20	-5.25

(P): Provisional

* Estimated value based on sourcewise availability of Coal, Crude Petroleum, Natural Gas and

Energy Intensity=Amount of energy consumed for producing one unit of Gross Domestic Product.

** from 2005-06 to 2010-11 GDP estimates are at base 2004-05 price, where as from 2011-12 to 2015-16 GDP estimates are at 2011-12 price

Table 6.4 : Trends in Industrywise Consumption of Raw Coal in India

(Million tonnes)

Year	Electricity	Steel & Washery	Cement	Paper	Textile	Sponge Iron	Fertilizers & chemicals	Brick	Others *	Total
1	2	3	4	5	6	7	8		9	10 = 2 to 9
2006-07	321.91	17.30	14.71	2.50	0.30	-	-	-	63.08	419.80
2007-08	350.58	16.99	15.27	2.64	0.37	-	-	-	67.72	453.57
2008-09	377.27	16.58	13.12	2.16	2.53	-	-	-	77.52	489.17
2009-10	390.58	16.45	14.66	2.34	0.27	-	-	-	89.50	513.79
2010-11	395.84	17.26	15.08	2.43	0.28	-	-	-	92.58	523.47
2011-12	437.67	47.86	26.36	2.03	0.26	21.69	2.82	0.13	69.36	608.17
2012-13	485.47	51.70	31.79	2.12	0.30	20.90	2.86	2.01	116.24	713.39
2013-14	493.25	53.05	32.46	1.91	0.36	18.49	2.64	4.01	133.19	739.34
2014-15	497.70	56.24	11.36	1.65	0.42	17.77	2.29	0.09	216.93	804.45
2015-16(p)	508.25	56.45	8.93	1.20	0.27	7.76	2.63	0.08	246.83	832.39
Distribution (%)	61.06	6.78	1.07	0.14	0.03	0.93	0.32	0.01	29.65	100.00
Growth rate of 2015-16 over 2014-15(%)	2.12	0.38	-21.41	-27.12	-36.04	-56.30	14.52	-15.38	13.78	3.47
CAGR 2006-07 to 2015-16(%)	-15.32	-8.94	-23.04	-24.80	-20.08	-	-	-	-7.27	-13.36

(P): Provisional

* Includes Sponge Iron, colliery consumption, jute, bricks, coal for soft coke, fertilisers & other industries consumption.

@ From 1996-97 and onwards Cotton includes 'Rayon' also.

Source : Office of the Coal Controller, Ministry of Coal

For year 2014-15 & 2015-16 value of Cement does not include any import as revised by Office of the Coal Controller, Ministry of Coal in Provisional coal statistics 2015-16

Table 6.5 : Trends in Industrywise Consumption of Lignite in India**(Million Tonnes)**

Year	Electricity	Steel & Washery	Cement	Paper	Textile	Others *	Total
1	2	3	4	5	6	7	8=2 to 7
2006-07	23.92	-	0.77	0.22	0.84	5.06	30.80
2007-08	26.76	-	0.96	0.35	0.77	5.83	34.66
2008-09	25.71	-	0.34	0.36	-	6.01	32.42
2009-10	28.14	-	0.38	0.82	-	4.09	33.43
2010-11	29.90	-	0.36	0.84	1.18	6.25	38.53
2011-12	32.06	0.03	1.01	0.63	3.67	4.48	41.88
2012-13	37.20	0.05	1.10	0.69	0.30	3.81	43.15
2013-14	36.34	0.03	1.49	1.29	0.73	4.02	43.90
2014-15	39.47	0.02	1.27	0.65	2.89	2.65	46.95
2015-16(p)	37.81	0.00	0.25	0.44	1.73	1.99	42.21
Distribution (%)	89.57	0.00	0.59	1.04	4.09	4.71	100.00
Growth rate of 2015-16 over 2014-15(%)	-4.22	-100.00	-80.46	-32.77	-40.15	-24.82	-10.09
CAGR 2006-07 to 2015-16(%)	14.11	-	-2.61	17.02	17.16	-0.70	12.50

(P): Provisional

* Includes Sponge Iron, colliery consumption., jute, bricks, coal for soft coke, chemicals, fertilisers & other industries consumption.

From 2008-09 onwards cotton is also included in others.

Note: Industrywise breakup of consumption for the period 1970-71 to 1999-2000 are not readily available, hence estimated by production data as it is observed, approximately for lignite, production= despatch= consumption.

Source : Office of the Coal Controller, Ministry of Coal

Table 6.6 : Trends in Consumption of Petroleum Products in India

(Million Tonnes)

Year	Light Distillates			Middle Distillates			
	LPG	Petrol	Naphtha	Kerosene	ATF	HSDO	LDO
1	2	3	4	5	6	7	8
2006-07	10.85	9.29	13.89	9.51	3.98	42.90	0.72
2007-08	12.17	10.33	13.29	9.37	4.54	47.67	0.67
2008-09	12.19	11.26	13.91	9.30	4.42	51.71	0.55
2009-10	13.14	12.82	10.13	9.30	4.63	56.24	0.46
2010-11	14.33	14.19	10.68	8.93	5.08	60.07	0.46
2011-12	15.35	14.99	11.22	8.23	5.54	64.75	0.42
2012-13	15.60	15.74	12.29	7.50	5.27	69.08	0.40
2013-14	16.29	17.13	11.31	7.17	5.51	68.37	0.39
2014-15	18.00	19.08	11.08	7.09	5.72	69.42	0.37
2015-16(p)	19.62	21.85	13.27	6.83	6.26	74.65	0.41
Growth rate of 2015-16 over 2014-15(%)	9.02	14.50	19.75	-3.72	9.42	7.54	10.00
CAGR 2006-07 to 2015-16(%)	6.11	8.93	-0.45	-3.26	4.63	5.70	-5.54

(p) : Provisional

Table 6.6 (Contd.) : Trends in Consumption of Petroleum Products in India

(Million Tonnes)

Year	Heavy Ends					Others*	Total	Refinery Fuel and Losses	Total including Refinery Fuel and
	Fuel Oil	Lubricants	Bitumen	Waxes	Petroleum Coke				
	9	10	11	12	13	14	15=2 to 14	16	17
2006-07	12.62	1.90	3.83	-	5.44	5.83	120.75	10.92	131.67
2007-08	12.72	2.29	4.51	-	5.95	5.45	128.95	11.75	140.70
2008-09	12.59	2.00	4.75	-	6.17	4.60	133.45	11.91	145.36
2009-10	11.63	2.54	4.93	0.29	6.59	5.11	137.81	15.11	152.92
2010-11	10.79	2.43	4.54	0.25	4.98	4.32	141.04	16.38	157.42
2011-12	9.31	2.63	4.64	0.27	6.14	4.65	148.13	17.29	165.43
2012-13	7.66	3.20	4.68	0.19	10.14	5.32	157.07	18.35	175.42
2013-14	6.24	3.31	5.01	0.18	11.76	5.78	158.43	17.87	176.30
2014-15	5.96	3.31	5.07	0.16	14.56	5.72	165.53	17.67	183.20
2015-16(p)	6.63	3.57	5.94	0.17	19.30	6.18	184.67	18.77	203.45
Growth rate of 2015-16 over 2014-15(%)	11.26	8.05	18.52	-2.26	64.09	6.88	16.56	5.05	15.39
CAGR 2006-07 to 2015-16(%)	-6.23	6.51	4.47	-	13.50	0.58	4.34	5.57	4.45

(p) : Provisional

* : Includes those of light & middle distillates and heavy ends and sales through private parties.

Source: Ministry of Petroleum & Natural Gas.

Table 6.7 : Sectorwise (end use) Consumption of Selected Petroleum Products in India

('000 tonnes)

Petroleum Product	Year	Transport	Agriculture	Power Generation	Industry	Mining & Quarrying	Resellers/ Retail	Misc. Services	Pvt Imports	Total
1	2	3	4	5	6	7	8	9	10	11 = 3 to 10
High Speed Diesel Oil	2006-07	23,817	7,914	2,894	2,188	714	**	3,091	2,248	42,866
	2007-08	5,003	504	313	1,241	925	**	39,652	31	47,669
	2008-09	5,293	490	336	1,310	1,025	**	43,195	62	51,710
	2009-10	5,365	594	303	1,502	1,248	**	47,137	94	56,242
	2010-11	5,417	616	166	1,440	1,366	48,704	2,170	193	60,071
	2011-12	5,529	684	168	1,649	1,181	53,208	2,262	70	64,750
	2012-13	5,160	617	214	1,628	1,073	58,021	2,320	47	69,080
	2013-14	3,203	429	204	687	873	61,465	1,426	77	68,364
	2014-15	4,617	575	197	794	998	60,403	1,748	83	69,416
	2015-16(p)	5,765	630	224	1,096	1,184	63,772	1,922	55	74,647
Growth rate of 2015-16 over 2014-15(%)		24.85	9.55	13.54	38.02	18.59	5.58	9.93	-33.57	7.54
CAGR 2006-07 to 2015-16(%)		-13.23	-22.36	-22.58	-6.68	5.19	-	-4.64	-30.95	5.70

Table 6.7 (Contd.) : Sector-wise (end use) Consumption of Selected Petroleum Products in India

('000 tonnes)

Petroleum Product	Year	Transport	Agriculture	Power Generation	Industry	Mining & Quarrying	resellers/ Retail	Misc. Services	Pvt Imports	Total
1	2	3	4	5	6	7	8	9	10	11 = 3 to 10
Light Diesel Oil	2006-07	53	13	67	243	7	**	337	0	720
	2007-08	36	3	77	200	2	**	350	0	668
	2008-09	15	4	175	171	5	**	182	0	552
	2009-10	6	3	152	143	2	**	152	0	458
	2010-11	5	2	137	127	3	0	182	0	455
	2011-12	3	1	127	102	2	0	180	0	415
	2012-13	3	1	142	74	2	1	175	0	399
	2013-14	4	1	132	64	3	1	182	0	386
	2014-15	5	1	132	55	4	4	165	0	365
	2015-16(p)	4	1	154	61	2	1	184	0	407
Growth rate of 2015-16 over 2014-15(%)		-26.00	18.18	16.64	11.36	-42.11	-71.05	11.53	-	11.44
CAGR 2006-07 to 2015-16(%)		-23.37	-20.57	8.69	-12.94	-10.93	-	-5.88	-	-5.54

Note: ** denotes that the data of Resellers / Retail are included in Miscellaneous services

Contd...

Table 6.7 (Contd.) : Sector-wise (end use) Consumption of Selected Petroleum Products in India

('000 tonnes)

Petroleum Product	Year	Transport	Agriculture	Power Generation	Industry	Mining & Quarrying	resellers/ Retail	Misc. Services	Pvt Imports	Total
1	2	3	4	5	6	7	8	9	10	11 = 3 to 10
Furnace Oil	2006-07	502	0	254	1,830	0	**	5,600	1,071	9,257
	2007-08	315	0	281	1,634	1	**	6,400	839	9,470
	2008-09	469	55	749	2,843	35	**	4,355	913	9,419
	2009-10	560	68	688	3,135	23	**	4,134	538	9,145
	2010-11	780	70	823	2,774	7	**	3,979	374	8,807
	2011-12	371	70	647	2,408	45	**	3,300	706	7,548
	2012-13	277	79	587	2,019	13	351	2,357	608	6,291
	2013-14	315	75	536	1,833	39	309	1,985	696	5,787
	2014-15	346	56	446	1,748	45	197	2,175	570	5,584
	2015-16(p)	380	57	430	2,137	53	270	2,564	592	6,482
Growth rate of 2014-15 over 2013-14(%)		9.56	1.80	-3.45	22.20	16.85	37.23	17.86	3.88	16.09
CAGR 2005-06 to 2014-15(%)		-2.76	-	5.42	1.56	-	-	-7.51	-5.75	-3.50

Table 6.7 (Contd.) : Sector-wise (end use) Consumption of Selected Petroleum Products in India

('000 tonnes)

Petroleum Product	Year	Transport	Agriculture	Power Generation	Industry	Mining & Quarrying	resellers/ Retail	Misc. Services	Pvt Imports	Total
1	2	3	4	5	6	7	8	9	10	11 = 3 to 10
Low Sulphur Heavy Stock	2006-07	0	0	298	1,358	-	-	1,705	0	3,361
	2007-08	0	0	344	1,304	0	-	1,600	0	3,248
	2008-09	-	1	1,347	1,294	0	-	526	0	3,169
	2009-10	-	2	937	1,225	0	-	320	0	2,484
	2010-11	-	0	469	1,031	0	-	482	0	1,983
	2011-12	-	0	399	1,067	1	-	292	0	1,759
	2012-13	-	0	439	778	0	-	149	0	1,366
	2013-14	-	0	328	76	0	-	44	0	449
	2014-15	-	0	226	104	0	-	48	0	377
	2015-16(p)	-	0	51	70	0	-	29	0	150
Growth rate of 2015-16 over 2014-15(%)		-	-	-77.59	-32.05	-	-	-38.53	-	-60.16
CAGR 2006-07 to 2015-16(%)		-	-	-16.23	-25.62	-	-	-33.42	-	-26.71

Note: ** denotes that the data of Resellers / Retail are included in Miscellaneous services

Contd...

Table 6.7 (Contd.) : Sectorwise (end use) Consumption of Selected Petroleum Products in India

('000 tonnes)

Petroleum Product	Year	Transport	Agriculture	Power Generation	manufacturing/Non domestic	Domestic Distribution	Reseller/Retail	Misc. Services	Private import	Total
1	2	3	4	5	6	7	8	9	10	11=3 to 10
Liquefied Petroleum Gas	2006-07	0	0	0	31	10427	**	66	330	10854
	2007-08	202	0	0	687	10299	**	146	676	12010
	2008-09	182	1	0	825	10637	**	136	409	12191
	2009-10	225	4	0	1014	11364	**	133	395	13135
	2010-11	224	2	0	1150	12369	**	157	430	14332
	2011-12	224	5	0	1255	13296	**	150	421	15350
	2012-13	215	4	0	1208	13568	59	45	398	15497
	2013-14	195	4	3	1208	14412	58	46	369	16294
	2014-15	165	6	3	1259	16040	45	53	429	18000
	2015-16(p)	172	7	3	1666	17182	45	60	489	19623
Growth rate of 2015-16 over 2014-15(%)		4.40	16.58	-12.34	32.35	7.12	-0.66	13.66	13.93	9.02
CAGR 2006-07 to 2015-16(%)		-	-	-	48.95	5.12	-	-0.97	4.01	6.10

Table 6.7 (Contd.) : Sectorwise (end use) Consumption of Selected Petroleum Products in India

('000 tonnes)

Petroleum Product	Year	Fertiliser Sector	Petrochemicals	Power Sector	Steel Plants	Others	Private import	Total
1	2	3	4	5	6	7	8	9 =3 to 8
Naptha	2006-07	1980	1197	660	33	1100	8669	10854
	2007-08	1689	6048	753	54	332	4417	13293
	2008-09	1803	5889	1147	71	693	4307	13910
	2009-10	844	6968	639	3	560	1121	10134
	2010-11	892	7500	419	0	155	1710	10676
	2011-12	962	8141	187	0	163	1768	11222
	2012-13	898	9412	342	0	203	1434	12289
	2013-14	516	9464	215	0	240	870	11305
	2014-15	302	9530	199	0	208	844	11082
	2015-16(p)	316	10350	50	0	37	2517	13271
Growth rate of 2015-16 over 2014-15(%)		4.78	8.61	-74.75	-	-82.12	198.38	19.75
CAGR 2006-07 to 2015-16(%)		-16.77	24.08	-22.70	-	-28.75	-11.63	2.03

Table 6.7 (Contd.) : Sectorwise (end use) Consumption of Selected Petroleum Products in India

Petroleum Product	Year	Domestic	Commercial/ Industry	Others	Total
1	2	3	4	5	6=3 to 5
SKO(Kerosene)	2006-07	9203	50	159	9412
	2007-08	9163	85	117	9365
	2008-09	9131	43	128	9302
	2009-10	9101	69	134	9304
	2010-11	8722	67	139	8928
	2011-12	8045	61	123	8229
	2012-13	7349	37	115	7502
	2013-14	7009	49	107	7165
	2014-15	6917	60	109	7087
	2015-16(p)	6649	64	113	6826
Growth rate of 2015-16 over 2014-15(%)		-3.88	6.32	3.57	-3.68
CAGR 2006-07 to 2015-16(%)		-3.20	2.48	-3.34	-3.16

Table 6.8 INDUSTRYWISE OFF-TAKE OF NATURAL GAS IN INDIA

(Billion Cubic Metres)

Year	Energy Purpose							Total
	Power Generation	Industrial Fuel	Tea Plantation	City or Local Natural Gas Distribution Network	Internal Consumption for Pipeline System	Refinery	Miscellaneous	
1	2	3	4	5	6	7	8	9
2006-07	11.96	-	0.17	-	-	-	-	12.13
2007-08	12.04	-	0.16	-	-	-	-	-
2008-09	12.60	-	0.15	6.01	-	-	3.42	22.19
2009-10	21.37	-	0.17	2.57	-	-	7.27	31.37
2010-11	25.79	-	0.19	3.43	-	-	7.55	36.95
2011-12	22.63	0.31	0.18	5.60	0.39	4.26	9.06	42.42
2012-13	16.08	0.23	0.18	5.78	0.39	3.89	7.98	34.52
2013-14	11.28	0.33	0.20	5.84	0.37	3.97	7.48	29.46
2014-15	10.72	0.55	0.18	5.42	0.35	4.58	5.94	27.73
2015-16 (P)	10.89	0.55	0.19	5.46	0.41	5.08	4.11	26.68
Distribution (%)	22.76	1.14	0.39	11.42	0.86	10.61	8.59	55.76
Growth rate of 2015-16 over 2014-15(%)	1.59	-1.27	4.44	0.89	17.00	10.95	-30.82	-3.79

Note: includes Consumption of LNG in 2011-12 & onwards.

