Data for Development

National Statistical Office
Ministry of Statistics and Programme Implementation
Government of India

www.mospi.gov.in

www.mospi.gov.in GoIStats GoIStats GoIStats

ENERGY STATISTICS 2021

सत्यमेव जयते

ENERGY STATISTICS

India 2021

Data for Development

National Statistical Office
Ministry of Statistics and Programme Implementation
Government of India

www.mospi.gov.in

www.mospi.gov.in GoIStats GoIStats GoIStats

28th Issue

सत्यमेव जयते

ENERGY STATISTICS

India 2021

Data for Development

National Statistical Office
Ministry of Statistics and Programme Implementation
Government of India

www.mospi.gov.in

डॉ. शैलजा शर्मा
महानिदेशक
Dr. Shailja Sharma
Director General

सत्यमेव जयते

भारत सरकार
Government of India
सांख्यिकी एवं कार्यक्रम कार्यान्वयन मंत्रालय
Ministry of Statistics and Programme Implementation
राष्ट्रीय सांख्यिकीय कार्यालय /National Statistical Office
सरदार पटेल भवन, संसद मार्ग नई दिल्ली-110001
Sardar Patel Bhawan, Parliament Street
New Delhi-110001
फोन/Tel. : 011-23742026, मो/Mob. : 09868301535
ईमेल/E-mail : dg-es.cso@mospi.gov.in

Foreword

Energy is fundamental to human development. In 2015, 193 Member States of the United Nations including India, committed to the Post-2015 Development Agenda, adopted the motto of 'Leaving no one Behind' and pledged to make our world more prosperous, inclusive, sustainable and resilient. The Goal-7 thereof acknowledges the role of access to affordable, reliable and modern energy services for sustainable path to prosperity and welfare of the most vulnerable.

Deploying renewable and energy-efficient technologies can spur innovation and reinforce local, regional and national industrial and employment objectives. Ensuring all have access to power and clean cooking by shifting to renewable and efficient modern energy system has been at the top of the country's policy initiatives. Hon'ble Prime Minister of India echoed this sentiment at the UN Summit 2015 recognising that "*We are focusing on the basics: housing, **power**, water and sanitation for all – important not just for welfare, but also human dignity*".

This publication, the 28th in the series, presents an integrated database on Energy Statistics in the country. Keeping in view the importance of collated statistics of energy resources, this repository serves as a vital instrument in providing a holistic picture of the changing energy scenario of the country. The data in the publication is sourced from different subject Ministries/Departments of the Government of India including Ministry of Power, Ministry of Coal, Ministry of Petroleum & Natural Gas and Ministryof New and Renewable Energy etc.

The publication presents a wide portfolio of data on reserves, capacity, production, trade, prices, consumption and energy efficiency parameters and also incorporates environmental impacts of energy systems. I hope the publication will provide enough evidence to the policy makers for formulation of key approaches.

S. Sharma

(Shailja Sharma)
Director General, NSO

30th March, 2021

Officers associated with the publication

Shri Naresh Kumar Sharma	Additional Director General
Ms. R Savithri	Deputy Director General
Shri Amit Kamal	Joint Director (Retd)
Ms. Avneet Kaur	Deputy Director
Shri Pramod Ram	Junior Statistical Officer
Shri Radha Krishna Rao	Senior Artist (Graphics Unit)

Abbreviations and Acronyms

ATF	Aviation Turbine Fuel
BCM	Billion Cubic Metres
BT	Billion Tonne
CAGR	Compound Annual Growth Rate
CBFS	Carbon Black Feed Stock
CPEs	Centrally Planned Economies
EMEs	Emerging Market Economies (includes countries of South & Central America, Africa, Middle-east, Non-OECD Asia & Non-OECD Europe)
F.O.	Furnace Oil
GW	Giga Watt
GWh	Giga Watt Hour
SHP	Small Hydro Power
HSDO	High Speed Diesel Oil
IAEA	International Atomic Energy Agency
IEA	International Energy Agency
IOC	Indian Oil Corporation
IRES	International Recommendations on Energy Statistics
KToE	Kilo Tonne of oil Equivalent
KW	Kilowatt
KWH	Kilo Watt Hour
LDO	Light Diesel Oil
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
LSHS	Low Sulphur Heavy Stock
Lubes	Lubricant
MJ	Mega-joules
MMSCM	Million Metric Standard Cubic Metres
MS/MOGAS	Motor Spirit/Motor Gasoline

MT	Million Tonne
MTBE	Methyl Tert-Butyl Ether
M.T.O.	Mineral Turpentine Oil
MTY	Million Tonne Per Year
MW	Megawatt
N.C.W.	Non-communist World
O.E.C.D.	Organization for Economic Cooperation & Development
O.P.E.C.	Organization of Petroleum Exporting Countries
(P)	Provisional
PJ	Peta-joules
PEC	Per Capita Energy Consumption
PET-COKE	Petroleum Coke
SBPS	Special Boiling Point Spirit
SDG	Sustainable Development Goal
SEEA	System of Environmental Economic Accounting
SKO	Superior Kerosene Oil
SNA	System of National Accounts
TEC	Total Energy Consumption
TFC	Total Final Consumption
TPES	Total Primary Energy Supply
TMT	Thousand Metric Tonne
TMTPA	Thousand Metric Tons Per Annum
VGO	Vacuum Gas Oil

Contents

List of Tables

List of Figures

Introduction

Introduction

The history of human evolution rests on the availability and use of energy. From the transformation from the early use of fire and animal power that improved lives, to the present world with use of electricity and cleaner sustainable fuels for a multitude of purposes – energy has been the enabler of development. Energy presents a fundamental need ranging from, but not limited to, the essential services of cooking, heating, cooling, lighting, mobility, and operation of appliances, to information and communications technology, and machines in every sector of every country. The lack of access to reliable and clean energy supplies is now considered as a major barrier to improving human well-being around the globe.

In response to increasing concerns about the effect of anthropogenic greenhouse gases on global climate, international action has agreed to reduce emissions. Renewable energy is being explored with renewed commitments as an intelligent solution to be tapped for addressing challenges such as poverty and global warming. If the world is to develop sustainably, it has been recognised that it is then necessary to secure access to affordable, reliable, sustainable, and modern energy services while reducing greenhouse gas emissions and the carbon footprint of the energy sector.

For well-balanced analysis of the energy situation of a country, it becomes imperative to compile the energy statistics for a greater understanding and course-correction to the pathway to sustainability.

However, not all energy is an object of statistical observation. Energy existing in nature and not having a direct impact on society is not measured and monitored as part of energy statistics conventionally. Energy statistics are a specialized field of statistics whose scope has been evolving over time and broadly covers (i) extraction, production, transformation, distribution, storage, trade and final consumption of energy products and (ii) the main characteristics and activities of the energy industries. Energy statistics are seen as a multipurpose body of data.

Energy resources refer to "all non-renewable energy resources of both inorganic and organic origins discovered in the earth's crust in solid, liquid and gaseous form." Energy reserves are part of the resources that, based on technical, economic and other relevant (e.g., environmental) considerations, could be recovered and for which extraction is justified to some extent.