NA :Non Availability of data

Source: Ministry of Petroleum & Natural Gas

**Table 6.8 (contd) INDUSTRYWISE OFF-TAKE OF
NATURAL GAS IN INDIA****(Billion Cubic Metres)**

Non-Energy Purposes					Grand Total
Fertilizer Industry	Petro-Chemicals	LPG Shrinkage	Sponge Iron	Total	
9	10	11	12	13=10 to 12	14
8.50	1.38	-	-	-	-
9.82	1.43	-	-	-	-
9.08	1.11	-	-	-	-
13.17	1.26	-	-	-	-
11.46	1.31	-	-	-	-
14.00	1.86	1.07	1.33	18.26	60.68
14.73	2.49	1.03	1.11	19.35	53.87
15.87	2.40	0.98	0.27	19.53	48.99
15.19	2.89	1.01	0.15	19.24	46.97
16.13	3.73	0.75	0.54	21.17	47.85
33.72	7.80	1.58	1.14	44.24	100.00
6.21	29.18	-24.98	255.56	10.02	1.86

Note: Includes of Consumption of LNG in 2011-12 & onwards.

NA :Non Availability of data

Source: Ministry of Petroleum & Natural Gas

Note:

Re-classification among the sectors of consumption of Natural gas under energy and non-energy sectors, as advised by GAIL has been done. Sectors where natural gas is being used as feedstock are classified as consumption of gas under non energy purpose whereas those sectors where natural gas is being used as fuel are classified as consumption of gas under energy purpose .

Table 6.9: Consumption of Electricity by Sectors in Indiain Giga Watt Hour = 10⁶ Kilo Watt Hour

Year	Industry	Agriculture	Domestic	Commercial	Traction & Railways	Others	Total Electricity Consumed
1	2	3	4	5	6	7	8=2 to 7
2006-07	1,71,293	99,023	1,11,002	40,220	10,800	23,411	4,55,749
2007-08	1,89,424	1,04,182	1,20,918	46,685	11,108	29,660	5,01,977
2008-09	2,09,474	1,09,610	1,31,720	54,189	11,425	37,577	5,53,995
2009-10	2,36,752	1,20,209	1,46,080	60,600	12,408	36,595	6,12,645
2010-11	2,72,589	1,31,967	1,69,326	67,289	14,003	39,218	6,94,392
2011-12	3,52,291	1,40,960	1,71,104	65,381	14,206	41,252	7,85,194
2012-13	3,65,989	1,47,462	1,83,700	72,794	14,100	40,256	8,24,301
2013-14	3,84,418	1,52,744	1,99,842	74,247	15,540	47,418	8,74,209
2014-15	4,18,346	1,68,913	2,17,405	78,391	16,177	49,289	9,48,522
2015-16(P)	4,23,523	1,73,185	2,38,876	86,037	16,594	62,976	10,01,191
Distribution (%)	42.30	17.30	23.86	8.59	1.66	6.29	100.00
Growth rate of 2015-16 over 2014-15(%)	1.24	2.53	9.88	9.75	2.58	27.77	5.55
CAGR 2006-07 to 2015-16(%)	9.47	5.75	7.97	7.90	4.39	10.40	8.19

(P): Provisional

Source : Central Electricity Authority.

Table 6.10 : Electricity Generated(from Utilities), Distributed, Sold and Transmission Losses in Indiain Giga Watt hour =10⁶ Kilo Watt hour

Year	Net Electricity Generated from Utilities	Purchases from Non-Utilities + Imported from Other Countries	Net Electricity Available for Supply	Sold to Ultimate Consumers & Other Countries	Loss in transmission	Loss in transmission (%)
1	2	3	4=2+3	5	6=4-5	7
2006-07	6,27,077	11,931	6,39,008	4,55,965	1,83,043	28.64
2007-08	6,77,095	12,685	6,89,780	5,02,267	1,87,513	27.18
2008-09	6,93,764	14,181	7,07,945	5,27,623	1,80,322	25.47
2009-10	7,49,128	14,391	7,63,519	5,69,723	1,93,796	25.38
2010-11	7,91,796	19,839	8,11,635	6,17,098	1,94,537	23.97
2011-12	8,65,952	15,514	8,81,466	6,73,068	2,08,398	23.64
2012-13	9,00,380	20,849	9,21,229	7,08,997	2,12,232	23.04
2013-14	9,56,488	17,948	9,74,436	7,51,908	2,22,528	22.84
2014-15	10,40,582	13,773	10,54,355	8,14,056	2,40,299	22.79
2015-16(P)	10,88,282	15,947	11,04,228	8,63,364	2,40,864	21.81
Growth rate of 2015-16 over 2014-15(%)	4.58	15.78	4.73	6.06	0.24	-4.29
CAGR 2006-07 to 2015-16(%)	5.67	2.94	5.62	6.59	2.78	-2.69

(P): Provisional

Source : Central Electricity Authority.

CHAPTER 7: ENERGY BALANCE

7.1 Definition

- ❖ **Commodity balance:** The purpose of commodity balance is to show the sources of supply and various uses of particular energy product with reference to national territory of the compiling country. The balance is compiled for any energy commodity provided that the commodity remains homogeneous at each point in the balance.
- ❖ International Recommendations on Energy Statistics (IRES) recommends that the format of energy balance and all applicable concepts are consistently used in the compilation of a commodity balance to ensure data consistency. The major sources for commercial energy in India are coal, oil products, natural gas and electricity. Non-energy producing sectors derive energy from the resources available in primary form such as coal, crude oil, natural gas, hydro-power and nuclear power. Some of the energy resources are converted into other (final) energy products that are used for purposes other than energy generation.
- ❖ Coal is also used as a final product or intermediate for power generation. Similarly, natural gas is also used directly or as an intermediate in power generation. Many petroleum products, such as HSDO, Naphtha etc. are used as a final product by the non-energy producing sectors and also used for power generation. This indicates that the same energy source can be used in various forms at various stages of consumption. This creates a possibility of over-estimation or under-estimation of energy consumption in totality as well as for different sources.
- ❖ **Energy Balance:** An energy balance is a framework to complete data on all energy products entering, existing and used within a given country during a reference periods (e.g. a year). It expresses all data in common energy units, which makes it possible to define a “total” product.
- ❖ The purpose of compiling an energy balance starting from the various commodity balances are numerous; they are to:
 - Provide a comprehensive overview of the energy profile of a country, to monitor energy security, energy markets, relevant policy goals and to formulate adequate energy policies;
 - Provide the basis for aggregate socio-economic indicators, as well as for estimates of CO₂ emissions;
 - Compare data of different reference periods and different countries;
 - Provide a tool to ensure completeness, consistency and comparability of basic statistics;
 - Calculate efficiencies of transformation processes, as well as relative shares of different sectors or products in the country’s total supply or consumption

- ❖ An energy balance generally takes the form of a matrix of products and flows, with varying levels of disaggregation, although graphical formats also exist (e.g. sankey diagram).
- ❖ Two major components of the energy balance statistics are Total Primary Energy Supply and Total Final Consumption of energy commodity.
- ❖ Within a balance, the total final consumption is disaggregated into sectors, like industry, transport, residential, services and others. However, the level of disaggregation of such energy data is not enough to monitor energy efficiency, as no information is available for example on the residential or services end uses, nor on the transport vehicle types or segments. The energy balance will therefore be useful to assess the largest consuming sectors within a country where the energy saving potential will have more impact, before starting more detailed collection programmes on data for energy efficiency indicators.

7.2 Methodology used for Energy Balance

- ❖ **Energy (in KToe) = Quantity of Commodity * Conversion factor**
- ❖ **1 Toe = 41868 MJ**
- ❖ **Conversion factor = $\frac{\text{Net Calorific Value (NCV)}}{\text{Mega joules per ton of oil equivalent}}$**
where NCV is in kj per kg
- ❖ **Net Calorific Value (NCV) = Gross calorific value (GCV) – (% Moisture Content) [1NCV = 0.9 GCV]**
 - The difference between net and gross calorific values are typically about 5% to 6% of the gross value of solid and liquid fuels and about 10% for Natural gas.
 - Net Calorific Values are, as recommended by IEA for all commodities.

7.3 Highlights of Energy Balance:

- ❖ In 2015-16, Primary Energy Supply added up to 6,75,405 Kilo Tonne of Oil equivalent (ktoe). The share of Coal accounted for 53.91% and the contribution of Crude Oil was 35.50%. (Table 7.2).
- ❖ In 2015-16, National Energy Consumption was 5,19,286 ktoe. The industrial sector used 56.91 % of the total final energy consumption (table 7.2).

- ❖ Within the industry sector, the most energy intensive industries were iron and steel, which accounted for 15.01 % of the industrial energy use followed by Chemicals and petrochemicals 4.77 % and construction 2.18 % (Table 7.2).
- ❖ The transport sector accounted for 7.33% of Total Final Consumption. The consumption of the residential, commercial and public sectors represented 11.43%. (Table 7.2).
- ❖ Efforts are being made to reduce the statistical difference, by incorporating more data.

7.3 Sankey Diagram (2015-16):

- ❖ The concept of data visualization in the digital age has revived interest in a style of chart called a Sankey diagram. This style of diagram makes it easy to see the dominant flows within a system and highlights where losses occur.
- ❖ The Sankey diagram is very useful tool to represent an entire input and output energy flow in energy system after carrying out energy balance calculation. The thicker the line, the greater the amount of energy involved.
- ❖ The data of Energy Balance (Table 7.2) is used to construct the Sankey diagram, in which flows of energy are traced from energy sources to end-use consumption. The resulting diagram provides a convenient and clear snapshot of existing energy transformations in India which can usefully be compared with a similar global analysis. It gives a basis for examining and communicating future energy scenarios.

Table 7.1 : Energy Commodity Balance for the year 2015-16(p)

Supply	Coal	Lignite	LPG	Naphtha	Kerosene	Diesel	Furnace Oil	Lubricants	Bitumin	Low Sulfur Heavy Stock	Petrol/Motor Spirit	Other Petroleum Products*	Natural Gas	Electricity
	(000 tonnes)												(MMSCM)	(GWh)
Production	639234	43843	10568	17861	7504	98588	9468	1037	5157	259	35321	46162	32249	1167584
From Other Sources			489	2517		55	592	2259	879					168372
Imports	199884		8885	2984	41	180	1162	1880	750	32	1024	11364	21971	5244
Exports	1250		195	7116	10	24035	2731	17	101	75	16817	9439		5150
Stock changes	5404	1631												
Domestic Supply	832464	42212	19747	16246	7535	74788	8491	5159	6685	216	19528	48087	54220	1336050
Transfer														
Statistical difference	76	0	124	2976	709	141	2009	1588	747	66	-2319	15769	6371	-142976
Transformation	508246	37809	3	50		224	430			51			10889	79302
Electricity plants	508246	37809	3	50		224	430			51			10889	79302
Energy Sector	335					1184							9187	
Coal mines	335					1184								
Petroleum refineries													5077	
Other energy sector													4110	
Distribution losses														240864
Final Consumption	832388	42212	19623	13271	6826	74647	6482	3571	5938	150	21847	32318	47849	1479026
Industry Sector	323807	4403	2155	13221	64	1151	3052			70		19470	545	581192
Iron and steel	64215		134			170	764			46				
Chemical and petroleum	2626	272	5	10666		116	670			24				
Non-ferrous metals						26	361							
Machinery			18			460	66							
Mining & Quarrying							53							
Paper, pulp and print	1201	437												
Construction	9003	641				204	15							
Textile and leather	268	1728	3			46	68							
Non-specified	246494	1325	1995	2555	64	128	1056					19470	545	581192
Transport Sector			172			5765	380				21847	6669	410	16594
Domestic aviation						1						6262		
Road			171			2671	45							
Rail			1			2726	2							16594
Pipeline transport													410	
Domestic navigation						366	333							
Non-specified											21847	407		
Other Sectors			17294		6762	66324	2621	3571	5938	29		6179	5652	561074
Residential			17182		6649								5464	238876
Comm. And public services														86037
Agriculture/forestry			7			630	57						188	173185
Fishing														
Non-specified			105		113	65694	2564	3571	5938	29		6179		62976
Non-Energy Use													21166	

(P): Provisional

Statistical Difference= Estimated Production - Estimated Consumption

Final consumption = Transformation+Energy sector+Total Industrial Consumption+Consumption by Other sectors+Non energy Use

* Include ATF, LDO, Pet Coke, Paraffin waxes, petroleum jelly, LSWR, MTBE and reformate, BGO, Benzene, MTO, CBFS and Sulfur etc.

Table 7.2: Energy Balance of India for 2015-16 (P)

All figures in KToe

	Coal	Crude Oil	Oil Products	Natural Gas	Nuclear	Hydro	Solar, Wind, Others	Electricity	Total
Production	2,39,112.66	36,950.00	-	29,664.69	9,750.32	10,447.88	35,413.60	-	3,61,339.15
Imports	1,29,326.88	2,02,850.00	29,157.69	20,210.19	-	-	-	450.98	3,81,995.74
Exports	-841.93	-	-62,554.05	-	-	-	-	-442.90	-63,838.88
International marine bunkers	-	-	-585.07	-	-	-	-	-	-585.07
International aviation bunkers	-	-	-	-	-	-	-	-	-
Stock changes	-3,506.13	-	-	-	-	-	-	-	-3,506.13
Total primary energy supply	3,64,091.47	2,39,800.00	-33,981.42	49,874.88	9,750.32	10,447.88	35,413.60	8.08	6,75,404.81
Statistical differences	2,06,152.75	-6,935.00	-5,966.04	-5,860.82	-	0.00	-	29,461.19	2,16,852.08
Main activity producer electricity plants	-3,50,947.31	-	-750.63	-10,016.32	-9,750.32	-10,438.42	-35,413.60	68,480.17	-3,48,836.43
Autoproducer electricity plants	-	-	-	-	-	-9.46	-	8,867.29	8,857.83
Oil refineries	-	-2,32,865.00	2,30,456.44	-	-	-	-	-	-2,408.56
Energy industry own use	-194.30	-	-1,224.50	-8,450.73	-	-	-	-	-9,869.52
Losses	-	-	-	-	-	-	-	-20,714.30	-20,714.30
Final consumption	2,19,102.62	-	1,88,533.85	25,547.01	-	-	-	86,102.43	5,19,285.91
Industry	2,19,102.62	-	39,500.80	501.62	-	-	-	36,422.98	2,95,528.02
Iron and steel	43,251.72	-	1,104.93	-	-	-	-	-	44,356.65
Chemical and petrochemical	1,830.75	-	12,255.85	-	-	-	-	-	14,086.60
Non-ferrous metals	-	-	373.51	-	-	-	-	-	373.51
Machinery	-	-	559.44	-	-	-	-	-	559.44
Mining and quarrying	-	-	50.89	-	-	-	-	-	50.89
Paper, pulp and print	908.57	-	-	-	-	-	-	-	908.57
Construction	6,210.08	-	225.38	-	-	-	-	-	6,435.46
Textile and leather	574.50	-	116.25	-	-	-	-	-	690.75
Non-specified (industry)	1,66,327.01	-	24,814.54	501.62	-	-	-	36,422.98	2,28,066.15
Transport	-	-	36,268.71	376.75	-	-	-	1,427.08	38,072.55
Road	-	-	26,375.69	-	-	-	-	-	26,375.69
Domestic aviation	-	-	5,983.65	-	-	-	-	-	5,983.65
Rail	-	-	2,822.29	-	-	-	-	1,427.08	4,249.37
Pipeline transport	-	-	-	376.75	-	-	-	-	376.75
Domestic navigation	-	-	698.25	-	-	-	-	-	698.25
Non-specified (transport)	-	-	388.84	-	-	-	-	-	388.84
Other	-	-	1,12,764.35	5,198.93	-	-	-	48,252.36	1,66,215.64
Residential	-	-	26,367.03	5,026.00	-	-	-	20,543.34	51,936.37
Commercial and public services	-	-	-	-	-	-	-	7,399.18	7,399.18
Agriculture/forestry	-	-	714.19	172.93	-	-	-	14,893.91	15,781.03
Fishing	-	-	-	-	-	-	-	-	-
Non-specified (other)	-	-	85,683.13	-	-	-	-	5,415.94	91,099.07
Non-energy use	-	-	-	19,469.70	-	-	-	-	19,469.70
Non-energy use industry/transformation/en	-	-	-	19,469.70	-	-	-	-	19,469.70
Elect. output in GWh	-	-	-	-	37,414.00	1,21,487.00	4,11,786.00	-	5,70,687.00
Elec output-main activity producer ele plants	-	-	-	-	37,414.00	1,21,377.00	4,11,786.00	-	5,70,577.00
Elec output-autoproducer electricity plants	-	-	-	-	-	110.00	-	-	110.00

P: Provisional

Source Program for diagram: SankeyMATIC

SANKEY DIAGRAM (INDIA)
FINAL CONSUMPTION (2015-16)
MILLION TONNE OF OIL EQUIVALENT

Total Consumption = 519286



Chem\$petro- chemical and petroleum
constr -construction
trans- transport
produ - production
Cons -Consumption