The term products are understood in the same way as in economic statistics where it refers to all goods and services that are the result of production.

Energy products are a subset of products. As a general guideline, energy products refer to products exclusively or mainly used as a source of energy. They include forms of energy suitable for direct use (e.g., electricity and heat) and energy products that release energy while undergoing some chemical or other process (including combustion). By convention, energy products also include peat, biomass and waste when and only when they are used for energy purposes.

Since a number of energy products are transformed into other kinds of energy products prior to their consumption, a distinction is made between primary and secondary energy products. This distinction is necessary for various analytical purposes, including for avoiding the double-counting of energy production in cross-fuel tabulations, such as energy balances. Energy products can be obtained from both renewable (e.g., solar, biomass, etc.) and non-renewable sources (e.g., coal, crude oil, etc.).

The description of the boundary of the universe of energy products in energy statistics is not always straightforward. For example, different forms of corn/corncobs are: (1) combusted directly to produce heat; (2) used in the production of ethanol as a biofuel, (3) consumed as food, or (4) thrown away as waste.

Countries, often in the delineation of energy products, follow the International Recommendations on Energy Statistics or the IRES.

The United Nations Statistical Commission, at its forty second session (22–25 February 2011), adopted IRES as a statistical standard and encouraged its implementation in all countries. IRES provide a comprehensive methodological framework for the collection, compilation and dissemination of energy statistics in all countries irrespective of the level of development of their statistical system. In particular, IRES provides of a set of internationally agreed recommendations covering all aspects of the statistical production process, from the institutional and legal framework, basic concepts, definitions and classifications to data sources, data compilation strategies, energy balances, data quality issues and statistical dissemination.

As per the IRES 2011, recommended unit of dissemination for main categories of energy products are:

Recommended units for dissemination

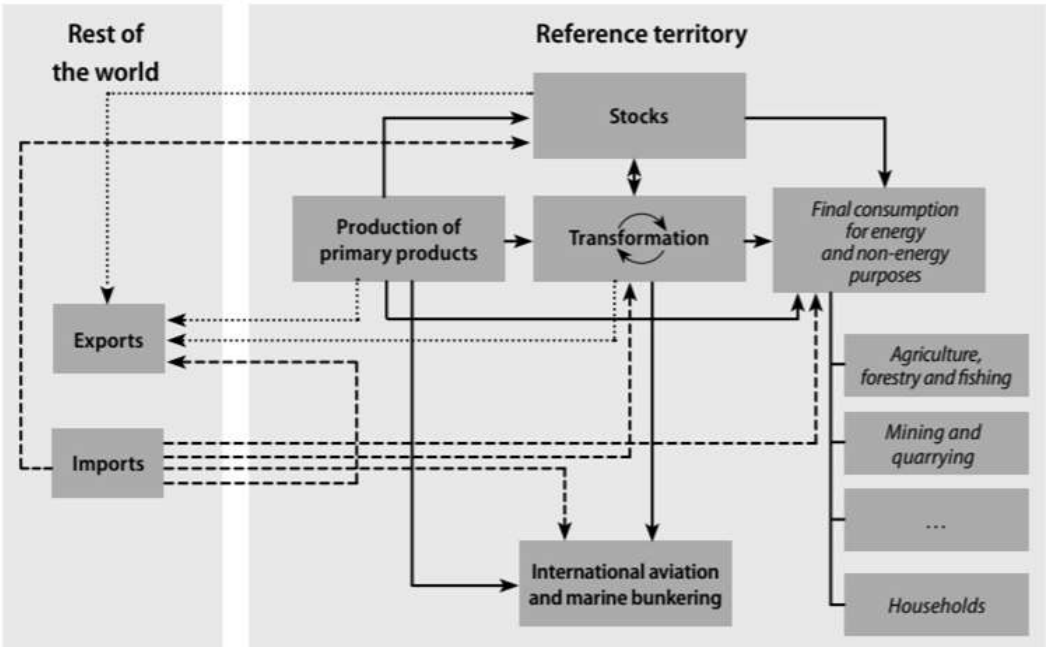
Energy products	Dimension	Unit
Solid fossil fuels	Mass	Thousand metric tons
Liquid fossil fuels	Mass	Thousand metric tons
(Liquid) Biofuels	Mass/Volume	Thousand metric tons/ Thousand cubic metres
Gases	Energy	Terajoules
Wastes	Energy	Terajoules
Fuelwood	Volume/ Energy	Thousand cubic metres/ Terajoules
Charcoal	Mass	Thousand metric tons
Electricity	Energy	GWh
Heat	Energy	Terajoules
Common unit (e.g., balances)	Energy	Terajoules
Electricity installed capacity	Power	MW
Refinery capacity	Mass/time	Thousand metric tons/year

Source: IRES, 2011, United Nations

Energy Flows

In the context of basic energy statistics and energy balances, the term "energy flow" refers to the production, import, export, bunkering, stock changes, transformation, energy use by energy industries, losses during the transformation, and final consumption of energy products within the territory of reference for which these statistics are compiled. This territory generally corresponds to the national territory; however, it can also refer to an administrative region at the sub-national level or even to a group of countries. The term "rest of the world" is used here to denote all areas/territories outside the reference territory. The broad sectoral diagram representation of Energy Flow in an economy is presented below.

Diagram of the main energy flows



Source: IRES, 2011, United Nations

The present publication, Energy Statistics India 2021, is fully compliant with the IRES 2011 and follows the practices prescribed therein.

The publication in its various chapters presents the concepts of production, consumption, trade, energy balance etc. The data is collected from various line Ministries/Departments of Government of India including Ministry of Coal, Ministry of Petroleum and Natural Gas, Ministry of Power, Ministry of New and Renewable Energy etc. Chapter 1 presents the reserves and potential for generation in the country, Chapter 2 focuses on Installed Capacity and capacity utilization, Chapter 3 gives the production statistics of various energy resources and products, Chapter 4 adds up the statistics on imports-exports and prices in the scenario, the final availability of energy in the country is then given in Chapter 5, and Chapter 6 highlights the consumption of energy sector/industry wise. The overall energy balance combining information of all the previous chapters is presented in Chapter 7 of the publication while chapter 8 looks at sustainability in energy.

This publication, the 28th in the series, is an updated and integrated repository of statistics on energy resources and highlights the India's commitment and the progress made so far in the area of reliable, sustainable and efficient energy systems in the country.

Chapter | 1

Reserves and Potential for Generation

CHAPTER 1
Reserves and potential for generation

Reserves and potential

Energy reserves are part of the energy resources that, based on technical, economic and other relevant (e.g., environmental) considerations, can be recovered and for which extraction is justified. The exact definition of reserves depends on the kind of resources in focus.