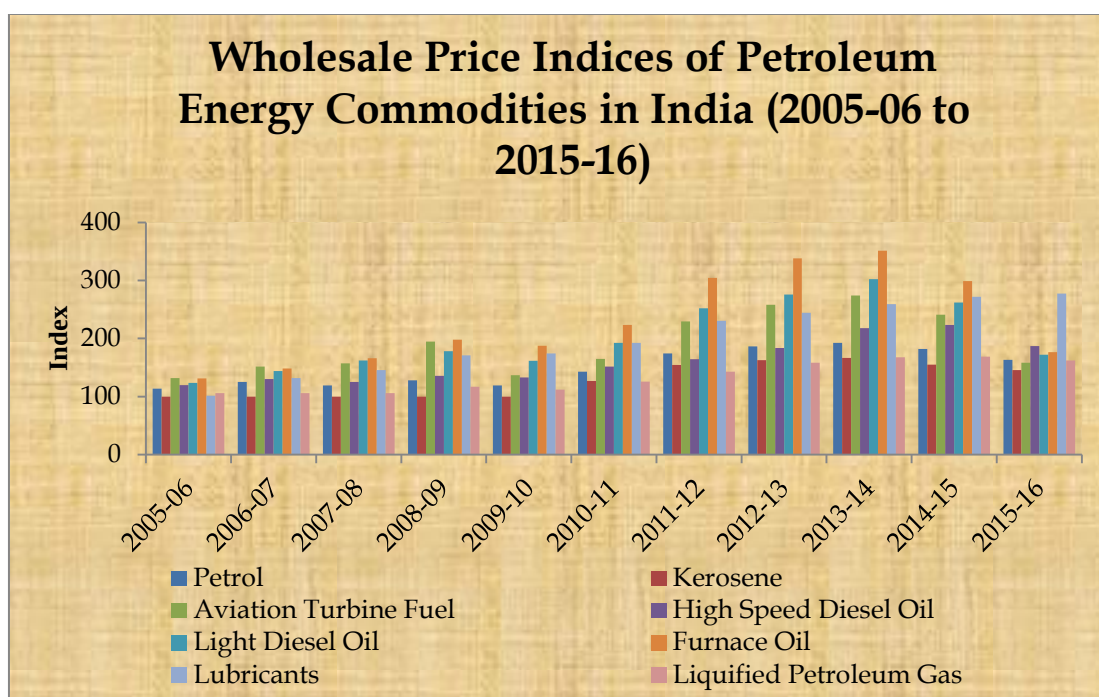
Indus -Industries
SW-Solar & Wind
pp-pulp
spec-specific

Source Program for diagram: SankeyMATIC

CHAPTER 8: WHOLE SALE PRICE INDEX OF ENERGY COMMODITIES

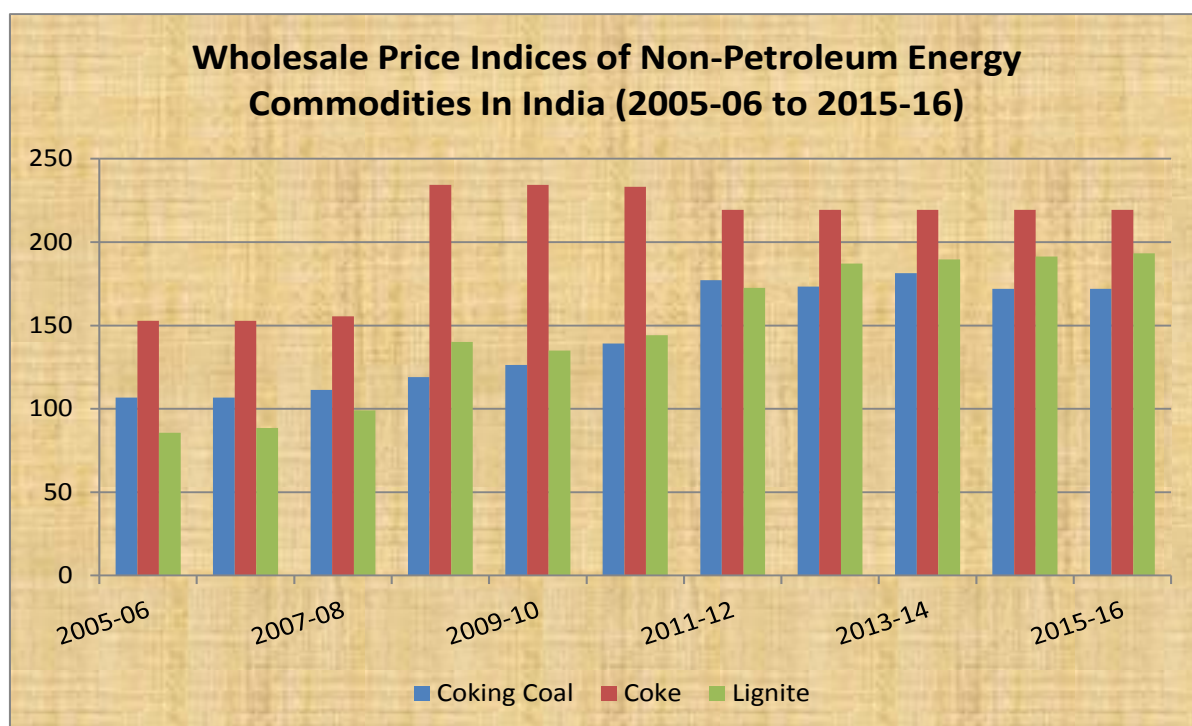
8.1 The Wholesale Price Index of Petroleum Products

- ❖ Annual increase (2015-16 over 2014-15) in Wholesale Price Index of Petroleum Products varied for different products ranging from -41.05% (Furnace Oil) to 2.11% (Lubricants).
- ❖ The maximum decrease was observed in Furnace Oil (-41.05%), followed by Light Speed Diesel Oil (-34.36%).



8.2 The Wholesale Price Index of Non-Petroleum Products

- ❖ The wholesale price index remained constant for Coke at 219.3 for the period 2015-16 over 2014-15.
- ❖ Wholesale Price Index of Electricity recorded an increase of 3.74% during 2015-16 over 2014-15.



8.2 Sector Wise Wholesale Price Indices of Electricity

- ❖ The movement of index for sector-wise electricity show that the maximum annual growth was observed in agriculture (8.79%) followed by railway traction (3.17%). For industries, the annual growth rate in the index was minimum (0.39%).

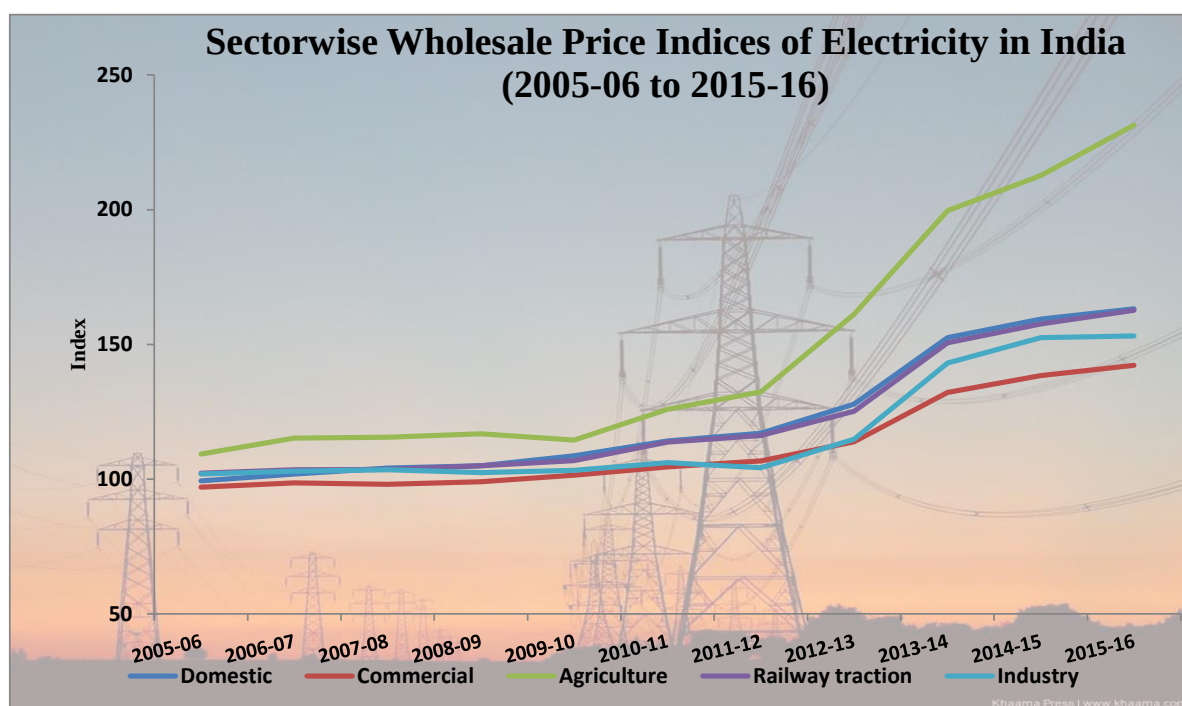


Table 8.1 : Wholesale Price Indices of Energy Commodities in India

(2004-05=100)

	Petroleum Products								Coking Coal	Coke	Lignite	Electricity
Year	Petrol	Kero-sene	Aviation Turbine Fuel	High Speed Diesel Oil	Light Diesel Oil	Furnace Oil	Lubri-cants	Liquified Petroleum Gas				
1	2	3	4	5	6	7	8	9	10	11	12	13
2005-06	113.6	99.9	132.0	119.7	123.4	131.2	101.9	106.1	106.7	152.7	85.7	102.6
2006-07	125.3	99.9	151.6	130.2	143.8	148.4	131.8	106.1	106.7	152.7	88.5	105.3
2007-08	119.1	99.9	157.4	125.6	162.3	166.0	145.8	106.1	111.4	155.4	99.1	106.2
2008-09	128.3	99.9	194.5	135.8	178.3	197.9	171.1	117.2	119.0	234.4	140.0	106.4
2009-10	119.3	99.9	137.0	133.0	161.5	187.6	174.5	111.9	126.3	234.4	134.9	107.4
2010-11	143.0	127.2	164.9	151.7	192.5	223.7	192.6	125.9	139.2	233.1	144.1	113.2
2011-12	174.4	154.4	229.4	164.5	252.0	304.6	230.4	143.2	177.1	219.3	172.6	115.0
2012-13	186.3	162.9	257.9	183.6	275.7	337.8	244.6	158.5	173.4	219.3	187.0	129.8
2013-14	192.6	166.5	274.0	217.8	302.5	351.1	259.5	168.0	181.3	219.3	189.7	158.7
2014-15	182.1	155.2	241.0	223.3	262.0	299.1	271.8	169.1	172.0	219.3	191.3	168.0
2015-16	163.5	145.4	158.5	186.9	172.0	176.3	277.5	162.1	172.0	219.3	193.3	174.3
Increase in 2015-16 over 2014-15 (%)	-10.25	-6.27	-34.22	-16.28	-34.36	-41.05	2.11	-4.10	0.00	0.00	1.05	3.74

Source :Office of the Economic Advisor, Ministry of Commerce & Industry.

Table 8.2 : Sector Wise Wholesale Price Indices of Electricity

(2004-05=100)

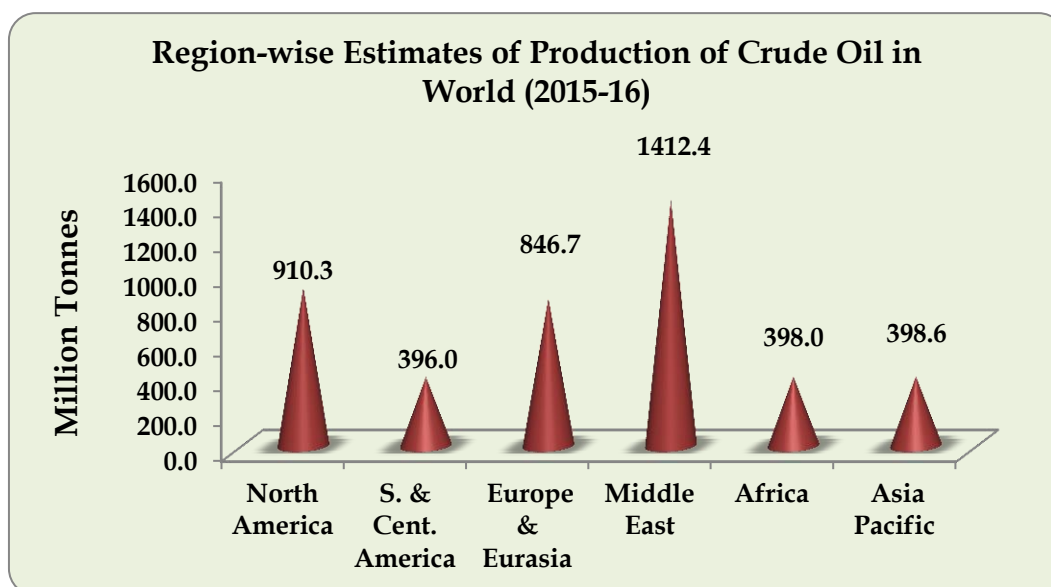
	Electricity					
Year	Domestic	Commercial	Agriculture	Railway traction	Industry	Total
1	2	3	4	5	6	7
2005-06	99.3	97.0	109.3	102.2	101.9	102.6
2006-07	101.9	98.6	115.3	103.5	102.9	105.3
2007-08	104.1	98.1	115.5	103.5	103.5	106.2
2008-09	104.9	99.0	116.8	104.9	102.4	106.4
2009-10	108.7	101.4	114.5	106.9	103.2	107.4
2010-11	114.2	104.5	125.9	113.8	106.1	113.2
2011-12	117.0	106.7	132.4	116.2	104.2	115.0
2012-13	127.8	113.8	161.2	125.2	114.8	129.8
2013-14	152.5	132.2	199.6	150.6	143.1	158.7
2014-15	159.4	138.4	212.7	157.6	152.6	168.0
2015-16	163.2	142.2	231.4	162.6	153.2	174.3
Increase in 2015-16 over 2014-15 (%)	2.38	2.75	8.79	3.17	0.39	3.74

Source :Office of the Economic Advisor, Ministry of Commerce & Industry.

CHAPTER 9: WORLD PRODUCTION AND CONSUMPTION OF CRUDE OIL & NATURAL GAS

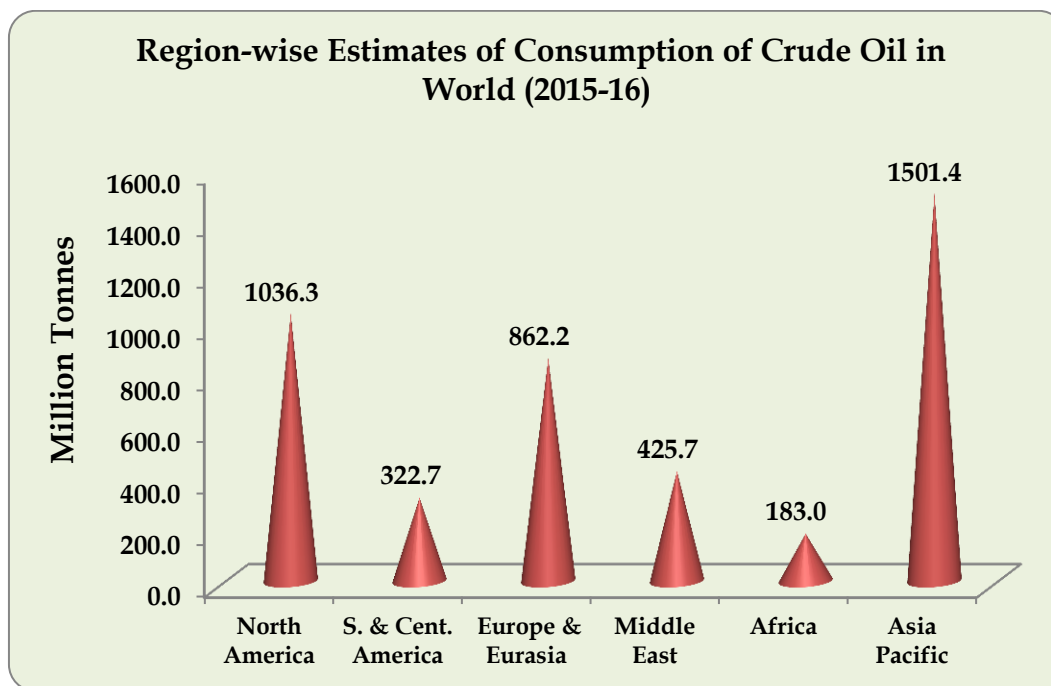
9.1 Production and consumption of crude oil

- ❖ The total estimated production of crude oil in the world has increased from about 3963.3 MT in 2006-07 to about 4119.2 MT during 2012-13, and further increased to 4361.9 MT during 2015-16 (Table 9.1). The production increased by 3.2% from 2014-15 to 2015-16.
- ❖ Geographical distribution of total world production during 2015-16 across major regions reveals that Middle East accounted for the highest share (32.38%), followed by North America (20.87%), Europe & Eurasia (19.41%), Asia Pacific (9.14%), Africa (9.12%) and South & Central America (9.10%). (Table 9.1)
- ❖ Distribution of total world production according to countries shows that Saudi Arabia and USA were the first and second highest producers with 13.03% and 13.0% respectively. They were followed by Russian Federation (12.40%), Canada (4.94%), China (4.92%), Iraq (4.52%), Iran (4.19%), UAE(4.02%), Kuwait (3.42%), Venezuela (3.1%), Brazil (3%), Mexico (2.92%) and Nigeria (2.59%) . India has accounted for only 0.94% of the world production.



- ❖ Region-wise consumption (Table 9.2) shows that Asia Pacific accounted for the highest share (34.66%) of total world consumption, followed by North America (23.93%), and Europe & Eurasia (19.91%). African countries accounted for the lowest share in the world consumption (4.23%).

- ❖ Country-wise distribution of consumption reveals that the United States was the largest consumer of crude oil, consuming 19.66% of the world consumption during 2015-16. China was the second largest consumer (12.92%), followed by **India (4.51%)**, Japan (4.38%), Saudi Arabia (3.88%) and Russian federation (3.30%).
- ❖ India was the third largest consumer of crude oil in the world and the second largest crude oil consumer in the Asia-Pacific region after China.