Globally, the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources (UNFC 2009) provides a scheme for classifying and evaluating these resources according to three dimensions, namely, their economic and social viability, the field project status and feasibility, and the geological knowledge about these resources. System of Environmental Economic Accounting (SEEA)-Energy groups the detailed categories of UNFC into three aggregated classes characterizing the commercial recoverability of the resources as follows:

Categorization of mineral and energy resources relevant for energy
Class A: Commercially recoverable resources
Class B: Potentially commercially recoverable resources
Class C: Non – commercial and other known deposits

Thus, primary energy production relies on 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 mostly when extraction and sale have been confirmed to be economically viable.

A good measure of the overall resource and the geographical and technical potential of what can be produced is also often represented by the potential in case of renewable power.

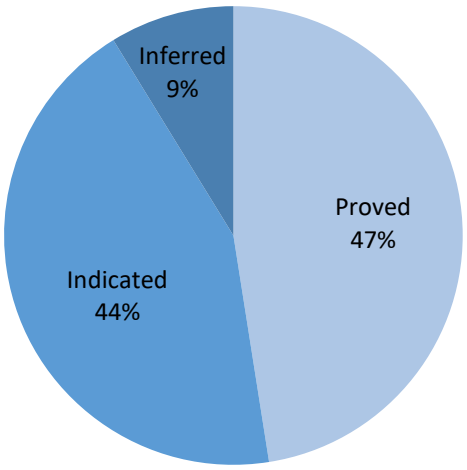
India has one of the largest proven coal reserves in the world. However, one of the objectives of India's energy mix has been to promote the production of energy through the use of renewable energy sources in accordance with climate, environment and macroeconomic considerations in order to reduce dependence on fossil fuels, ensure security of supply and reduce emissions of CO_2 and other greenhouse gases.

This chapter presents data on these reserves and potential in a concise form.

Highlights

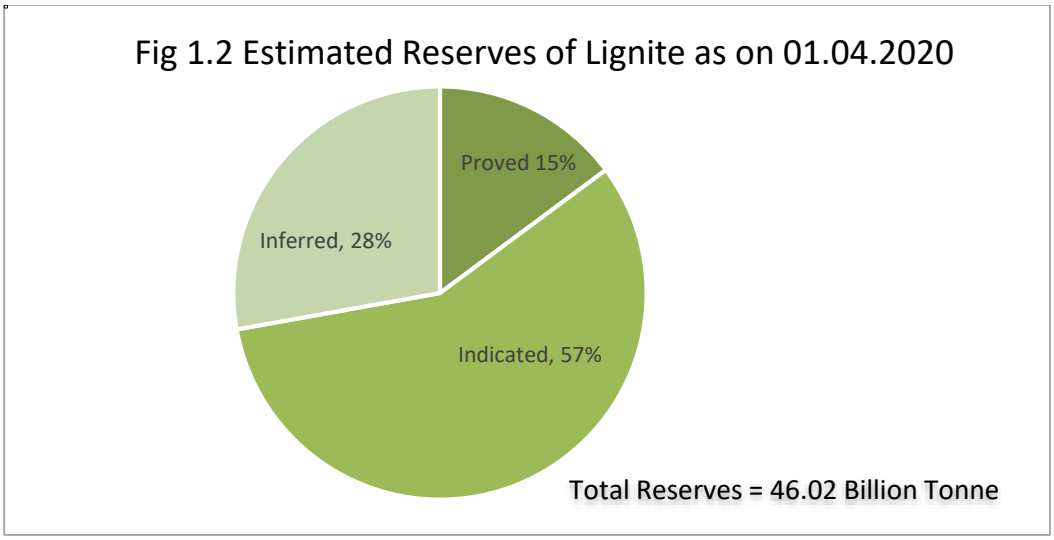
- India has rich deposits of coal in the world. Total estimated reserves of coal in 2020 were 344.02 billion tonnes, an addition of 17.53 billion tonnes over the 2019 in corresponding period. In terms of percentage, there has been a growth of 5.37% in the total estimated coal reserves during the year 2020 over 2019 (Table 1.1.).
- The top three states with highest coal reserves in India are Jharkhand, Odisha, Chhattisgarh, which account for approximately 70% of the total coal reserves in the country.
- Out of the total reserves in the country, proven reserves i.e. those available for extraction in terms of i.e. economically viability, feasibility study and geologically exploration level, account for almost 47% of the total as depicted below in Fig 1.1.

Fig 1.1 Estimated Reserves of Coal as on 01.04.2020

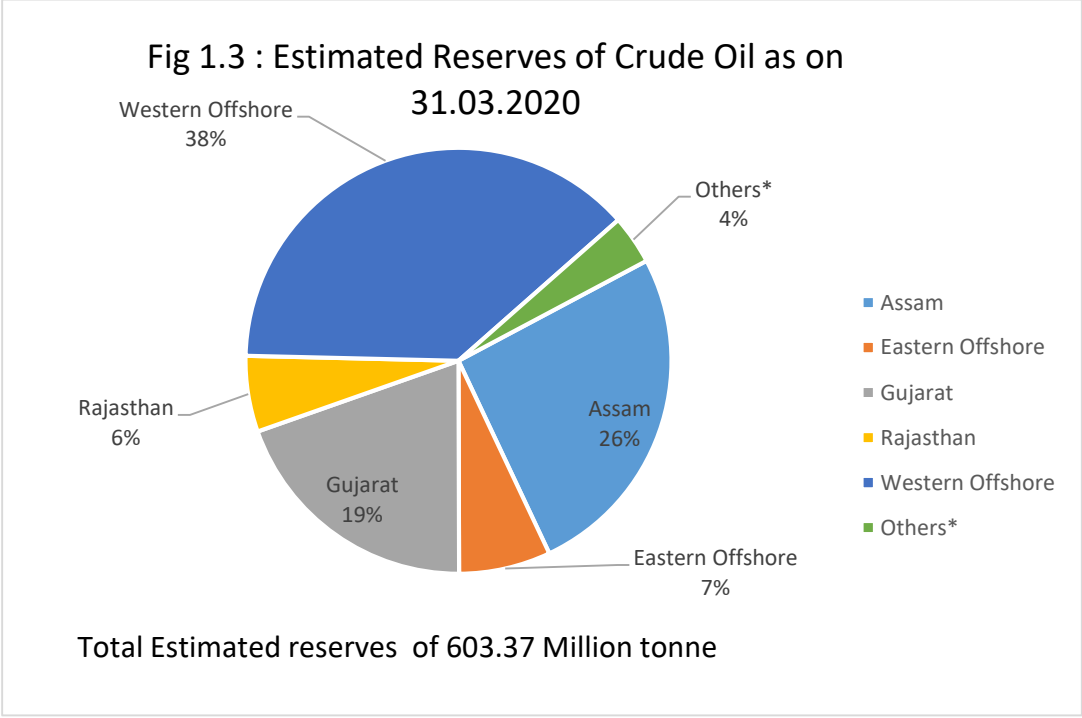


Total reserve of 344.02 Billion Tonnes

- The estimated total reserves of lignite in 2020 were 46.02 billion tonnes against 45.76 billion tonnes in 2019. (Table 1.1(A)). The highest reserves of lignite are found in the state of Tamil Nadu.
- Out of the total reserves in the country, proven reserves account for almost only 15% of the total as depicted below in Fig 1.2.