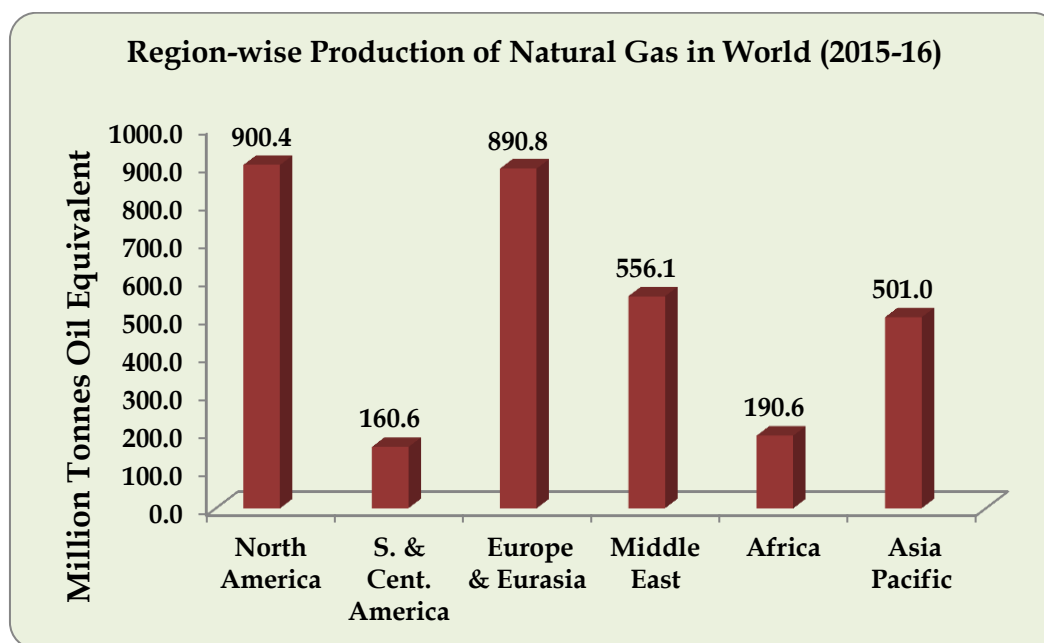


9.2 Production and Consumption of Natural Gas

- ❖ The total world production of Natural Gas increased from 2678.9 Million Tonne oil equivalent (Mtoe) in 2007-08 to 3199.5 Mtoe in 2015-16. The production has increased by 1.7% from 2014-15 to 2015-16 (Table 9.3).
- ❖ Distribution of production of natural gas over major regions shows that North America (28.14%) and Europe & Eurasia (27.84%) are the highest and the second highest producers, together accounting for 55.98% of the total world production.
- ❖ Country-wise, USA was the largest producer of natural gas (22.04%) in the world during 2015-16, followed by the Russian Federation (16.13%), Iran (5.41%) and Qatar (5.1%). India's share in the total world production of natural gas during 2015-16 was only 0.91% (26.3 Mtoe). (Table 9.3)
- ❖ The growth in production of natural gas from 2014-15 to 2015-16 was the highest in Middle East (5.9%), followed by Asia Pacific (3.6%), South & Central

America (1.3%), Africa (1%), North America (0.9%) and Europe & Eurasia (0.6%). (Table 9.3)

- ❖ The total world consumption of natural gas has increased from 2675.5 Mtoe in 2007-08 to 3135.2 Mtoe in 2015-16 (Table 9.4).



- ❖ Country-wise distribution of consumption of natural gas indicates that USA was the largest consumer (22.8%), followed by Russian federation (11.24%), China (5.7%) and Iran (5.49%) respectively. India with a consumption of 45.5 Mtoe accounted for only 1.45% of total world consumption (Table 9.4).
- ❖ Consumption of natural gas over major regions shows that Europe & Eurasia (28.81%) and North America (28.09%) are the highest and the second highest consumers, together accounting for 57.9% of the total world consumption (Table 9.4).

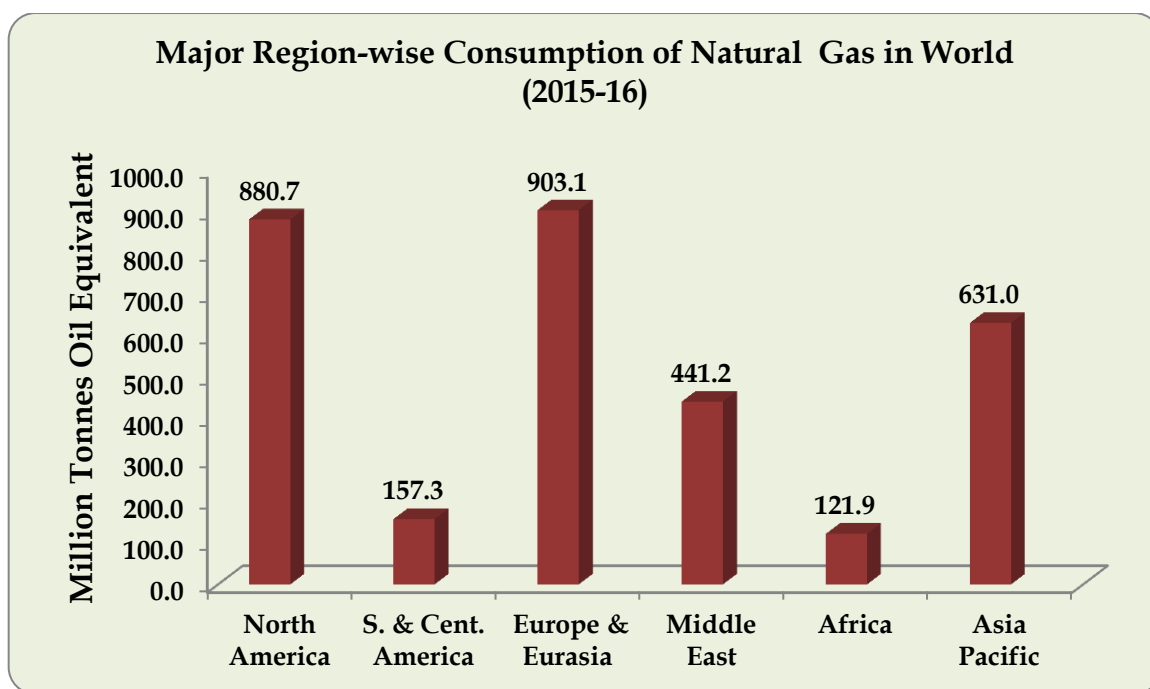


Table 9.1: Country-wise Estimates of Production of Crude Oil*

(Million tonnes)

Country/	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	% Change 2015-16 over 2014- 15	2015-16 % Share of World's Total Production
North America												
USA	304.7	305.2	302.3	322.5	332.8	345.0	393.7	448.0	522.8	567.3	8.5	13.00
Canada	150.6	166.3	152.9	152.8	160.3	169.8	182.6	195.0	209.6	215.5	2.8	4.94
Mexico	182.5	172.2	156.9	146.7	145.7	144.6	143.9	141.9	137.1	127.6	-6.9	2.92
Total North	637.8	632.7	612.2	622.0	638.8	659.4	720.2	785.0	869.5	910.3	4.7	20.87
South and Central America												
Argentina	39.1	38.0	36.5	33.6	33.0	30.6	30.7	30.1	29.7	29.7	0.1	0.7
Brazil	93.7	95.2	98.9	105.8	111.4	114.1	112.1	109.8	122.1	131.8	7.9	3.0
Colombia	27.9	28.0	31.1	35.3	41.4	48.2	49.9	52.9	52.2	53.1	1.7	1.2
Ecuador	28.8	27.5	27.2	26.1	26.1	26.8	27.1	28.2	29.8	29.1	-2.4	0.7
Peru	4.6	4.6	4.7	4.8	5.1	4.9	4.9	4.8	5.3	4.8	-11.0	0.1
Trinidad &	9.6	8.2	7.0	6.8	6.3	6.0	5.2	5.2	5.1	4.9	-4.9	0.1
Venezuela	171.0	165.5	165.6	155.7	145.7	141.6	139.2	137.6	138.2	135.2	-2.1	3.1
Other S. &	7.1	7.1	7.1	6.6	6.9	7.0	7.3	7.5	7.6	7.4	-1.7	0.2
Total S. &	381.8	374.1	378.1	374.6	375.8	379.0	376.2	376.1	390.0	396.0	1.5	9.1
Europe and Eurasia												
Azerbaijan	32.3	42.6	44.5	50.4	50.8	45.6	43.4	43.5	42.1	41.7	-1.0	0.96
Denmark	16.7	15.2	14.0	12.9	12.2	10.9	10.0	8.7	8.1	7.7	-5.4	0.18
Italy	5.8	5.9	5.2	4.6	5.1	5.3	5.4	5.6	5.8	5.5	-5.2	0.13
Kazakhstan	66.1	67.1	70.7	76.5	79.7	80.1	79.2	81.8	80.8	79.3	-1.9	1.82
Norway	129.0	118.6	114.7	108.7	98.9	93.8	87.3	83.2	85.3	88.0	3.2	2.02
Romania	5.0	4.7	4.7	4.5	4.3	4.2	4.0	4.1	4.1	4.0	-1.0	0.09
Russian	485.6	496.8	493.7	500.8	511.8	518.8	526.1	531.1	534.1	540.7	1.2	12.40
Turkmenistan	9.2	9.8	10.3	10.5	10.8	10.8	11.2	11.7	12.1	12.7	5.0	0.29
United	76.5	76.6	71.7	68.2	63.0	52.0	44.6	40.7	39.9	45.3	13.4	1.04
Uzbekistan	5.4	4.9	4.8	4.5	3.7	3.6	3.2	3.2	3.1	3.0	-2.9	0.07
Other Europe	21.7	21.6	20.6	19.9	19.2	19.3	19.2	19.6	19.2	18.7	-2.4	0.43
Total	853.2	863.8	855.0	861.4	859.3	844.4	833.3	833.0	834.7	846.7	1.4	19.41
Middle East												
Iran	209.2	210.9	213.0	205.6	211.9	212.7	180.5	169.6	174.7	182.6	4.5	4.19
Iraq	98.0	105.1	119.3	119.9	121.5	136.7	152.5	153.2	160.3	197.0	22.9	4.52
Kuwait	133.7	129.9	136.1	121.0	123.4	140.9	154.0	151.5	150.8	149.1	-1.1	3.42
Oman	36.6	35.2	37.6	40.2	42.8	43.8	45.0	46.1	46.2	46.6	0.8	1.07
Qatar	56.8	57.9	64.7	62.6	71.1	78.0	82.2	80.2	79.6	79.3	-0.4	1.82
Saudi Arabia	508.9	488.9	509.9	456.7	473.8	526.0	549.8	538.4	543.4	568.5	4.6	13.03
Syria	21.0	20.1	20.3	20.0	19.2	17.6	8.5	3.0	1.6	1.3	-18.3	0.03
United Arab	144.3	139.6	141.4	126.2	133.3	151.3	154.8	165.5	166.6	175.5	5.3	4.02
Yemen	18.1	15.9	14.8	14.4	14.3	11.2	8.8	6.9	6.6	2.1	-67.8	0.05
Other Middle	8.9	9.5	9.5	9.4	9.4	9.9	9.0	10.2	10.5	10.4	-0.5	0.24
Total	1235.7	1213.0	1266.4	1176.0	1220.7	1327.9	1345.1	1324.6	1340.3	1412.4	5.4	32.38

Contd....

CHAPTER 9: WORLD PRODUCTION AND CONSUMPTION OF CRUDE OIL & NATURAL GAS

Table 9.1(Contd.):Country-wise Estimates of Production of Crude Oil*

											(Million Tonnes)	
Country/ Region	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	% Change 2015-16	2015-16 % Share of World's
Africa												
Algeria	86.2	86.5	85.6	77.2	73.8	71.7	67.2	64.8	68.8	68.5	-0.4	1.57
Angola	69.3	82.1	93.5	87.6	90.5	83.8	86.9	87.3	83.0	88.7	6.8	2.03
Chad	8.0	7.5	6.7	6.2	6.4	6.0	5.3	4.4	4.3	4.1	-4.8	0.09
Rep. of Congo (Bra	14.0	11.4	12.3	14.2	16.2	15.5	15.2	14.5	14.2	14.3	0.5	0.33
Egypt	34.5	33.8	34.7	35.3	35.0	34.6	34.7	34.4	35.1	35.6	1.4	0.82
Equatorial Guinea	15.6	15.9	16.1	14.2	12.6	11.6	12.7	12.4	13.1	13.5	3.2	0.31
Gabon	12.1	12.3	12.0	12.0	12.7	12.7	12.3	11.8	11.8	11.6	-1.4	0.27
Libya	85.3	85.3	85.5	77.4	77.6	22.5	71.1	46.4	23.3	20.2	-13.4	0.46
Nigeria	116.6	110.2	103.8	107.6	122.1	119.1	117.2	111.5	114.8	113.0	-1.5	2.59
South Sudan	-	-	-	-	-	-	1.5	4.9	7.7	7.3	-4.8	0.17
Sudan	16.3	23.8	22.6	23.4	22.8	14.3	5.1	5.8	5.9	5.2	-12.4	0.12
Tunisia	3.3	4.6	4.6	4.3	4.0	3.7	3.9	3.6	3.4	2.9	-14.0	0.07
Other Africa	11.2	9.7	9.3	9.2	8.1	10.9	11.0	12.1	12.1	13.1	7.9	0.30
Total Africa	472.3	483.0	486.6	468.6	481.8	406.3	444.0	413.9	397.5	398.0	0.1	9.12
Asia Pacific												
Australia	23.3	24.7	24.1	22.4	24.5	21.5	21.4	17.8	19.1	17.0	-10.9	0.39
Brunei	10.8	9.5	8.6	8.3	8.5	8.1	7.8	6.6	6.2	6.2	0.3	0.14
China	184.8	186.3	190.4	189.5	203.0	202.9	207.5	210.0	211.4	214.6	1.5	4.92
India	37.8	36.4	37.8	38.0	41.3	42.9	42.6	42.5	41.6	41.2	-1.1	0.94
Indonesia	50.2	47.8	49.4	48.4	48.6	46.3	44.6	42.7	41.2	40.0	-3.0	0.92
Malaysia	32.7	33.8	34.0	32.2	32.6	29.4	29.8	28.5	29.8	31.9	6.9	0.73
Thailand	12.5	13.2	14.0	14.6	14.8	15.4	16.7	16.5	16.3	17.2	6.0	0.40
Vietnam	17.2	16.3	15.2	16.7	15.6	15.8	17.3	17.4	18.1	17.4	-3.4	0.40
Other Asia Pacific	13.1	13.9	14.8	14.4	13.8	13.0	12.7	12.0	12.9	13.1	1.4	0.30
Total Asia Pacific	382.4	382.0	388.5	384.4	402.7	395.3	400.4	394.0	396.6	398.6	0.5	9.14
TOTAL WORLD	3963.3	3948.6	3986.8	3887.0	3979.1	4012.4	4119.2	4126.6	4228.7	4361.9	3.2	100.00

* Includes crude oil, shale oil, oil sands and NGLs (the liquid content of natural gas where this is recovered separately). Excludes liquid fuels from other sources such as biomass & coal derivatives.

Note: Annual changes and shares of total are calculated using million tonnes per annum figures.

Source : Ministry of Petroleum & Natural Gas.

CHAPTER 9: WORLD PRODUCTION AND CONSUMPTION OF CRUDE OIL & NATURAL GAS

Table 9.2 : COUNTRY-WISE ESTIMATES OF CONSUMPTION OF CRUDE OIL*

	(in Million Tonnes)										
Country/ Region	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	% Change 2015-16 over 2014-15	2015-16 % Share of World's Total Consumption
North America											
US	928.8	875.4	833.2	850.1	834.9	817	832.1	838.1	851.6	1.61	19.66
Canada	102.3	101.2	95	101.6	105	103.3	103.5	103.3	100.3	-2.90	2.32
Mexico	92	91.6	88.5	88.6	90.3	92.3	89.7	85.2	84.3	-1.06	1.95
Total North America	1123.1	1068.2	1016.7	1040.3	1030.2	1012.6	1025.3	1026.6	1036.3	0.94	23.93
South and Central America											
Argentina	24	24.9	24.3	28.1	28.3	29.7	31.1	30.9	31.6	2.27	0.73
Brazil	102.2	110.1	110.3	120	125.9	128.8	137.4	143.4	137.3	-4.25	3.17
Chile	17	18.6	18.2	16	17.6	17.5	16.8	16.7	16.9	1.20	0.39
Colombia	10.7	11.7	10.7	11.9	12.8	13.9	13.8	14.6	15.5	6.16	0.36
Ecuador	8.5	8.7	8.9	10.3	10.5	10.9	11.6	12	11.7	-2.50	0.27
Peru	7.1	8	8.2	8.6	9.5	9.6	10.2	10.2	10.9	6.86	0.25
Trinidad & Tobago	1.6	1.8	1.7	1.9	1.7	1.6	1.7	1.8	1.8	0.00	0.04
Venezuela	29.7	33.8	34.2	34.2	34.6	37.2	38.1	36.7	32	-12.81	0.74
Cent. America	61.6	63.5	62.8	63.6	64.8	63.9	62.1	63.6	65	2.20	1.50
America	262.6	281.1	279.3	294.6	305.6	312.9	322.9	329.8	322.7	-2.15	7.45
Europe and Eurasia											
Austria	13.4	13.4	12.8	13.4	12.7	12.5	12.7	12.5	12.6	0.80	0.29
Azerbaijan	4.5	3.6	3.3	3.2	4	4.2	4.5	4.4	4.5	2.27	0.10
Belarus	8	7.9	9.3	7.5	8.6	10.4	7.1	7.3	7.1	-2.74	0.16
Belgium	33.7	35.9	31.5	33	30.8	29.6	30.2	29.8	30.5	2.35	0.70
Bulgaria	4.8	4.8	4.3	3.9	3.8	3.9	3.6	3.9	4.2	7.69	0.10
Czech Republic	9.7	9.9	9.7	9.2	9	8.9	8.5	9.1	9.4	3.30	0.22
Denmark	9.4	9.3	8.3	8.4	8.3	7.8	7.7	7.9	8.1	2.53	0.19
Finland	10.6	10.5	9.9	10.4	9.7	9.2	9	8.6	8.3	-3.49	0.19
France	91.4	90.8	87.5	84.5	83	80.3	79.3	76.9	76.1	-1.04	1.76
Germany	112.5	118.9	113.9	115.4	112	111.4	113.4	110.4	110.2	-0.18	2.54
Greece	21.7	20.4	19.5	18.1	17	15.3	14.5	14.4	14.8	2.78	0.34
Hungary	7.7	7.5	7.1	6.7	6.3	5.9	5.8	6.5	7	7.69	0.16
Republic of Ireland	9.4	9	8	7.6	6.8	6.5	6.5	6.5	6.9	6.15	0.16
Italy	84	80.4	75.1	73.1	70.5	64.2	59.4	55.8	59.3	6.27	1.37
Kazakhstan	11.3	11	8.9	9.3	12.3	13.1	13.1	13.5	12.7	-5.93	0.29
Lithuania	2.8	3.1	2.6	2.7	2.6	2.7	2.6	2.6	2.6	0.00	0.06
Netherlands	50.7	47.3	45.9	45.9	46.1	43.7	41.4	39.6	38.7	-2.27	0.89
Norway	10.7	10.4	10.7	10.8	10.6	10.5	10.8	10.2	10.2	0.00	0.24
Poland	24.2	25.3	25.3	26.7	26.6	25.7	23.8	23.9	25.1	5.02	0.58
Portugal	14.7	14.1	13.2	13	12.1	11	11.3	11.1	11.4	2.70	0.26
Romania	10.3	10.4	9.2	8.8	9.1	9.2	8.4	9	9.1	1.11	0.21
Russian Federation	130	133.6	128.2	133.3	142.2	144.6	144.9	150.8	143	-5.17	3.30
Slovakia	3.6	3.9	3.7	3.9	3.9	3.6	3.6	3.4	3.8	11.76	0.09
Spain	80.3	78	73.5	72.1	68.8	64.7	59.3	59	60.5	2.54	1.40
Sweden	16.9	16.7	15.5	16.2	14.8	14.6	14.4	14.5	14.1	-2.76	0.33
Switzerland	11.3	12.1	12.3	11.4	11	11.2	11.8	10.6	10.7	0.94	0.25
Turkey	33.6	32.1	32.6	31.8	31.1	31.6	32.7	34.4	38.8	12.79	0.90
Turkmenistan	5.2	5.3	5	5.5	5.8	6	6.2	6.3	6.4	1.59	0.15
Ukraine	14.7	14.2	13.5	12.6	13.1	12.5	11.9	10	8.4	-16.00	0.19
United Kingdom	79.2	79.5	75.8	74.9	73.7	71.2	70.6	69.9	71.6	2.43	1.65
Uzbekistan	4.7	4.6	4.3	3.6	3.4	3	2.9	2.8	2.8	0.00	0.06
Other Europe & Eurasia	32.5	35.8	35	34.7	34.5	33.4	32.6	32.8	33.1	0.91	0.76
Total Europe & Eurasia	957.7	959.5	915.4	911.3	904.3	882.7	864.7	858.6	862.2	0.42	19.91

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Table 9.2(Contd.) : COUNTRYWISE ESTIMATES OF CONSUMPTION OF CRUDE OIL

(Million tonnes)										
Country/ Region	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	% Change 2015-16 over 2014- 15 2015-16 % Share of World's Total Consumption
Middle East										
Iran	89.4	93.1	95.4	86.8	88.0	89.0	95.5	93.1	88.9	-4.51 2.05
Israel	12.1	12.0	10.8	11.2	11.8	13.9	10.9	10.3	11.0	6.80 0.25
Kuwait	17.9	19.0	20.4	21.6	20.4	21.5	22.7	22.7	23.6	3.96 0.54
Qatar	5.3	6.2	6.0	6.5	8.0	8.3	9.4	10.0	10.9	9.00 0.25
Saudi Arabia	98.1	114.4	125.9	137.1	139.1	146.2	147.3	160.1	168.1	5.00 3.88
United Arab Emirates	28.9	30.2	28.9	30.8	33.3	34.5	35.1	37.6	40.0	6.38 0.92
Other Middle East	62.4	68.5	71.1	74.3	74.9	76.8	81.0	83.2	83.3	0.12 1.92
Total Middle East	314.1	343.4	358.6	368.3	375.6	390.3	402.0	417.1	425.7	2.06 9.83
Africa										
Algeria	12.9	14.0	14.9	14.8	15.8	16.9	17.7	18.2	19.3	6.04 0.45
Egypt	30.6	32.6	34.4	36.3	33.7	35.3	35.7	38.3	39.2	2.35 0.91
South Africa	26.6	25.7	24.2	26.6	28.1	28.2	27.9	29.3	31.1	6.14 0.72
Other Africa	75.0	80.9	82.9	86.7	82.7	88.5	92.0	91.4	93.5	2.30 2.16
Total Africa	145.0	153.2	156.3	164.5	160.3	168.9	173.3	177.2	183.0	3.27 4.23
Asia Pacific										
Australia	42.5	42.7	43.1	43.4	45.6	47.2	46.7	45.4	46.2	1.76 1.07
Bangladesh	3.7	3.8	3.5	3.9	5.1	5.4	5.3	5.7	5.5	-3.51 0.13
China	369.3	377.5	392.2	447.9	464.2	486.3	507.2	526.8	559.7	6.25 12.92
SAR	16.4	14.8	16.9	17.8	18.0	17.2	17.6	16.7	18.3	9.58 0.42
India	138.1	144.7	152.6	155.4	163.0	173.6	175.3	180.8	195.5	8.13 4.51
Indonesia	60.9	60.1	59.7	64.2	73.1	74.7	74.6	76.0	73.5	-3.29 1.70
Japan	230.9	224.8	200.4	202.7	203.6	217.0	208.0	197.3	189.6	-3.90 4.38
Malaysia	30.8	29.5	29.2	29.3	31.0	32.6	34.7	35.0	36.2	3.43 0.84
New Zealand	7.1	7.2	6.9	7.0	7.0	7.0	7.1	7.2	7.5	4.17 0.17
Pakistan	19.2	20.0	21.8	21.3	21.5	20.5	21.7	22.8	25.2	10.53 0.58
Philippines	14.1	13.3	14.0	14.6	13.8	14.4	14.9	16.1	18.4	14.29 0.42
Singapore	48.3	51.4	55.5	61.0	63.7	63.3	64.0	65.9	69.5	5.46 1.60
South Korea	107.6	103.1	103.7	105.0	105.8	108.8	108.3	107.9	113.7	5.38 2.63
Taiwan	51.2	45.9	46.1	47.2	44.5	44.6	45.1	45.4	46.0	1.32 1.06
Thailand	45.1	44.4	45.9	47.7	49.7	52.4	54.6	54.9	56.6	3.10 1.31
Vietnam	13.3	14.1	14.6	15.6	16.9	17.3	17.5	18.0	19.5	8.33 0.45
Other Asia Pacific	16.4	15.6	16.4	16.9	18.7	19.1	19.1	20.4	20.6	0.98 0.48
Total Asia Pacific	1214.8	1212.7	1222.4	1300.9	1345.5	1401.2	1421.8	1442.2	1501.4	4.10 34.66
TOTAL WORLD	4017.3	4018.1	3948.7	4079.9	4121.6	4168.6	4209.9	4251.6	4331.3	1.87 100.00

Notes: Growth rates are adjusted for leap years.

* Inland demand plus international aviation and marine bunkers and refinery fuel and loss. Consumption of fuel ethanol and biodiesel is also included.

Differences between these world consumption figures and world production statistics are accounted for by stock changes, consumption of non-petroleum additives and substitute fuels, and unavoidable disparities in the definition, measurement or conversion of oil supply and demand data.

Source : Ministry of Petroleum & Natural Gas

Table 9.3: Countrywise Estimates of Production of Natural Gas*

(Million Tonnes Oil Equivalent)

Country/ Region	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	% Change 2015-16 over 2014- 15	2015-16 % Share of World's Total Consumption
North America											
USA	498.6	521.7	532.7	549.5	589.8	620.2	626.4	669.1	705.3	5.4	22.04
Canada	164.4	158.9	147.6	143.9	143.7	140.2	140.5	145.8	147.2	0.2	4.60
Mexico	48.2	48.0	53.4	51.8	52.4	51.5	52.4	51.4	47.9	1.7	1.50
Total North America	711.2	728.7	733.6	745.2	786.0	811.8	819.3	866.3	900.4	0.9	28.14
South and Central America											
Argentina	40.4	39.7	37.2	36.1	34.9	34.0	32.0	31.9	32.8	-5.8	1.03
Bolivia	12.4	12.9	11.1	12.8	14.0	16.0	18.3	18.9	18.8	14.2	0.59
Brazil	10.1	12.6	10.7	13.1	15.1	17.3	19.2	20.4	20.6	10.7	0.64
Colombia	6.8	8.2	9.5	10.1	9.9	10.8	11.4	10.6	9.9	5.5	0.31
Peru	2.4	3.1	3.1	6.5	10.2	10.7	11.0	11.6	11.3	2.8	0.35
Trinidad & Tobago	38.0	37.8	39.3	40.3	38.8	38.5	38.6	37.9	35.7	0.3	1.11
Venezuela	32.5	29.5	27.9	27.6	24.8	26.5	25.6	25.8	29.2	-3.5	0.91
Other S. & Cent. America	3.5	3.1	3.1	3.1	2.7	2.5	2.4	2.4	2.4	-4.4	0.07
Total S. & Cent. America	146.1	146.7	142.0	149.6	150.3	156.2	158.3	159.4	160.6	1.3	5.02
Europe and Eurasia											
Azerbaijan	8.8	13.3	13.3	13.6	13.3	14.0	14.6	15.8	16.4	3.8	0.51
Denmark	8.3	9.1	7.6	7.4	5.9	5.2	4.4	4.2	4.1	-15.8	0.13
Germany	12.9	11.7	11.0	9.6	9.0	8.1	7.4	7.0	6.5	-9.1	0.20
Italy	8.0	7.6	6.6	6.9	7.0	7.1	6.3	5.9	5.6	-10.8	0.17
Kazakhstan	13.6	10.4	9.7	9.5	9.4	10.2	10.7	11.0	11.1	4.8	0.35
Netherlands	54.5	60.0	56.4	63.4	57.7	57.4	61.8	50.1	38.7	7.6	1.21
Norway	81.3	90.1	94.0	96.5	91.1	103.3	97.9	97.9	105.4	-5.2	3.30
Poland	3.9	3.7	3.7	3.7	3.9	3.9	3.8	3.7	3.7	-2.3	0.12
Romania	10.4	9.0	8.9	8.6	8.7	9.0	8.6	8.8	9.3	-4.5	0.29
Russian Federation	532.8	541.6	474.9	530.0	546.3	533.1	544.2	523.6	516.0	2.1	16.13
Turkmenistan	58.9	59.5	32.7	38.1	53.6	56.1	56.1	62.3	65.2	0.1	2.04
Ukraine	16.9	17.1	17.4	16.7	16.8	16.7	16.6	16.1	15.7	-0.7	0.49
United Kingdom	64.9	62.7	53.7	51.4	40.7	35.0	32.8	33.1	35.7	-6.2	1.12
Uzbekistan	52.4	52.0	50.0	49.0	51.3	51.2	51.2	51.6	52.0	-0.1	1.62
Other Europe & Eurasia	9.6	8.9	8.7	8.8	8.3	7.6	6.6	5.9	5.6	-13.4	0.18
Total Europe & Eurasia	937.0	956.5	848.5	913.1	923.0	917.9	923.0	896.9	890.8	0.6	27.84
Middle East											
Bahrain	10.6	11.4	11.5	11.8	12.0	12.4	13.2	13.9	14.0	7.0	0.44
Iran	112.5	117.8	129.3	137.1	143.9	149.5	150.1	163.8	173.2	0.4	5.41
Iraq	1.3	1.7	1.0	1.2	0.8	0.6	1.1	0.8	0.9	82.8	0.03
Kuwait	10.9	11.5	10.3	10.6	12.2	14.0	14.7	13.5	13.5	5.2	0.42
Oman	21.6	23.4	24.3	26.4	27.8	29.0	31.3	30.0	31.4	8.1	0.98
Qatar	56.9	69.3	80.4	118.1	130.7	141.3	159.8	156.7	163.3	13.1	5.10
Saudi Arabia	67.0	72.4	70.6	78.9	83.0	89.4	90.0	92.1	95.8	0.7	2.99
Syria	5.0	4.8	5.3	7.2	6.4	5.2	4.6	4.2	3.9	-12.4	0.12
United Arab Emirates	45.3	45.2	44.0	46.2	47.1	48.9	49.1	48.8	50.2	0.6	1.57
Yemen	-	-	0.7	5.6	8.1	6.6	8.9	8.4	2.4	35.9	0.08
Other Middle East	2.7	3.3	2.6	3.1	4.0	2.4	5.9	6.9	7.6	146.0	0.24
Total Middle East	333.7	360.6	380.0	446.0	476.0	499.2	528.8	539.2	556.1	5.9	17.38

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Table 9.3 (contd.): Countrywise Estimates of Production of Natural Gas*

(Million Tonnes Oil Equivalent)

Country/ Region	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	% Change 2015-16 over 2014-15	% Share of World's Total Consumption for 2015-16
Africa											
Algeria	76.3	77.2	71.6	72.4	74.4	73.4	74.2	75.0	74.7	1.1	2.40
Egypt	50.1	53.1	56.4	55.2	55.3	54.8	50.5	43.9	41.0	-13.1	1.40
Libya	13.8	14.3	14.3	15.1	7.1	11.0	9.3	10.6	11.5	14.0	0.35
Nigeria	33.2	32.5	23.4	33.6	36.5	39.0	32.6	40.5	45.1	24.2	1.11
Other Africa	10.9	13.6	14.0	15.7	17.2	16.3	18.8	17.1	18.3	-9.0	0.57
Total Africa	184.3	190.8	179.7	192.0	190.5	194.4	185.3	187.2	190.6	1.0	5.83
Asia Pacific											
Australia	36.0	40.0	44.1	47.3	46.7	50.6	52.1	55.2	60.3	6.0	1.59
Bangladesh	14.3	15.3	17.5	18.0	18.3	20.0	20.5	21.5	24.1	4.9	0.68
Brunei	11.0	10.9	10.3	11.1	11.5	11.3	11.0	10.7	11.4	-2.7	0.34
China	64.4	74.8	79.4	89.2	98.1	100.7	110.0	118.4	124.2	7.6	3.87
India	27.1	27.5	33.8	44.3	40.1	34.9	29.0	27.4	26.3	-5.5	0.91
Indonesia	64.4	66.4	69.2	77.1	73.3	69.4	68.8	67.7	67.5	-1.6	2.11
Malaysia	55.4	57.3	54.8	54.8	55.8	55.4	60.4	60.0	61.4	-0.7	1.91
Myanmar	12.2	11.2	10.4	11.2	11.5	11.5	11.8	15.2	17.6	28.8	0.49
Pakistan	36.5	37.3	37.4	38.1	38.1	39.4	38.4	37.7	37.7	-1.8	1.21
Thailand	23.4	25.9	27.8	32.6	33.3	37.3	37.6	37.9	35.8	0.8	1.21
Vietnam	6.4	6.7	7.2	8.5	7.6	8.4	8.8	9.2	9.6	4.5	0.29
Other Asia Pacific	15.6	16.0	16.3	15.9	16.0	15.9	16.3	20.4	24.9	25.2	0.67
Total Asia Pacific	366.6	389.3	408.3	448.0	450.3	454.5	464.6	481.3	501.0	3.6	15.28
TOTAL WORLD	2678.9	2772.5	2692.1	2894.0	2976.1	3034.0	3079.2	3130.3	3199.5	2.2	100.0

* Excluding gas flared or recycled

Source : Ministry of Petroleum & Natural Gas

CHAPTER 9: WORLD PRODUCTION AND CONSUMPTION OF CRUDE OIL & NATURAL GAS

Table 9.4 : Country-wise estimates of Consumption of Natural Gas

(in Million Tonnes Oil Equivalent)