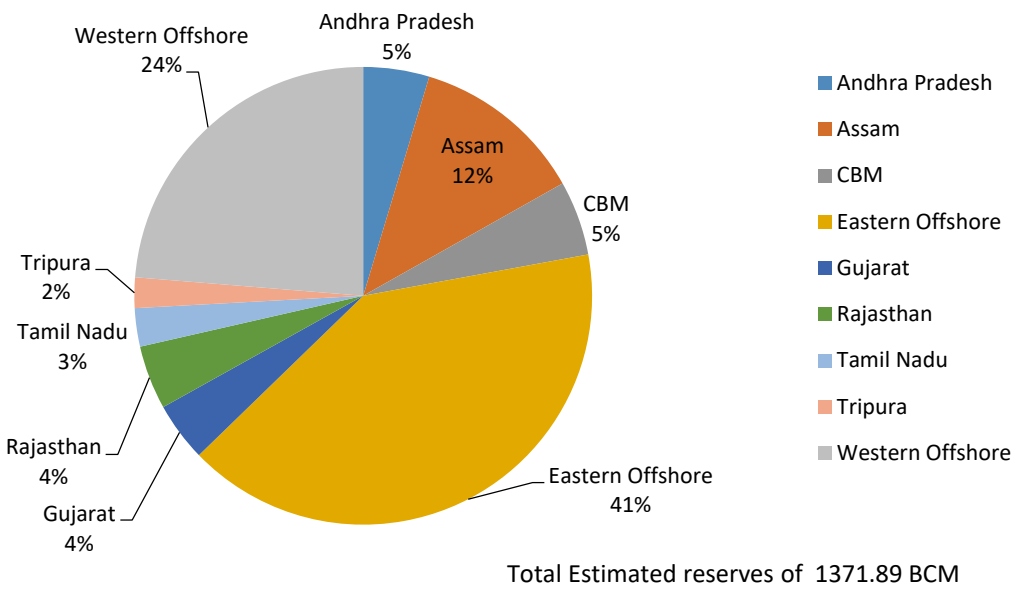


- The estimated reserves of crude oil in India in 2020 stood at 603.37 million tonnes against 618.95 million tonnes in the previous year. Geographical distribution of Crude oil indicates that the maximum reserves are in the Western Offshore (39%) followed by Assam (26%) (Table 1.2).



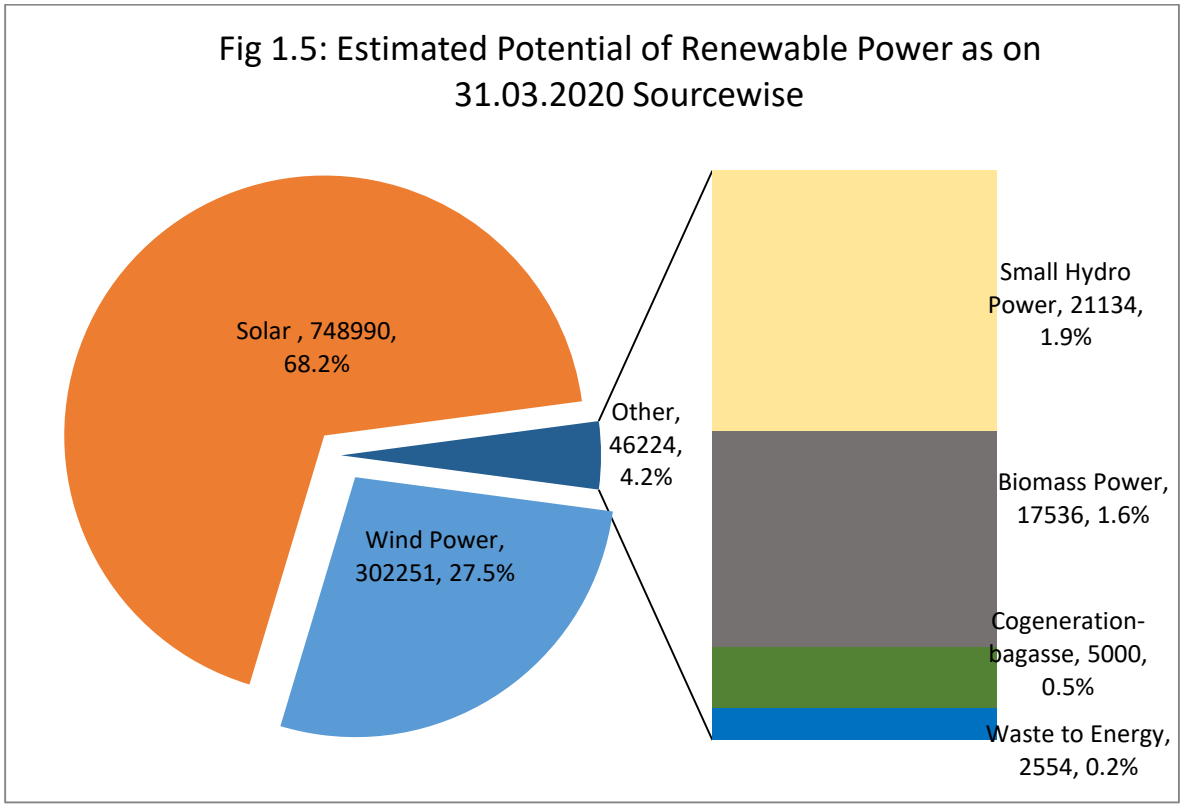
- The estimated reserves of Natural Gas in the year 2020 were at 1371.89 Billion Cubic Metres. The maximum reserves of Natural Gas are in the Eastern Offshore (41%) followed by Western offshore (23.66%).

Fig 1.4 :Estimated Reserves of Natural Gas as on 31.03.2020



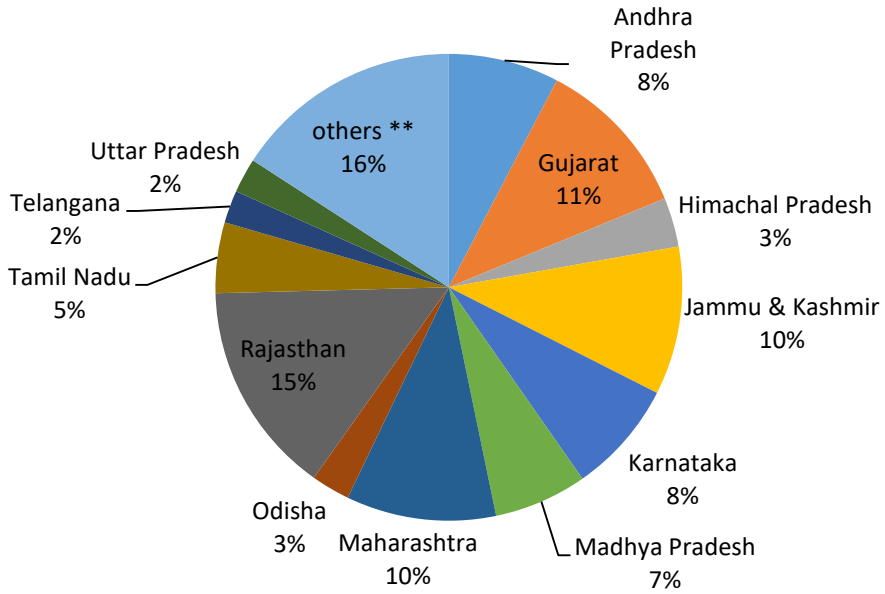
Total Estimated reserves of 1371.89 BCM

- There is a high potential for generation of renewable energy from various sources- wind, solar, biomass, small hydro and cogeneration bagasse in India. The total potential for renewable power generation in the country as on 31.03.2020 is estimated at 1,097,465 MW This includes solar power potential of 748990 MW (68.25%), wind power potential of 302251 MW (27.54%) at 100m hub height, SHP (small-hydro power) potential of 21134 MW (1.93%), Biomass power of 17,536 MW (1.60%), 5000 MW (0.46%) from bagasse-based cogeneration in sugar mills and 2554 MW (0.23%) from waste to energy (Table 1.3).