Country/ Region	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	% Change 2015-16 over 2014- 15	% Share of World's Total Consumption for 2015-16
North America											
USA	596.3	600.8	590.1	619.3	628.8	657.4	675.8	692.7	713.6	3.0	22.76
Canada	86.6	86.5	85.4	85.5	90.8	90.2	93.5	93.8	92.2	-1.7	2.94
Mexico	57.1	59.7	65.0	65.2	68.9	71.9	74.9	78.1	74.9	-4.1	2.39
Total North America	739.9	747.0	740.5	770.0	788.6	819.6	843.9	864.6	880.7	1.9	28.09
South and Central America											
Argentina	39.5	40.0	37.9	38.9	40.7	42.2	41.8	42.4	42.8	0.9	1.37
Brazil	19.1	22.4	18.1	24.1	24.0	28.5	33.6	35.5	36.8	3.7	1.17
Chile	4.1	2.1	2.2	4.4	4.5	4.1	4.1	3.4	3.5	2.9	0.11
Colombia	6.7	6.8	7.8	8.2	8.0	8.9	9.0	9.8	9.5	-3.1	0.30
Ecuador	0.4	0.4	0.4	0.4	0.4	0.5	0.6	0.6	0.6	0.0	0.02
Peru	2.4	3.1	3.1	5.0	5.6	6.1	5.9	6.5	6.8	4.6	0.22
Trinidad & Tobago	19.7	19.2	19.9	20.9	21.0	20.0	20.2	19.8	19.4	-2.0	0.62
Venezuela	32.5	30.9	29.0	29.0	26.7	28.3	27.5	27.7	31.1	12.3	0.99
Other S. & Cent. America	3.9	4.3	4.5	4.8	5.5	6.1	6.6	6.9	6.9	0.0	0.22
Total S. & Cent. America	128.5	129.1	123.1	135.8	136.4	144.5	149.2	152.6	157.30	19.4	5.02
Europe and Eurasia											
Austria	8.0	8.5	8.2	9.0	8.4	8.1	7.7	7.1	7.5	5.6	0.24
Azerbaijan	7.2	8.2	7.0	6.7	7.3	7.7	7.7	8.5	8.8	3.5	0.28
Belarus	16.9	17.4	14.5	17.8	16.5	16.7	16.7	16.5	15.5	-6.1	0.49
Belgium	14.9	14.8	15.1	17.0	14.2	14.4	14.2	12.4	13.6	9.7	0.43
Bulgaria	2.9	2.9	2.1	2.3	2.6	2.5	2.4	2.4	2.6	8.3	0.08
Czech Republic	7.8	7.1	6.7	7.6	6.9	6.9	6.9	6.2	6.5	4.8	0.21
Denmark	4.1	4.1	4.0	4.5	3.8	3.5	3.4	2.8	2.9	3.6	0.09
Finland	3.5	3.6	3.2	3.6	3.1	2.7	2.6	2.3	1.9	-17.4	0.06
France	38.2	39.9	38.4	42.6	37.0	38.2	38.8	32.6	35.1	7.7	1.12
Germany	74.6	77.0	72.6	75.7	69.5	69.7	73.1	64.0	67.2	5.0	2.14
Greece	3.3	3.5	2.9	3.2	4.0	3.6	3.2	2.4	2.5	4.2	0.08
Hungary	12.2	12.1	10.5	11.3	10.0	9.1	8.3	7.5	8.0	6.7	0.26
Republic of Ireland	4.3	4.5	4.3	4.7	4.1	4.0	3.8	3.7	3.8	2.7	0.12
Italy	70.0	69.5	63.9	68.1	63.8	61.4	57.4	50.7	55.3	9.1	1.76
Kazakhstan	7.3	6.3	6.0	4.0	4.6	6.1	6.3	6.9	7.8	13.0	0.25
Lithuania	3.3	2.6	2.2	2.5	2.7	2.7	2.2	2.1	2.1	0.0	0.07
Netherlands	33.3	34.7	35.0	39.2	34.2	32.7	33.3	28.8	28.6	-0.7	0.91
Norway	3.8	3.9	3.7	3.7	4.0	3.9	4.0	4.2	4.3	2.4	0.14
Poland	12.4	13.5	13.0	14.0	14.1	15.0	15.0	14.6	15.1	3.4	0.48
Portugal	3.9	4.3	4.2	4.6	4.7	4.0	3.8	3.7	3.9	5.4	0.12
Romania	14.5	12.6	10.5	10.8	11.0	11.2	10.2	9.5	9.3	-2.1	0.30
Russian Federation	379.8	374.4	350.7	372.7	382.1	374.6	372.1	370.7	352.3	-5.0	11.24
Slovakia	5.1	5.2	4.4	5.0	4.6	4.4	4.8	3.8	3.9	2.6	0.12
Spain	31.8	34.9	31.2	31.1	28.9	28.6	26.1	23.7	24.8	4.6	0.79
Sweden	0.9	0.8	1.0	1.4	1.1	1.0	1.0	0.8	0.8	0.0	0.03
Switzerland	2.6	2.5	2.4	2.7	2.4	2.6	2.8	2.4	2.6	8.3	0.08
Turkey	32.5	33.8	32.1	35.1	36.8	37.3	37.6	40.2	39.2	-2.5	1.25
Turkmenistan	19.1	19.3	17.7	20.4	21.2	23.7	20.6	24.9	30.9	24.1	0.99
Ukraine	56.9	54.0	42.1	47.0	48.3	44.6	38.9	33.1	25.9	-21.8	0.83
United Kingdom	81.9	84.4	78.3	84.8	70.3	66.5	65.7	60.0	61.4	2.3	1.96
Uzbekistan	41.3	43.8	35.9	36.8	42.9	42.5	42.2	43.9	45.3	3.2	1.44
Other Europe & Eurasia	16.2	15.4	13.4	14.8	14.9	14.7	13.5	13.4	13.7	2.2	0.44
Total Europe & Eurasia	1014.5	1019.4	937.4	1004.4	980.2	964.4	946.1	905.8	903.1	-0.3	28.81

Contd...

CHAPTER 9: WORLD PRODUCTION AND CONSUMPTION OF CRUDE OIL & NATURAL GAS

Table 9.4(Contd.) : Country-wise Estimates of Consumption of Natural Gas*

Country/ Region	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	% Change 2015-16 over 2014-15	2015-16 % Share of World's Total Consumption
Middle East											
Iran	113.0	119.9	128.4	137.6	146.0	145.4	146.6	162.0	172.1	6.2	5.49
Israel	2.5	3.4	3.8	4.8	4.5	2.3	6.2	6.8	7.6	11.8	0.24
Kuwait	10.9	11.5	11.1	13.1	14.9	16.6	16.8	16.8	17.5	4.2	0.56
Qatar	17.4	17.1	17.9	28.9	18.7	23.3	38.4	35.7	40.6	13.7	1.29
Saudi Arabia	67.0	72.4	70.6	78.9	83.0	89.4	90.0	92.1	95.8	4.0	3.06
United Arab Emirates	44.3	53.5	53.2	54.7	56.9	59.0	60.5	59.6	62.2	4.4	1.98
Other Middle East	29.1	34.5	37.4	41.6	40.2	40.2	43.7	42.2	45.4	7.6	1.45
Total Middle East	284.1	312.3	322.4	359.6	364.2	376.1	402.2	415.3	441.2	6.2	14.07
Africa											
Algeria	21.9	22.8	24.5	23.7	25.1	27.9	30.0	33.7	35.1	4.2	1.12
Egypt	34.5	36.8	38.3	40.6	44.7	47.3	46.3	43.2	43.0	-0.5	1.37
South Africa	3.1	3.4	3.0	3.5	3.7	4.0	4.1	4.5	4.5	0.0	0.14
Other Africa	26.9	27.7	23.8	28.6	29.4	31.8	30.1	34.1	39.2	15.0	1.25
Total Africa	86.4	90.6	89.6	96.5	102.8	111.0	110.6	115.6	121.9	5.5	3.89
Asia Pacific											
Australia	23.9	28.7	29.0	29.9	29.2	29.9	30.9	32.4	30.9	-4.6	0.99
Bangladesh	14.3	15.3	17.5	18.0	18.3	20.0	20.5	21.5	24.1	12.1	0.77
China	65.6	75.7	83.3	100.1	123.4	135.8	154.7	169.6	177.6	4.7	5.66
China Hong Kong SAR	2.5	2.9	2.8	3.4	2.7	2.5	2.4	2.3	2.9	26.1	0.09
India	36.3	37.4	45.6	55.3	55.7	51.8	45.3	45.6	45.5	-0.2	1.45
Indonesia	30.7	35.2	37.3	39.1	37.9	38.0	36.7	36.8	35.8	-2.7	1.14
Japan	81.2	84.4	78.7	85.1	95.0	105.2	105.2	106.2	102.1	-3.9	3.26
Malaysia	31.9	35.3	31.8	31.0	31.3	31.9	36.3	36.7	35.8	-2.5	1.14
New Zealand	3.6	3.4	3.6	3.9	3.5	3.8	4.0	4.4	4.1	-6.8	0.13
Pakistan	36.5	37.3	37.4	38.1	38.1	39.4	38.4	37.7	39.0	3.4	1.24
Philippines	3.2	3.4	3.4	3.2	3.5	3.3	3.0	3.2	3.0	-6.3	0.10
Singapore	7.7	8.3	8.7	7.9	7.9	8.5	9.5	9.8	10.2	4.1	0.33
South Korea	31.2	32.1	30.5	38.7	41.7	45.2	47.3	43.0	39.2	-8.8	1.25
Taiwan	9.6	10.5	10.2	12.7	14.0	14.7	14.7	15.5	16.5	6.5	0.53
Thailand	31.8	33.6	35.3	40.5	41.9	46.1	47.0	47.4	47.6	0.4	1.52
Vietnam	6.4	6.7	7.2	8.5	7.6	8.4	8.8	9.2	9.6	4.3	0.31
Other Asia Pacific	5.4	5.2	4.8	5.2	5.6	5.6	5.8	6.5	7.1	9.2	0.23
Total Asia Pacific	422.0	455.4	467.3	520.5	557.2	590.2	610.5	627.7	631.0	0.5	20.13
TOTAL WORLD	2675.5	2753.7	2680.2	2886.7	2929.3	3005.8	3062.5	3081.5	3135.2	1.7	100.0

The difference between these world consumption figures and the world production statistics is due to variations in stocks at storage facilities and liquefaction plants, together with unavoidable disparities in the definition, measurement or conversion of gas supply and demand data.

Source : Ministry of Petroleum & Natural Gas.

CHAPTER 10: ENERGY INDICATORS

The availability of resources and the reliability of their supply are essential for a sustainable economic growth. All sectors of the economy including residential, commercial, transportation, service and agricultural sectors depend on secure, sufficient and efficient energy services. Job availability, industrial productivity, urban and rural development and all major economic activities are strongly affected by energy input. The most important form of energy, viz. electricity is an important and sometimes irreplaceable input to modern productive activities, communication, dissemination of information and other service industries.

10.1 ENERGY INDICATORS

Energy indicators are the medium to provide a snap shot of the energy scenario of the country. They help to understand the various aspects of energy and are capable of detecting the grey areas in the complete chain of energy flow. Energy and energy efficiency indicators are indispensable tools for identifying and understanding the key drivers of trends, and for prioritizing interventions to control energy consumption growth. Indicators are also effective in quantifying the potential impact and benefits of interventions. While defining and constructing energy indicators is rather flexible, their accuracy strongly depends on the quality and detail of available energy end-use data.

As per “Energy Indicators for Sustainable Development: Guidelines and Methodology” the list of indicators includes indicators on Social, Economic and Environment. While the importance of these various indicators is recognized and since Social and Environmental indicators require additional levels of detail than that are presented in Energy Statistics his report is restricted to the economic dimension only due to non-availability of data or Energy Balance and therefore only Economic Indicators are presented in this publication.

Yet, choosing and developing appropriate indicators to support the development of policies is not straightforward. This publication should enable energy analysts and policy makers to: Identify priority areas for the development of energy sector and develop a strategy to advance policy development through the improved use of indicators to track progress of energy policies. No set of energy indicators can be final and definitive. To be useful, indicators must evolve over time to fit country-specific conditions, priorities and capabilities. The information inherent in these indicators is not only meaningful for internal management, but also of interest for external users.

10.2 ECONOMIC DIMENSION AND ENERGY INDICATORS

Modern Economies are highly dependent on reliable and adequate energy supply owing to the fact that it's the prerequisite for industrialization. All sectors of the economy- residential, commercial, transport, services and agriculture, demand energy in different forms. In turn, these sectors foster growth on economic and social front. Energy supply affects employment, productivity and development. Owing to the economic importance of energy it is important to develop the economic energy indicators and provide a profound basis for strategic changes and policy making.

The economic indicators have two themes: Use & production patterns and Security. The first has the sub theme of Overall Use, Overall Productivity, Supply Efficiency, Production, End Use, Diversification (Fuel Mix) and Prices. The second has the sub themes of Imports and strategic Fuel stocks.

Table: 10.1 List of Energy Indicators

Theme	Sub-theme	
Use and Production Pattern	Overall Use	Energy use per capita
	Overall Productivity	Energy use per unit of GDP
	Supply Efficiency	Efficiency of energy conversion and distribution
	Production	Reserves-to-production ratio
		Resources-to-production ratio
	End Use	Industrial energy intensities
		Agricultural energy intensities
		Transport energy intensities
	Diversification (Fuel Mix)	Fuel shares in energy and electricity
		Non-carbon energy share in energy and electricity
		Renewable energy share in energy and electricity
	Prices	WPI of energy sources
Security	Imports	Net Energy Import Dependency
	Strategic fuel stocks	Stocks of critical fuels per corresponding fuel consumption

The indicators as indicated in the earlier chapter have been classified under two themes Use and Production Pattern and Security. Indian scenario for each of these indicators has been presented in the current chapter. The indicators have been numbered irrespective of their theme and sub- theme

10.3. THEME: USE AND PRODUCTION PATTERN

This theme is further sub classified into sub themes as Overall Use, Overall Productivity, Supply Efficiency, Production, End Use, Diversification (Fuel Mix) and Prices.

➤ SUB THEME: OVERALL USE

10.3.1. Energy Indicator: Energy Use per Capita-

❖ **Purpose and Measurement method:** This indicator measures the level of energy use on per capita basis and reflects the energy-use patterns and aggregate energy intensity of a society. It is calculated as the ratio of the total annual use of energy to the mid-year population. It may be further classified as follows:

- a) Total Primary energy supply per capita
- b) Total Final consumption of energy per capita
- c) Electricity use per capita

➤ SUB THEME: OVERALL PRODUCTIVITY

10.3.2. Energy Indicator: Energy Use Per Unit of GDP

❖ **Purpose and Measurement method:** This indicator reflects the trends in **overall** energy use relative to GDP, indicating the general relationship of energy use to economic development. This indicator is calculated as the ratio of energy use to economic output. Here Energy Use indicates Total Primary Energy Supply (TPES), Total Final Consumption (TFC) and final electricity consumption and Output is taken as GDP measured in thousand INR. It may be further classified as follows:

- a) Total Primary energy supply per 000' rupees
- b) Total Final consumption of energy per 000' rupees
- c) Electricity Use per 000' rupees

➤ SUB THEME: PRODUCTION

10.3.3. Energy Indicator:

I. Reserve-to-Production Ratio

❖ **Purpose and Measurement method:** – The purpose of this indicator is to measure the availability of national energy reserves with respect to corresponding fuel production. Reserves are generally defined as identified (demonstrated and inferred) resources that are economically recoverable at the time of assessment. The indicator provides a basis for estimating future energy supplies in years with respect to current availability of energy reserves and levels of production.

It is computed by dividing the proven energy reserves of a commodity at the end of a year by the total production of that commodity in that year.

II. Resources To Production Ratio

- ❖ **Purpose and Measurement method:** – The purpose of this indicator is to measure the availability of national energy resources with respect to corresponding fuel production. Total resources include reserves, and hypothetical and speculative undiscovered resources. It provides a relative measure of the length of time that resources would last if production were to continue at current levels.

The lifetime of fuel resources in terms of years by using resources-to-production ratio is computed by dividing the total energy resources of a commodity at the end of a year by the total production of that commodity in that year.

➤ SUB THEME: END USE

10.3.4. Energy Indicator: End Use Energy Intensities

I. Industrial Energy Intensities-

- ❖ **Purpose and Measurement method:** – This set of indicators measures the aggregate energy use of the industrial sector and selected energy intensive industries per corresponding value added. Intensities provide information about the relative energy use per thousand units of output. The set is used to analyze trends in energy efficiency and evaluating trends in technological improvements. It is measured as Energy Use per thousand units of value added by industrial sector and by selected energy intensive industries.

II. Agricultural Energy Intensities

- ❖ **Purpose and Measurement method:** – This indicator is a measure of aggregate energy intensity in the agricultural sector that can be used for analyzing trends, particularly in renewables and non-commercial energy use. It is measured as Energy Use per thousand units of value added by Agriculture sector.

III. Transport Energy Intensities

- ❖ **Purpose and Measurement method:** – This indicator is used to monitor trends in energy use in the Transport sector. It is measured as Energy Use per thousand units of value added by Transport sector. The transport indicators measure how much energy is used for moving both goods and people. Transport is a major user of energy, mostly in the form of oil products, which makes transport the most important driver behind growth in global oil demand.

It is evident from the value of the indicator that industrial sector and transport sector are energy intensive. It must be noted that changes in the aggregate indicator can also be due to change in relative output of the sector. Hence we can say that the difference seen across the time development do not necessarily reflect differences in energy efficiency.

➤ SUB THEME: DIVERSIFICATION

10.3.5. Energy Indicator: Fuel share in energy and electricity

- I. Fuel Share In Energy
- II. Fuel Share In electricity

❖ **Purpose and Measurement method:** – This indicator provides the share of fuels in TPES, TFC and electricity generation. This indicator is computed by calculating the ratio of consumption or production of the specific energy fuels identified above to total energy use or production with respect to:

- i. TPES,
- ii. TFC and
- iii. Electricity generation

The fuel share percentage in total primary energy supply (TPES) from 2011-12 to 2014-15 indicate that share of coal is maximum and it stands at 66.05% in 2014-15.

Comparing the fuel share % for different fuel, similar trend is evident over the years of study.

10.3.6. Energy Indicator: Non carbon energy share in energy and electricity

- I. Non Carbon Energy Share In Energy
- II. Non Carbon Energy Share In Electricity

❖ **Purpose and Measurement method:** – This indicator measures the share of non-carbon energy sources in TPES and electricity generation. Share of non-carbon energy in TPES is computed by calculating the ratio of primary supply of non-carbon energy to TPES. The share of non-carbon in electricity generation is the total electricity generated from non-carbon energy sources divided by total electricity generated.

10.3.7. Energy Indicator: Renewable energy share in energy and electricity

- I. Renewable Energy Share In TPES
- II. Renewable Energy Share In TFC
- III. Renewable Energy Share In Electricity

- ❖ **Purpose and Measurement method:** – This indicator measures the share of Renewable energy in TPES, TFC and electricity generation. This indicator is computed by calculating the ratio of the consumption and production of renewables to total final energy supply and production. The share of renewables in electricity is the electricity generated from renewables divided by total electricity generated.

➤ SUB THEME: PRICES

10.3.8. Energy Indicator: WPI Of Energy Sources

- ❖ **Purpose and Measurement method:** – This is a price indicator of energy sources and reflects the price change with respect to base year 2004-05. It is to be noted that energy prices are driving forces for incentive or conservation, or efficiency improvements. Also, it shows affordability and therefore is one of the factors responsible for fuel diversification.

➤ SUB THEME: SUPPLY EFFICIENCY

10.3.9. Energy Indicator: Efficiency of energy conversion and distribution

- ❖ **Purpose and Measurement method:** – This indicator measures the efficiency of energy conversion and distribution systems in various energy supply chains including losses occurring during electricity transmission and distribution, and gas transportation and distribution. Due to constraint of data availability only the losses in transmission of electricity are used. The indicator is calculated as ratio of losses in transmission of electricity to electricity generated.

10.4 THEME: SECURITY

➤ SUB THEME: STRATEGIC FUEL STOCKS

10.4.1 Energy Indicator: Stock Of Critical Fuels per Corresponding Fuel consumption

- ❖ **Purpose and Measurement method:** – The purpose of this indicator is to measure the availability of national stocks of critical fuels, such as oil, with respect to corresponding fuel consumption. Many countries maintain stocks of oil in anticipation of disruptions in oil supply. For some countries, the critical fuel might be natural gas or other types of fuel. In Indian context we have taken coal as critical fuel. The indicator provides a relative measure of the length of time that stocks would last if supply were disrupted and fuel use were to continue at current levels. This indicator is defined by dividing the stocks of the critical fuels maintained by countries by the corresponding annual fuel consumption.

➤ SUB THEME: IMPORTS

10.4.2 Energy Indicator: Net energy import dependency

- ❖ **Purpose and Measurement method:** – This indicator measures the extent to which a country relies on imports to meet its energy requirements. This indicator is computed by calculating the ratio of net imports to consumption. Petroleum products are excluded as India is net exporter of them and have taken into account only the import value of different energy sources to calculate the indicator.

ENERGY INDICATORS (2015-16) AT A GLANCE

Theme	Sub-theme	Indicator	Category	Unit	Value
Use and Production Pattern	Overall Use	Energy use per capita	TPES	toe/person	0.53
			TFC	toe/person	0.41
			Electricity	Kwh/person	777.02
	Overall Productivity	Energy use per unit of GDP	TPES	toe/000'rupees	0.006
			TFC	toe/000'rupees	0.005
			Electricity	Kwh/rupees	9.55
	Supply Efficiency	Efficiency of energy conversion and distribution	All	%	20.63
	Production	Reserves-to-production ratio	All	years	172
			coal	years	216.03
			lignite	years	140.97
		Resources-to-production ratio	All	years	402
			Crude oil	years	16.81
			Natural Gas	years	38.05
			Coal	years	483
			Lignite	years	1017
	End Use	Sectoral Energy Intensities	Industry	toe/000'rupees	0.013
			Agriculture	toe/000'rupees	0.001
			Transport	toe/000'rupees	0.02
		Sectoral Electricity Intensities	Industry	Kwh/000'rupees	19.17
			Agriculture	Kwh/000'rupees	10.66
			Transport	Kwh/000'rupees	3.23
	Diversification (Fuel Mix)	Fuel shares in TPES	Crude Oil	%	26.44
			Natural Gas	%	4.77
			Coal	%	66.05
			RE & Others	%	2.74
		Fuel share in TFC	Oil Products	%	37.06
			Natural Gas	%	5.01
			Coal	%	41.08
			Electricity	%	16.85
		Fuel share in electricity	Thermal	%	74.11
			Nuclear	%	2.81
			Hydro	%	10.07
			Non-Utility	%	12.62
Security	Imports	Net energy import dependency	Overall	%	38.64
			Crude Oil	%	84.59
			Natural gas	%	33.95
			Coal	%	35.52
			Electricity	%	0.47
	Strategic Fuel Stocks	Stocks of critical fuels per corresponding fuel consumption	Coal	%	7.78

ANNEX- I

DEFINITIONS OF ENERGY PRODUCTS

1. *Solid fuels*

- i. **Hard Coal:** Coals with a gross calorific value (moist, ash-free basis) which is not less than 24 MJ/kg or which is less than 24 MJ/kg provided that the coal has a vitrinite mean random reflectance greater than or equal to 0.6 per cent. Hard coal comprises anthracite and bituminous coals.
- ii. **Lignite:** Brown coal with a gross calorific value (moist, ash-free basis) less than 20 MJ/kg.
- iii. **Coke:** Products derived directly or indirectly from the various classes of coal by carbonisation or pyrolysis processes, or by the aggregation of finely divided coal or by chemical reactions with oxidising agents, including water.
- iv. **Proved Reserves:** A 'Proven Mineral Reserve' is the economically mineable part of a Measured Mineral Resource demonstrated by at least a Preliminary Feasibility Study. This Study must include adequate information on mining, processing, metallurgical, economic, and other relevant factors that demonstrate, at the time of reporting, that economic extraction is justified.
- v. **Indicated Reserves:** An 'Indicated Mineral Resource' is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics can be estimated with a level of confidence sufficient to allow the appropriate application of technical and economic parameters, to support mine planning and evaluation of the economic viability of the deposit. The estimate is based on detailed and reliable exploration and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes that are spaced closely enough for geological and grade continuity to be reasonably assumed.
- vi. **Inferred Reserves:** An 'Inferred Mineral Resource' is that part of a Mineral Resource for which quantity and grade or quality can be estimated on the basis of geological evidence and limited sampling and reasonably assumed, but not verified, geological and grade continuity. The estimate is based on limited information and sampling gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. Due to the uncertainty that may be attached to Inferred Mineral Resources, it cannot be assumed that all or any part of an Inferred Mineral Resource will be upgraded to an Indicated or Measured Mineral Resource as a result of continued exploration. Confidence in the estimate is insufficient to allow the meaningful application of technical and economic parameters or to enable an evaluation of economic viability worthy of public disclosure. Inferred Mineral Resources must be excluded from estimates forming the basis of feasibility or other economic studies

2. Liquid fuels

- i. **Crude petroleum** A mineral oil of fossil origin extracted by conventional means from underground reservoirs, and comprises liquid or near-liquid hydrocarbons and associated impurities such as sulphur and metals.

Remark: Conventional crude oil exists in the liquid phase under normal surface temperature and pressure, and usually flows to the surface under the pressure of the reservoir. This is termed “conventional” extraction. Crude oil includes condensate from condensate fields, and “field” or “lease” condensate extracted with the crude oil.

The various crude oils may be classified according to their sulphur content (“sweet” or “sour”) and API gravity (“heavy” or “light”). There are no rigorous specifications for the classifications but a heavy crude oil may be assumed to have an API gravity of less than 20° and a sweet crude oil may be assumed to have less than 0.5% sulphur content.

- ii. **Liquefied petroleum** LPG refers to liquefied propane (C₃H₈) and butane (C₄H₁₀) or mixtures of both. Commercial grades are usually mixtures of the gases with small amounts of propylene, butylene, isobutene and isobutylene stored under pressure in containers.

Remark: The mixture of propane and butane used varies according to purpose and season of the year. The gases may be extracted from natural gas at gas separation plants or at plants re-gasifying imported liquefied natural gas. They are also obtained during the refining of crude oil. LPG may be used for heating and as a vehicle fuel. Certain oil field practices also use the term LPG to describe the high vapour pressure components of natural gas liquids.

- iii. **Motor gasoline** A mixture of some aromatics (e.g., benzene and toluene) and aliphatic hydrocarbons in the C₅ to C₁₂ range. The distillation range is 25°C to 220°C.

Remark: Additives are blended to improve octane rating, improve combustion performance, reduce oxidation during storage, maintain cleanliness of the engine and improve capture of pollutants by catalytic converters in the exhaust system. Motor gasoline may also contain bio-gasoline products.

- iv. **Naphtha** Light or medium oils distilling between 30°C and 210°C which do not meet the specification for motor gasoline.

Remark: Different naphthas are distinguished by their density and the content of paraffins, isoparaffins, olefins, naphthenes and aromatics. The main uses for naphthas are as feedstock for high octane gasolines and the manufacture of olefins in the petrochemical industry.

- v. **Kerosene** Mixtures of hydrocarbons in the range C₉ to C₁₆ and distilling over the temperature interval 145°C to 300°C, but not usually above 250°C and with a flash point above 38°C.

Remark: The chemical compositions of kerosenes depend on the nature of the crude oils from which they are derived and the refinery processes that they have undergone. Kerosenes obtained from crude oil by atmospheric distillation are known as straight-run kerosenes. Such streams may be treated by a variety of processes to produce kerosenes that are acceptable for blending as jet fuels. Kerosenes are primarily used as jet fuels. They are also used as domestic heating and cooking fuels, and as solvents. Kerosenes may include components or additives derived from biomass.

- vi. **Gasoline-type Jet fuels** Light hydrocarbons for use in aviation turbine power units, distilling between 100°C and 250°C. They are obtained by blending kerosene and gasoline or naphtha in such a way that the aromatic content does not exceed 25 per cent in volume, and the vapour pressure is between 13.7 kPa and 20.6 kPa.

Remark: Gasoline-type jet fuel is also known as “aviation turbine fuel”.

- vii. **Gas oil / Diesel oil** Gas oils are middle distillates, predominantly of carbon number range C11 to C25 and with a distillation range of 160°C to 420°C.

Remark: The principal marketed products are fuels for diesel engines (diesel oil), heating oils and marine fuel. Gas oils are also used as middle distillate feedstock for the petrochemical industry and as solvents.

- viii. **Fuel oil** Comprises residual fuel oil and heavy fuel oil. Residual fuel oils have a distillation range of 350°C to 650°C and a kinematic viscosity in the range 6 to 55 cSt at 100°C. Their flash point is always above 60°C and their specific gravity is above 0.95. Heavy fuel oil is a general term describing a blended product based on the residues from various refinery processes.

Remark: Other names commonly used to describe fuel oil include: bunker fuel, bunker C, fuel oil No. 6, industrial fuel oil, marine fuel oil and black oil. Residual and heavy fuel oil are used in medium to large industrial plants, marine applications and power stations in combustion equipment such as boilers, furnaces and diesel engines. Residual fuel oil is also used as fuel within the refinery.

- ix. **Lubricants** Oils, produced from crude oil, for which the principal use is to reduce friction between sliding surfaces and during metal cutting operations.

Remark: Lubricant base stocks are obtained from vacuum distillates which result from further distillation of the residue from atmospheric distillation of crude oil. The lubricant base stocks are then further processed to produce lubricants with the desired properties.

- x. **Petroleum coke** Petroleum coke is a black solid obtained mainly by cracking and carbonizing heavy hydrocarbon oils, tars and pitches. It consists mainly of carbon (90 to 95 per cent) and has a low ash content. The two most important categories are "green coke" and "calcined coke".

- xi. Green coke (raw coke) is the primary solid carbonization product from high boiling hydrocarbon fractions obtained at temperatures below 630°C. It contains 4-15 per cent by weight of matter that can be released as volatiles during subsequent heat treatment at temperatures up to approximately 1330°C. Calcined coke is a petroleum coke or coal-derived pitch coke obtained by heat treatment of green coke to about 1330°C. It will normally have a hydrogen content of less than 0.1 per cent by weight.

Remark: In many catalytic operations (e.g., catalytic cracking) carbon or catalytic coke is deposited on the catalyst, thus deactivating it. The catalyst is reactivated by burning off the coke which is used as a fuel in the refining process. The coke is not recoverable in a concentrated form

- xii. **Bitumen (Asphalt)** A solid, semi-solid or viscous hydrocarbon with a colloidal structure, being brown to black in color.

Remark: It is obtained as a residue in the distillation of crude oil and by vacuum distillation of oil residues from atmospheric distillation. It should not be confused with the nonconventional primary extra heavy oils which may also be referred to as bitumen. In addition to its major use for road pavements, bitumen is also used as an adhesive, a waterproofing agent for roof coverings and as a binder in the manufacture of patent fuel. It may also be used for electricity generation in specially designed power plants. Bitumen is also known in some countries as asphalt but in others asphalt describes the mixture of bitumen and stone aggregate used for road pavements.

- xiii. **Refinery gas** is a non-condensable gas collected in petroleum refineries (it is also known as still gas).

3. Gaseous fuels

- i. **Natural Gas:** A mixture of gaseous hydrocarbons, primarily methane, but generally also including ethane, propane and higher hydrocarbons in much smaller amounts and some noncombustible gases such as nitrogen and carbon dioxide.

Remark: The majority of natural gas is separated from both "non-associated" gas originating from fields producing hydrocarbons only in gaseous form, and "associated" gas produced in association with crude oil. The separation process produces natural gas by removing or reducing the hydrocarbons other than methane to levels which are acceptable in the marketable gas. The natural gas the natural gasliquids (NGL) removed in the process are distributed separately.

- ii. **Coke-oven gas:** A gas produced from coke ovens during the manufacture of coke oven coke.
- iii. **Biogases:** Gases arising from the anaerobic fermentation of biomass and the gasification of solid biomass (including biomass in wastes).

Remark: The biogases from anaerobic fermentation are composed principally of methane and carbon dioxide and comprise landfill gas, sewage sludge gas and other biogases from anaerobic fermentation. Biogases can also be produced from thermal processes (by gasification or pyrolysis) of biomass and are mixtures containing hydrogen and carbon monoxide (usually known as syngas) along with other components. These gases may be further processed to modify their composition and can be further processed to produce substitute natural gas. The gases are divided into two groups according to their production: biogases from anaerobic fermentation and biogases from thermal processes. They are used mainly as a fuel but can be used as a chemical feedstock.

4. Electricity

- i. **Installed capacity:** The net capacity measured at the terminals of the stations, i.e., after deduction of the power absorbed by the auxiliary installations and the losses in the station transformers.
- ii. **Utilities:** undertakings of which the essential purpose is the production, transmission and distribution of electric energy. These may be private companies, cooperative organisations, local or regional authorities, nationalised undertakings or governmental organisations.
- iii. **Non-Utilities:** An Independent Power Producer which is not a public utility, but which owns facilities to generate electric power for sale to utilities and end users. They may be privately held facilities, corporations, cooperatives such as rural solar or wind energy producers, and non-energy industrial concerns capable of feeding excess energy into the system
- iv. **Hydro Electricity:** refers to electricity produced from devices driven by fresh, flowing or falling water.
- v. **Thermal Electricity** comprises conventional thermal plants of all types, whether or not equipped for the combined generation of heat and electric energy. Accordingly, they include steam-operated generating plants, with condensation (with or without extraction) or with back-pressure turbines, and plants using internal combustion engines or gas turbines whether or not these are equipped for heat recovery.
- vi. **Nuclear Electricity** is defined as the heat released by the reactors during the accounting period and is obtained by dividing the generation of nuclear electricity by average efficiency of all nuclear power stations.
- vii. **Production** is defined as the capture, extraction or manufacture of fuels or energy in forms which are ready for general use. In energy statistics, two types of production are distinguished, primary and secondary. Primary production is the capture or extraction of fuels or energy from natural energy flows, the biosphere and natural reserves of fossil fuels within the national territory in a form suitable for use. Inert matter removed from the extracted fuels and quantities reinjected flared or vented are not included. The resulting products are referred to as

“primary” products. Secondary production is the manufacture of energy products through the process of transformation of primary fuels or energy. The quantities of secondary fuels reported as production include quantities lost through venting and flaring during and after production. In this manner, the mass, energy and carbon within the primary source(s) from which the fuels are manufactured may be balanced against the secondary fuels produced. Fuels, electricity and heat produced are usually sold but may be partly or entirely consumed by the producer. comprises gross production, i.e. the amount of electric energy produced, including that consumed by station auxiliaries and any losses in the transformers that are considered integral parts of the station. Included is the total production of electric energy produced by pump storage installations.

- viii. **Imports of energy products** comprise all fuel and other energy products entering the national territory. Goods simply being transported through a country (goods in transit) and goods temporarily admitted are excluded but re-imports, which are domestic goods exported but subsequently readmitted, are included. The bunkering of fuel outside the reference territory by national merchant ships and civil aircraft engaged in international travel is excluded from imports. Fuels delivered to national merchant ships and civil aircraft which are outside of the national territory and are engaged in international travel should be classified as “International Marine” or “Aviation Bunkers”, respectively, in the country where such bunkering is carried out (see paragraph 5.12). Note that the “country of origin” of energy products should be recorded as a country from which goods were imported.
- ix. **Exports of energy products** comprise all fuel and other energy products leaving the national territory with the exception that exports exclude quantities of fuels delivered for use by merchant (including passenger) ships and civil aircraft, of all nationalities, during international transport of goods and passengers. Goods simply being transported through a country (goods in transit) and goods temporarily withdrawn are excluded but re-exports, foreign goods exported in the same state as previously imported, are included. Fuels delivered to foreign merchant ships and civil aircraft engaged in international travel are classified as “International Marine” or “Aviation Bunkers”, respectively. Note that “country of destination” of energy products (that is country of the last known destination as it is known at the time of exportation) should be recorded as a country to which these products are exported to.
- x. **Losses** refer to losses during the transmission, distribution and transport of fuels, heat and electricity. Losses also include venting and flaring of manufactured gases, losses of geothermal heat after production and pilferage of fuels or electricity. Production of secondary gases includes quantities subsequently vented or flared. This ensures that a balance can be constructed between the use of the primary fuels from which the gases are derived and the production of the gases.
- xi. **Energy Industries Own Use** refers to consumption of fuels and energy for the direct support of the production, and preparation for use of fuels and energy. Quantities of fuels which are transformed into other fuels or energy are not included here but within the transformation use. Neither are quantities which are

used within parts of the energy industry not directly involved in the activities listed in the definition. These quantities are reported within final consumption.

5. Non-commercial Energy Sources

- i. Fuelwood, wood residues and by-products:** Fuel wood or firewood (in log, brushwood, pellet or chip form) obtained from natural or managed forests or isolated trees. Also included are wood residues used as fuel and in which the original composition of wood is retained.
Remark: Charcoal and black liquor are excluded.
- ii. Charcoal** The solid residue from the carbonisation of wood or other vegetal matter through slow pyrolysis.
- iii. Bagasse** The fuel obtained from the fiber which remains after juice extraction in sugar cane processing.

6. Other important definitions:

- i. Gross Domestic Product (GDP)** is the broadest quantitative measure of a nation's total economic activity. More specifically, GDP represents the monetary value of all goods and services produced within a nation's geographic borders over a specified period of time.
- ii. Energy Use** indicates Total Primary Energy Supply (TPES), Total Final Consumption (TFC) and final electricity consumption.
- iii. Transformation/Conversion Losses:** When one form of energy is converted into another form, the amount of losses are referred as transformation/conversion losses.