- The geographic distribution of the estimated potential of renewable power as on 31.03.2020 shows that Rajasthan has the highest share of about 15% (162223 MW). This is followed by Gujarat with 11% share 122086 MW). Both Maharashtra and Jammu & Kashmir come next with a 10% share (113925MW and 112800 MW respectively), mainly on account of solar power. However, amongst these, share of Wind Power is the highest in Gujarat.

Fig 1.6: Estimated Potential of Renewable Power as on 31.03.2020 Statewise



Total Estimated potential of 1,097,465 MW

Table 1.1: Statewise Estimated Reserves of Coal

(in Million Tonne)

States/ UTs	Proved		Indicated		Inferred		Total		Distribution (%)	
	01.04.2019	01.04.2020	01.04.2019	01.04.2020	01.04.2019	01.04.2020	01.04.2019	01.04.2020	01.04.2019	01.04.2020
Andhra Pradesh	97	97	1,078	1,078	432	432	1,607	1,607	0.49	0.47
Arunachal Pradesh	31	31	40	40	19	19	90	90	0.03	0.03
Assam	465	465	57	57	3	3	525	525	0.16	0.15
Bihar	310	310	1,513	2,431	11	11	1,834	2,751	0.56	0.80
Chhattisgarh	21,446	24,985	36,260	42,368	2,202	2,079	59,908	69,432	18.35	20.18
Jharkhand	48,032	49,469	30,400	30,284	6,074	5,850	84,506	85,602	25.88	24.88
Madhya Pradesh	12,182	12,597	12,736	12,888	3,875	3,799	28,793	29,285	8.82	8.51
Maharashtra	7,573	7,624	3,257	3,257	1,847	1,847	12,677	12,728	3.88	3.70
Meghalaya	89	89	17	17	471	471	576	576	0.18	0.17
Nagaland	9	9	22	22	415	415	446	446	0.14	0.13
Odisha	39,654	40,872	33,473	36,067	7,713	7,713	80,840	84,652	24.76	24.61
Sikkim	0	0	58	58	43	43	101	101	0.03	0.03
Uttar Pradesh	884	884	178	178	0	0	1,062	1,062	0.33	0.31
West Bengal	14,219	15,189	12,847	13,125	4,624	4,623	31,690	32,937	9.71	9.57
Telangana	10,622	10,841	8,565	8,521	2,652	2,863	21,839	22,225	6.69	6.46
All India Total	**1,55,614**	**1,63,461**	**1,40,501**	**1,50,392**	**30,380**	**30,168**	**3,26,495**	**3,44,021**	**100**	**100**
Distribution (%)	**47.66**	**47.51**	**43.03**	**43.72**	**9.30**	**8.77**	**100.00**	**100.00**		

Total may not tally due to rounding off

Note: Proved and indicated Balance Recoverable Reserves as on 1st April.

Source: Office of Coal Controller, Ministry of Coal

Table 1.1(A) :Statewise Estimated Reserves of Lignite

(in Million Tonne)

States/ UTs	Proved		Indicated		Inferred		Total		Distribution (%)	
	01.04.2019	01.04.2020	01.04.2019	01.04.2020	01.04.2019	01.04.2020	01.04.2019	01.04.2020	01.04.2019	01.04.2020
Gujarat	1279	1279	284	284	1160	1160	2722	2722	5.95	5.91
Jammu & Kashmir	0	0	20	20	7	7	28	28	0.06	0.06
Kerala	0	0	0	0	10	10	10	10	0.02	0.02
Puducherry	0	0	406	406	11	11	417	417	0.91	0.91
Rajasthan	1169	1169	3030	3030	2151	2151	6349	6349	13.87	13.80
Tamil Nadu	4340	4340	22497	22497	9393	9653	36230	36490	79.18	79.29
West Bengal	0	0	1	1	3	3	4	4	0.01	0.01
All India	**6788**	**6788**	**26237**	**26237**	**12734**	**12994**	**45759**	**46019**	**100.00**	**100.00**
Distribution (%)	**14.83**	**14.75**	**57.34**	**57.01**	**27.83**	**28.24**	**100.00**	**100.00**		

Total may not tally due to rounding off

Note: Proved and indicated Balance Recoverable Reserves as on 1st April.

Source:Office of Coal Controller, Ministry of Coal - Negligible

Table 1.2 :Statewise Estimated Reserves of Crude Oil and Natural Gas

States/ UTs/ Region	Crude Petroleum (million tonnes)				Natural Gas (billion cubic metres)			
	01.04.2019		01.04.2020		01.04.2019		01.04.2020	
	Estimated Reserves	Distribution (%)	Estimated Reserves	Distribution (%)	Estimated Reserves	Distribution (%)	Estimated Reserves	Distribution (%)
Arunachal Pradesh	2.67	0.43	3.12	0.52	1.64	0.12	2.72	0.20
Andhra Pradesh	8.05	1.30	7.85	1.30	63.57	4.60	63.85	4.65
Assam	158.62	25.63	155.45	25.76	170.71	12.36	166.60	12.14
Cold Bed Methane (CBM)*	-	-	-	-	72.56	5.26	72.23	5.26
Eastern Offshore	42.34	6.84	42.05	6.97	565.15	40.93	556.33	40.55
Gujarat	119.63	19.33	118.60	19.66	59.45	4.31	57.13	4.16
Nagaland	2.38	0.38	2.38	0.39	0.09	0.01	0.09	0.01
Rajasthan	40.71	6.58	34.78	5.76	63.03	4.57	61.80	4.50
Tamil Nadu	9.21	1.49	9.03	1.50	38.00	2.75	37.09	2.70
Tripura	0.07	0.01	0.07	0.01	23.24	1.68	29.45	2.15
Western Offshore	235.27	38.01	230.04	38.13	323.19	23.41	324.60	23.66
Total	**618.95**	**100.00**	**603.37**	**100.00**	**1380.63**	**100.00**	**1371.89**	**100.00**

* CBM : Cold Bed Methane (Jharkhand, West Bengal and M.P.) - Neg.

Notes:

1. Western offshore includes Gujarat offshore

2. Total may not tally due to rounding off

Source: M/o Petroleum & Natural Gas

Table 1.3: Statewise Estimated Potential of Renewable Power

(as on 31.03.2020)

(in MW)

Sl. No.	States/ UTs	Wind Power @ 100m	Small Hydro Power	Biomass Power	Cogeneration-bagasse	Waste to Energy*	Solar Energy	Total	Distribution (%)
1	Andhra Pradesh	44229	409.32	577.7	300	123	38440	84079	7.66
2	Arunachal Pradesh	-	2064.92	8.2	-	-	8650	10723	0.98
3	Assam	-	201.99	211.8	-	8	13760	14182	1.29
4	Bihar	-	526.98	618.7	300	73	11200	12719	1.16
5	Chhattisgarh	77	1098.2	235.8	-	24	18270	19705	1.80
6	Goa	1	4.7	25.7	-	-	880	911	0.08
7	Gujarat	84431	201.97	1220.7	350	112	35770	122086	11.12
8	Haryana	-	107.4	1332.6	350	24	4560	6374	0.58
9	Himachal Pradesh	-	3460.34	142.2	-	1.5	33840	37444	3.41
10	Jammu & Kashmir	-	1707.45	42.6	-	-	111050	112800	10.28
11	Jharkhand	-	227.96	90	-	10	18180	18508	1.69
12	Karnataka	55857	3726.49	1130.5	450	-	24700	85864	7.82
13	Kerala	1700	647.15	1044.4	-	36	6110	9538	0.87
14	Madhya Pradesh	10484	820.44	1364	-	78	61660	74406	6.78
15	Maharashtra	45394	786.46	1887.3	1250	287	64320	113925	10.38
16	Manipur	-	99.95	13.4	-	2	10630	10745	0.98
17	Meghalaya	-	230.05	11.11	-	2	5860	6103	0.56
18	Mizoram	-	168.9	1	-	1.5	9090	9261	0.84
19	Nagaland	-	182.18	10.2	-	-	7290	7482	0.68
20	Odisha	3093	286.22	246.4	-	22	25780	29428	2.68
21	Punjab	-	578.28	3172.1	300	45	2810	6905	0.63
22	Rajasthan	18770	51.67	1038.9	-	62	142310	162233	14.78
23	Sikkim	-	266.64	2.3	-	-	4940	5209	0.47
24	Tamil Nadu	33800	604.46	1069.5	450	151	17670	53745	4.90
25	Telangana	4244	102.25	-	-	-	20410	24756	2.26
26	Tripura	-	46.86	2.9	-	1.5	2080	2131	0.19
27	Uttar Pradesh	-	460.75	1616.7	1250	176	22830	26333	2.40
28	Uttarakhand	-	1664.31	23.7	-	5	16800	18493	1.69
29	West Bengal	2	392.06	396	-	148	6260	7198	0.66
30	Andaman & Nicobar	8	7.27	-	-	-	-	15	0.00
31	Chandigarh	-	-	-	-	6	-	6	0.00
32	Dadar & Nagar Haveli	-	-	-	-	-	-	-	-
33	Daman & Diu	-	-	-	-	-	-	-	-
34	Delhi	-	-	-	-	131	2050	2181	0.20
35	Lakshadweep	8	-	-	-	-	-	8	0.00
36	Puducherry	153	-	-	-	2.5	-	156	0.01
37	Others*	-	-	-	-	1022	790	1812	0.17
All India Total		**302251**	**21134**	**17536**	**5000**	**2554**	**748990**	**1097465**	**100.00**
Distribution (%)		**27.54**	**1.93**	**1.60**	**0.46**	**0.23**	**68.25**	**100.00**	

* Industrial waste

Source: Ministry of New and Renewable Energy

Chapter | 2

Installed Capacity and Capacity Utilization

CHAPTER 2
Installed capacity and capacity utilization

Installed capacity

The world in its commitment to sustainability has pledged to expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries (SDG Target 7.B).

Energy systems capable of delivering to the ever growing and emerging needs of developing economies is the need of the hour. Growing energy demands world over and in the densely populated regions of Asia including India have driven the need to shift to cleaner fuels and lager energy systems. Thus, in India, there has been a thrust to increase installed generating capacity of power and to decrease the reliance on primary fossil fuels to cater to these needs.

Generating and providing reliable power at competitive prices in a sustainable manner by optimising the use of multiple energy resource with innovative eco-friendly technologies has been at the core of policy planning in India. Also, the environmental and health burdens arising out of the use of hydrocarbons force the world towards adopting energy efficiency and clean energy systems.

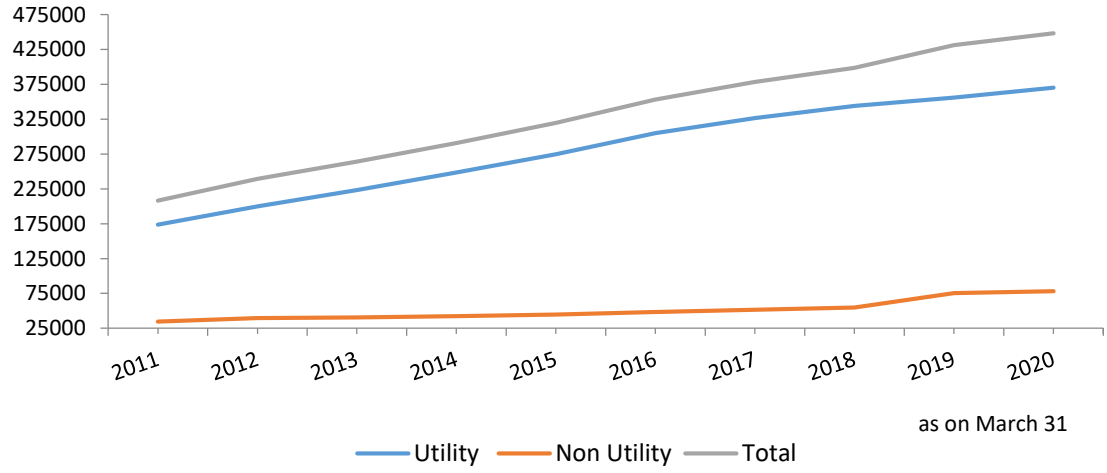
It is worthy to note here that not all potential is viable to be transformed into capacity, and overall capacity does not lead to an equal amount of generation due to production losses etc. Power plants have a capacity to produce a certain amount of power during a given time, but if they are taken offline (i.e. for maintenance or refuelling) then they are not actually generating power.

This chapter presents the capacity of coal washeries, oil refineries and electricity. It also provides the progress of installation of Renewable Energy Systems in the country.