ANNEX- II

Conversion Factors

1 kilogram	=	2.2046 pounds
1 Pound	=	454 gm.
1 Cubic metres	=	35.3 cubic feet (gas)
1 Metric ton	=	1 Tonne =1000 kilogram
1 Joule	=	0.23884 calories
1 Mega Joule	=	10^6 joules = 238.84 x 10^3 calories
1 Giga Joule	=	10^9 joules = 238.84 x 10^6 calories
1 Tera Joule	=	10^{12} joules = 238.84 x 10^9 calories
1 Peta Joule	=	10^{15} joules = 238.84 x 10^{12} calories
One million tonnes of coal	=	15.13 peta Jules of energy
One million tonnes of oil equivalent (MTOE)	=	15.13 peta Jules of energy
One billion cubic meter of natural gas	=	38.52 peta Jules of energy
One million cubic meter of natural gas	=	38.52 tera Jules of energy
	=	0.03852 peta Jules of energy
One billion kilowatt hour of electricity	=	3.60 peta Jules of energy

Abbreviations

ATF	:	Aviation Turbine Fuel
HSDO	:	High Speed Diesel Oil
LDO	:	Light Diesel Oil
LSHS	:	Low Sulphur Heavy Stock
LPG	:	Liquefied Petroleum Gas
MS/MOGAS	:	Motor Spirit/Motor Gasoline
F.O.	:	Furnace Oil
M.T.O.	:	Mineral Turpentine Oil
PET-COKE	:	Petroleum Coke
SBPS	:	Special Boiling Point Spirit
SKO	:	Superior Kerosene Oil
CPEs	:	Centrally Planned Economies
N.C.W.	:	Non-communist World
O.P.E.C.	:	Organisation of Petroleum Exporting Countries
O.E.C.D.	:	Organisation for Economic Cooperation & Development
EMEs	:	Emerging Market Economies (includes countries of South & Central America, Africa, Middle-east, Non-OECD Asia & Non-OECD Europe)
MW	:	Megawatt
KW	:	Kilowatt
(P)	:	Provisional

ANNEX- IV

Categorisation of Coal in India

Grading of Coking Coal based on ash content

Grade	Ash Content
Steel Gr I	Ash content < 15%
Steel Gr II	15%≤Ash content<18%
Washery Gr.I	18%≤Ash content<21%
Washery Gr.II	21%≤Ash content<24%
Washery Gr.III	24%≤Ash content<28%
Washery Gr.IV	28%≤Ash content<35%

Grading of Non Coking Coal based on Gross Calorific Value(GCV)

Grade	GCV Range (Kcal/Kg)
G1	GCV exceeding 7000
G2	GCV between 6701 and 7000
G3	GCV between 6401 and 6701
G4	GCV between 6101 and 6400
G5	GCV between 5801 and 6100
G6	GCV between 5501 and 5800
G7	GCV between 5201 and 5500
G8	GCV between 4901 and 5200
G9	GCV between 4601 and 4900
G10	GCV between 4301 and 4600
G11	GCV between 4001 and 4300
G12	GCV between 3700 and 4000
G13	GCV between 3400 and 3700
G14	GCV between 3101 and 3400
G15	GCV between 2801 and 3100
G16	GCV between 2501 and 2800
G17	GCV between 2201 and 2500

Source: Office of Coal Controller

ANNEX- V

Energy Data Collection Mechanisms

I. Coal and Coal Derivatives

I.1 Organizational set up: The Coal controller's Office is a subordinate office of Ministry of Coal having headquarters in Kolkata and five field offices at Dhanbad, Ranchi, Bilaspur and Nagpur. The Statistical Division of coal controller's Office, working under overall guidance of Coal Controller located at Kolkata is having a Deputy Director General and Deputy Director from Indian Statistical Service.

I.2. Current Activities: Statistics division of Coal Controller's Office (CCO) look's after the work related to coal and lignite statistics. Major role of this division are as under:-

- Collection, compilation, analysis and dissemination of Coal Statistics
- Undertake Annual Survey of Coal and Lignite Industry to assess production, dispatch, stock at pithead etc.
- To monitor the progress of captive coal and lignite blocks
- To maintain a database of washeries in India

I.3 Future initiatives:- To develop a more robust database, Coal Controller's Office needs to conduct own survey on various aspect of coal statistics like reserve, production, dispatch, stock at pithead etc.

I.4. Details of data flows/ items:

- **Data items-** The organization is collecting data on the following items on regular basis:-

Items	Periodicity
1.Reserve (from GSI)	Annual
2.Production (from coal/ lignite company)	Monthly
3.Despatches (from coal/ lignite company)	Monthly
4. Pit head closing stock (from coal/ lignite company)	Monthly
5. Price (for non-captive coal mines)	Monthly
6. Wagon Loading (Rail)(from CIL/ SCCL)	Monthly
7. Import & Export (DGC&S)	Monthly
8. Coal consumption in steel (from SAIL/RINL/TSL)	Monthly
9. Coal consumption in power & cement sector (from CEA etc.)	Annual
10. Captive coal & lignite mining	Monthly
11. Washery in India	Monthly
12. World Coal Statistics (from IEA)	Annual
13.Colliery-wise production data	Annual

- **Data sources and Act/ Order/ Rule etc.**

The data are collected from different coal/ lignite companies under the statutory power vested with the Coal Controller under the provisions of Collection of Statistics Act, 1953, the Colliery Control Rule, 2004 and Coal Mines (Conservation & Development) Act, 1974 and publications of CIL, SAIL and DGCIS.

- **Methodology of Data Collection**

Monthly Data- Data are collected from coal companies (pvt. And pub) on monthly basis on some major parameters.

Annual survey- Complete enumeration (through mailed questionnaire) and sample check by physical inspection in Annual Survey of Coal and Lignite Industries.

Coverage:- Entire coal and lignite producing sector.

Response:- 100%

- Details of data items being compiled and periodicity

Items	Periodicity
1. Coal production data for PMO	Monthly
2. Data for Infrastructure Bulletin of MOSPI through MOC	Monthly
3. Data for IIP(Covering Washed Coal, Middlings, Hard Coke)	Monthly
4. Data for IIP of Mineral Sector (Coal & Lignite – state-wise)	Monthly
5. Provisional Coal Statistics	Annual
6. Coal Directory of India- Vol I & II	Annual
7. U. N. Annual energy Report- through CSO	Annual
8. IEA(for energy balance in case of non-OECD country: India)	Annual
9. Ad-hoc Reports	As and when required

II. Petroleum and Natural Gas

The Ministry of Petroleum and Natural Gas is mandated to take measures for exploration and exploitation of petroleum resources including natural gas and coal bed methane, and also distribution, marketing and pricing of petroleum products.

II.1. Organizational set up and activities

Ministry of Petroleum has an Economic and Statistics Division headed by Economic Adviser. The Division provides economic inputs to the Divisions of the Ministry after detailed analysis of the plan and programmes. An exhaustive data base is maintained on production and trade of crude oil, natural gas, petroleum products and stages of capacity creation by the petroleum industry. The Economic and Statistics Division is involved in the plan formulation exercise of the public sector enterprises associated with petroleum exploration, production, refining and marketing. Also, all issues pertaining to foreign investment policy in the petroleum sector and issues relating to Double Taxation Avoidance Agreement (DTAA) on Income & Capital etc. are handled in the Division.

The Division brings out the following reports for monitoring the performance of Petroleum & Natural gas products:

❑ **Monthly & Quarterly Reports on Petroleum Statistics:** Collection, compilation and submission of Reports on:

- (i) Production of Crude Oil, Natural Gas and Petroleum Products- to Ministries/Department/Committees etc. on monthly basis.
- (ii) Quarterly report on Production Performance- to Ministry of Statistics & Programme Implementation;
- (iii) Import/Export of Crude Oil and Petroleum Products- to the designated Ministries/Departments.
- (iv) Joint Oil Data Initiative Statistics - to United Nations Statistics Division.

❑ **Publication of Annual Basic Statistics on Petroleum & Natural Gas Products and Annual Indian Petroleum & Natural Gas Statistics**

II.2. Details of the data flows and items

Data Collected: Production of Crude Oil, all Petroleum Products, Natural Gas, LNG, Imports/Exports of Oil & Petroleum products, Consumption of Petroleum Products and Refinery intake etc. on monthly basis and apart from these data other related data for publication of “Basic Statistics on Indian Petroleum & Natural Gas Products” and “Indian Petroleum & Natural Gas Statistics” being collected annually.

Periodicity & Data Sources: The data being collected on monthly, quarterly, annual basis from all Public Sector Undertakings and Private Oil Companies including oil refineries.

Methods of Data Collection: Data collected through electronic mail, FAX as well as hard copy by post.

Data Dissemination Methods: Monthly, Quarterly and Annual Progress Reports circulated to all concerned and also uploaded on Ministry's web site for the public user.

II.3. Provisions under which statutory returns are collected for the petroleum sector:

(i) For returns on crude oil and natural gas

- Principal Legislation:

THE OILFIELDS (REGULATION AND DEVELOPMENT) ACT, 1948
(53 of 1948) (8TH SEPTEMBER, 1948)

- Subordinate Legislation:

THE PETROLEUM AND NATURAL GAS RULES, 1959
(As amended from time to time)

Section 14: Royalty on petroleum and furnishing of returns and particulars:

(2) The lessee shall, within the first seven days of every month or within such further time as the Central Government or the State Government, as the case may be, may allow, furnish or cause to be furnished to the Central Government or the State Government as the case may be a full and proper return showing the quantity of all crude oil, casing head condensate and natural gas obtained during the preceding month from mining operations conducted pursuant to the lease. The monthly return required to be furnished shall be, as nearly as may be, in the form specified in the schedule annexed to these rules.

(ii) For returns on refinery output (petrol, diesel etc)

-Principal Legislation:

THE INDUSTRIES (DEVELOPMENT AND REGULATION) ACT, 1951, (ACT NO. 65 OF 1951)

-Subordinate Legislation:

Scheduled Industries (Submission of Production Returns) Rules, 1979.

Section 6: However, collection of data is also governed by the Gazette of India (Extraordinary) Part II-Section 3-Sub Section (i) order No.G.S.R.272(E) dated 16.04.1999 wherein clause 8 states that "Every oil refining company shall furnish to the Central Government or an agency nominated by Central Government any and every information that may be asked for in regard to the procurement, stocking, movements (onshore or offshore), transfers, imports, exports and sales of crude oil and or all products at such period, in such manner and from such of the sources, as may be specified from time to time".

III. Electricity

III.1 Organisational Setup

The Central Electricity Authority (CEA) is the nodal authority for supply of electricity data. It is a statutory organization under M/o Power, constituted under Section 3 of the repealed Electricity (Supply) Act, 1948. It was established as a part-time body in the year 1951 and made a full-time body in the year 1975.

With the objective of reforming the Power sector, the Electricity Act, 2003 (No. 36 of 2003) has been enacted and the provisions of this Act have been brought into force with effect from 10th June, 2003.

III.2 Functions

As per section 73 of the Electricity Act, 2003, the Central Electricity Authority shall perform such functions and duties as the Central Government may prescribe or direct, and in particular to -

- a) advise the Central Government on the matters relating to the national electricity policy, formulate short-term and perspective plans for development of the electricity system and coordinate the activities of the planning agencies for the optimal utilization of resources to sub serve the interests of the national economy and to provide reliable and affordable electricity to all consumers;
- b) Specify the technical standards for construction of electrical plants, electric lines and connectivity to the grid;
- c) Specify the safety requirements for construction, operation and maintenance of electrical plants and electric lines;
- d) Specify the Grid Standards for operation and maintenance of transmission lines;
- e) Specify the conditions for installation of meters for transmission and supply of electricity;
- f) Promote and assist in the timely completion of schemes and projects for improving and augmenting the electricity system;
- g) Promote measures for advancing the skills of persons engaged in electricity industry;
- h) advise Central Government on any matter on which its advice is sought or make recommendation to that Government on any matter if, in the opinion of the Authority, the recommendation would help in improving the generation, transmission, trading, distribution and utilization of electricity;
- i) collect and record the data concerning the generation, transmission, trading, distribution and utilization of electricity and carry out studies relating to cost, efficiency, competitiveness and such like matters;
- j) Make public from time to time the information secured under this Act, and provide for the publication of reports and investigations;
- k) Promote research in matters affecting the generation, transmission, distribution and trading of electricity;
- l) Carry out, or cause to be carried out, any investigation for the purpose of generating or transmitting or distributing electricity;
- m) Advise any State Government, licensees or the generating companies on such matters which shall enable them to operate and maintain the electricity system under their ownership or control in an improved manner and where necessary, in

- coordination with any other Government, licensee or the generating company owning or having the control of another electricity system;
- n) Advise the Appropriate Government and the Appropriate Commission on all technical matters relating to generation, transmission and distribution of electricity; and
 - o) Discharge such other functions as may be provided under this Act.

III.3. Details of the data Flows/ Items

In exercise of the powers conferred by section 177, read with section 74 and clause (i) of section 73 of the Electricity Act, 2003, the Central Electricity Authority published the regulations vide Extra Ordinary Gazette notification dated 19th April 2007, namely:- **Central Electricity Authority (Furnishing of Statistics, Returns and Information) Regulations, 2007**

(a) Sources of Statistics, Returns and Information

All licensees, generating companies and person(s) mentioned below, but not limited to, shall furnish to the Authority such statistics, returns or other information relating to generation, transmission, distribution, trading and utilization of electricity at such times and in such form and manner as specified under these regulations-

❑ Licensees

- (i) Transmission Licensees;
- (ii) Distribution Licensees;
- (iii) Trading Licensees;
- (iv) Central Transmission Utility;
- (v) State Transmission Utilities;
- (vi) Appropriate Governments who are responsible for transmitting, distributing or trading of electricity;
- (vii) Damodar Valley Corporation established under sub-section (1) of section 3 of the Damodar Valley Corporation Act, 1948 (14 of 1948);
- (viii) Any person engaged in the business of transmission or supply of electricity under the provisions of the repealed laws or any act specified in the Schedule;
- (ix) Any person who intends to generate and distribute electricity in a rural area as notified by the State Government;
- (x) State Electricity Boards;
- (xi) Local authorities including Cantonment Boards;
- (xii) Deemed licensees and entities exempted from license.
- (xiii) Bhakra Beas Management Board.

❑ Generating companies

- (i) Generating companies established by appropriate Governments;
- (ii) Independent Power Producers;
- (iii) Appropriate Governments responsible for generating electricity;
- (iv) Bhakra Beas Management Board;
- (v) Any person engaged in the business of generating electricity under the provisions of the repealed laws or any act specified in the Schedule;

- (vi) Damodar Valley Corporation.

❑ Person(s) generating electricity for own use:

- (i) All captive power producers;
- (ii) Any other person including Co-operative Society, Association of persons, body of individuals, etc. engaged in generating electricity for its or his own use.

❑ Other entities

- (i) National Load Despatch Centre;
- (ii) Regional Load Despatch Centre(s);
- (iii) State Load Despatch Centre(s);
- (iv) Regional Power Committee(s);
- (v) High voltage or extra high voltage consumers of electricity.

(b) Formats for furnishing of statistics, returns or information –

The entities shall furnish the statistics, returns and information as per the formats annexed to these regulations titled “List of formats, frequency(ies) and target date(s)”. These formats can also be obtained from the website of the Central Electricity Authority. (Website www.cea.nic.in)

(c) Time schedule for furnishing of statistics, returns or information –

The time schedule or targets for furnishing of statistics, returns or information is specified by the Authority on its prescribed formats.

(d) Frequency of submission of statistics, returns or information –

The frequency of submission i.e. daily, weekly, monthly, quarterly or annually is specified by the Authority in its prescribed formats.

(e) Manner of furnishing the statistics, returns or information –

The statistics, returns or information in the prescribed formats shall be furnished to the Authority preferably electronically or by post or courier or fax.

III.4 Data collection problems

The Central Electricity Authority is receiving data from various Public and Private Entities/ Utilities / Organizations/Industries. Though, it is mandatory to these organizations to furnish the correct, complete data in time, yet the following problems are being faced in collection of data.

- i. Delay in furnishing data.
- ii. Furnishing incomplete/ incorrect data.
- iii. Non submission of data.

For smooth collection of the electricity data, CEA is installing electronic data collection system titled as Information Management System (IMS), where all the returns of electricity data can be directly furnished by concerned party (licensees, generating companies, entities etc.)

IV. New and Renewable Energy

IV.1. Nodal ministry

Ministry of New and Renewable Energy (MNRE) is the nodal Ministry of the Government of India at the National level for all matters relating to new and renewable energy. The Ministry has been facilitating the implementation of broad spectrum programmes including harnessing renewable power, renewable energy to rural areas for lighting, cooking and motive power, use of renewable energy in urban, industrial and commercial applications and development of alternate fuels and applications. In addition, it supports research, design and development of new and renewable energy technologies, products and services.

IV.2. Organisational setup

It is broadly organized into eight Groups dealing with 'Bio-Energy, Research & Development and TIFAD(Technology Information Forecasting, Assessment and Databank), Solar Energy', and Remote Village Electrification', Biomass and Wind Power', 'Energy for Urban, Industrial & Commercial Applications', 'Small Hydro and Information & Public Awareness', 'Hydrogen Energy' and 'Administration and Coordination'. In addition, the Ministry has an Integrated Finance Division, which is functioning under the Special Secretary and Financial Adviser. The Ministry is classified as a Scientific Ministry.

IV.3. Current responsibilities

Formulating policies and programmes for the development of new and renewable sources of energy;

- (a) Coordinating and intensifying research and development activities in new and renewable sources of energy;
- (b) Ensuring implementing of Government's policies in regard to all matters concerning new and renewable sources of energy.

IV.4. Data flows

The basic data being compiled includes year wise and month wise no. of systems installed, their capacities, locations, etc. and is obtained from various stakeholders i.e. State Government Departments/Nodal Agencies, NGOs, Private Entrepreneurs, etc. Annual statistical information regarding achievements under different programmes/schemes is being included in the yearly Annual Report of the Ministry.



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