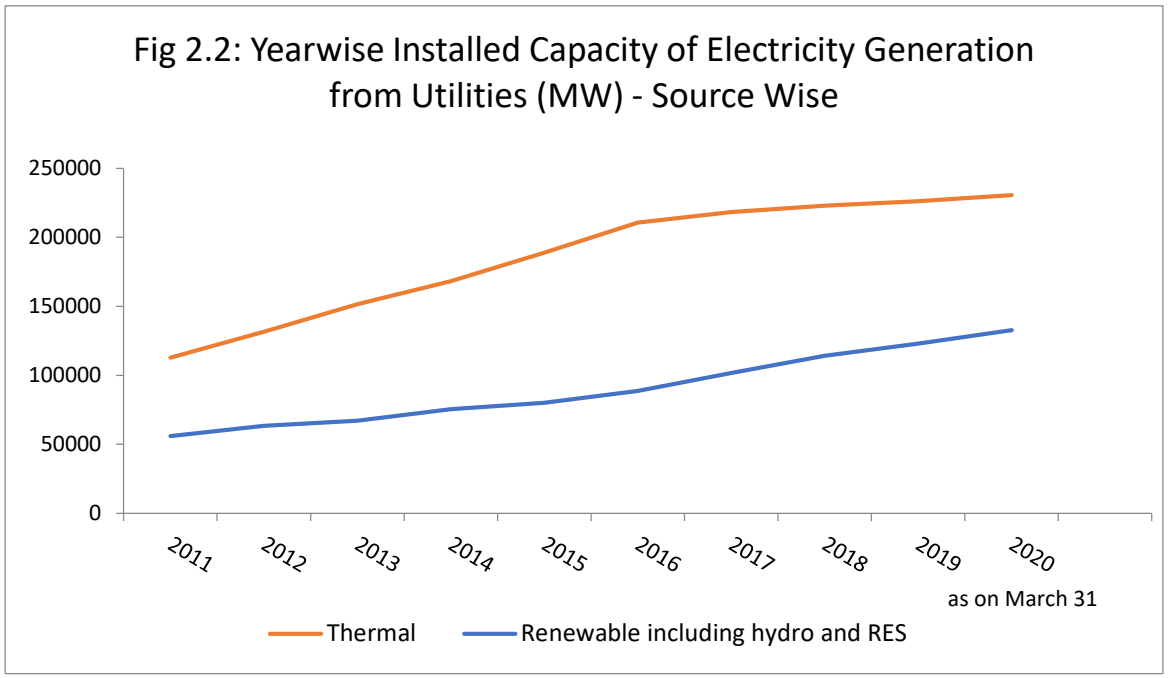
Highlights

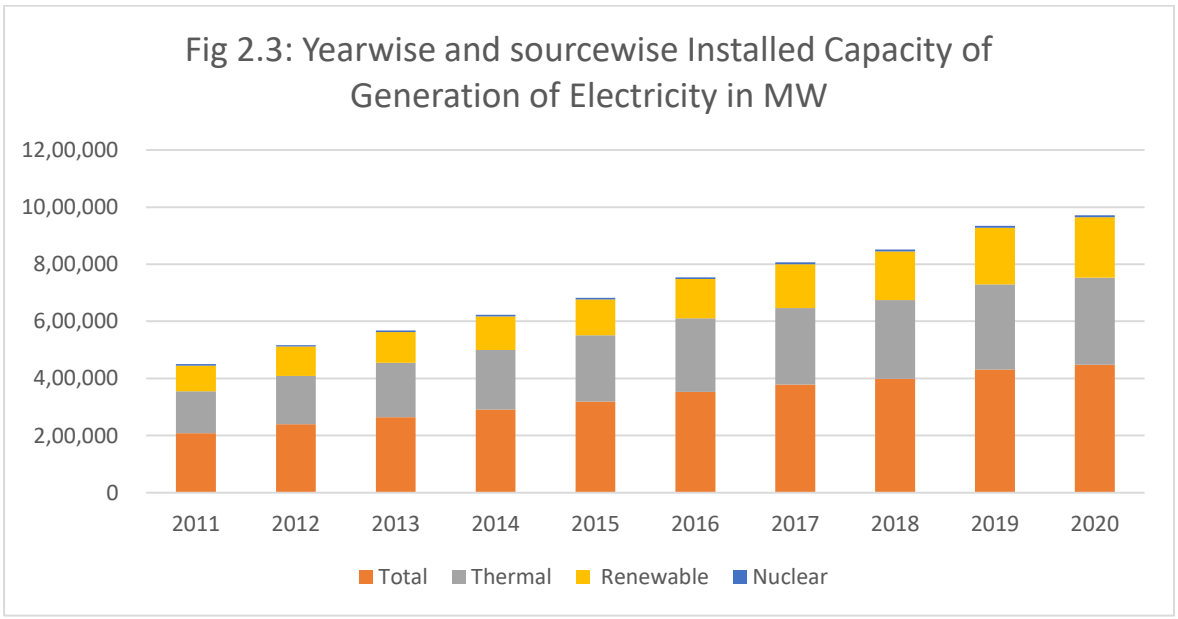
- Total installed capacity of coal washeries in India is 143.44 Million Tonne per year (MTY) as on 31.03.2020 (P). This comprises of 29.84 MTY in coking and 113.60 MTY in Non Coking Coal Washeries (Table 2.1).
- Similarly, as on 31.03.2020, there were a total of 23 refineries in the country, 18 in the Public Sector, 3 in the Private sector and 2 in Joint Venture (Table 2.2).
- The refining capacity of the country was 249366 TMTPA on 31.03.2019 which is 500 TMTPA lower than the country's refining capacity of 249866 TMTPA on 31.03.2020 and the entire increase is on account of refineries in Joint Venture sector.
- The Refinery production (crude throughput) achievement was 257205 TMT during 2018-19 which has decreased to 254386 TMT during 2019-20 i.e. a net decrease of 1.1% over 2018-19.
- Hence, Capacity utilization of the refineries which was 103.9% during 2018-19 has decreased to 102.01% in 2019-20. In the Public Sector, Indian Oil Corporation (IOC) decreased its capacity utilization from 106.27% in 2018-19 to 101.87% in 2019-20. However, capacity utilization in 2019-20 improved by 1.67 % in private sector and 0.39% in Joint Ventures over 2018-19.
- In absolute terms, the installed capacity of electricity generation increased by 3.8% to 448106 MW in 2019-20 over 431307 MW in 2018-19 with the major share of installed capacity existing with utilities i.e. 82.59% (Table 2.3).

Fig 2.1: Yearwise Installed Capacity of Electricity Generation (MW) from utilities and non utilities

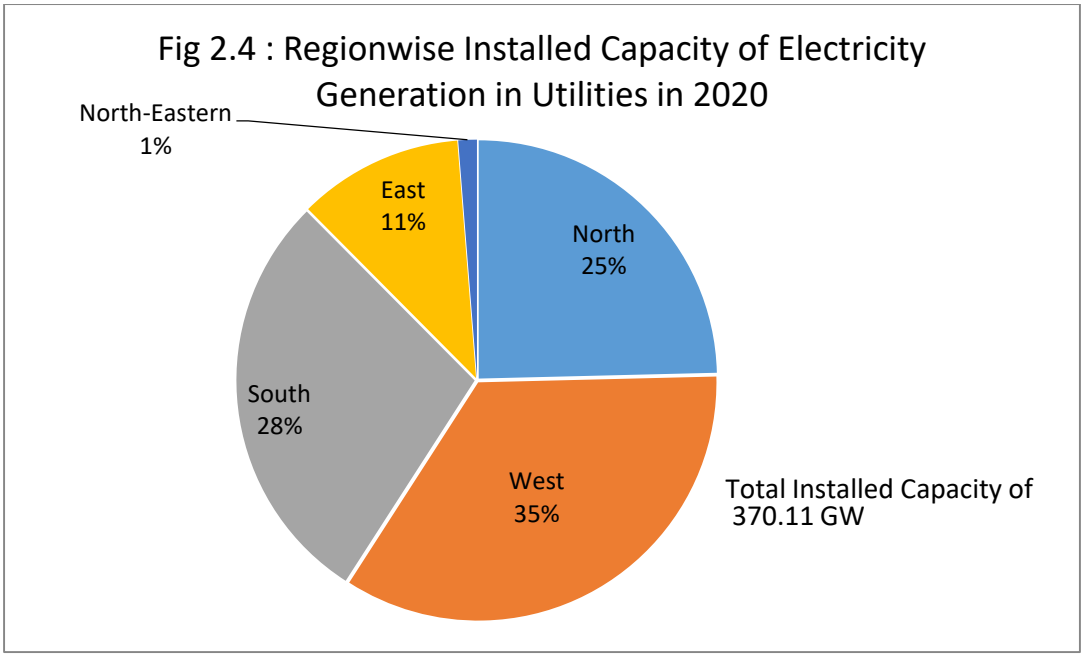


- India's Energy mix has been seeing a shift from more conventional resources of energy to renewable sources. This is well captured by the fact that while the installed capacity of renewable sources of electricity generation excluding hydro from utilities grew at 12% in the previous year (2020 over 2019), that of thermal sources grew only at 1.91%.





- The geographical distribution of installed capacity of electricity generating as on 31.03.2020 indicates that Western Region accounted for the highest share (35%) followed by Southern Region (28%) and Northern Region (25%). Northern Region also accounted for the highest share of hydro energy. Among states, the state of Karnataka has the highest share of hydro installed capacity of 3.59 GW and also the highest share of Other renewable resources as well at 15.23 GW. (Table 2.4).



- Region wise growth in the installed capacity during 2019-20 reveals that North Eastern Region (NER) registered highest annual growth of about 7.88%. Amongst all the major states Odisha registered highest annual growth (19.64%) in the installed capacity.
- The total installed capacity of grid interactive renewable power, which was 78316.44 MW as in 2019 increased at growth rate of 11.19% during a year (2020) (Table 2.5).
- Out of the total installed generation capacity of renewable sources of power in 2020, installed capacity of Wind power accounted for about 43.3%, followed by Solar power including roof tops (39.8%) and Biomass power (11.2%). However, in terms of growth rates year on year, Solar power installed capacity raced at a growth rate of almost 23% just over the last year from 2019 to 2020.

- Karnataka had the highest installed capacity of grid connected renewable power (15232.06 MW) in 2020 followed closely by Tamil Nadu (14347.22 MW) mainly on account of wind and solar power.

Fig 2.5 : Cumulative Installed Capacity of Grid Interactive Renewable Power by Type (in MW)

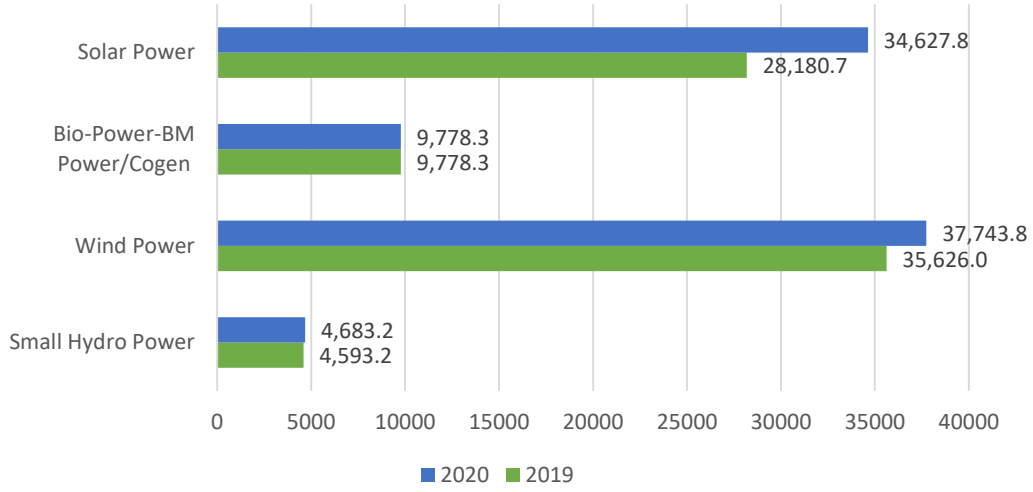


Table 2.1: Installed Capacity of Coal Washeries

as on 31.03.2020

Sl. No.	Washery & Operator	State	Capacity (MTY) 31.03.2020*
	COKING COAL		
1	Dudga-II, CIL	Jharkhand	2.00
2	Bhojudih, CIL	West Bengal	1.70
3	Moonidih, CIL	Jharkhand	1.60
4	Sudamdih, CIL	Jharkhand	1.60
5	Mahuda, CIL	Jharkhand	0.63
6	Madhuban,CIL	Jharkhand	2.50
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		**20.58**
12	Chasnala, IISCO	Jharkhand	1.4
13	Jamadoba, TISCO	Jharkhand	1.3
14	West Bokaro-II, TISCO	Jharkhand	2.5
15	West Boakaro-III,TISCO	Jharkhand	2.56
16	Bhelatand, TISCO	Jharkhand	1.5
	(B) PSU & Private		**9.26**
	TOTAL COKING (A + B)		**29.84**
	NON-COKING COAL		
1	Gidi,CIL	Jharkhand	2.50
2	Piparwar,CIL	Jharkhand	6.50
3	Kargali,CIL	Jharkhand	2.72
	(A) CIL		**11.72**
4	Dipka, Aryan coal beneficiation pvt. Ltd.	Chattisgarh	14.00
5	Gevra, Aryan coal beneficiation pvt. Ltd.	Chattisgarh	6.25
6	Panderpauni, Aryan coal beneficiation pvt. Ltd.	Maharashtra	2.62
7	Chakabuwa, Aryan coal beneficiation pvt. Ltd.	Chattisgarh	7.50
8	Himgir, Aryan coal beneficiation pvt. Ltd.	Odisha	5.00
9	Binjhari, Aryan coal beneficiation pvt. Ltd.	Chattisgarh	4.80
10	Talcher, Aryan Energy Pvt. Ltd.	Odisha	2.34

* Provisional

Contd….

Source: Office of Coal Controller, Ministry of Coal

Table 2.1(Contd.): Installed Capacity of Coal Washeries

Sl. No.	Washery & Operator	State of Location	Capacity (MTY) 31.03.2020*
11	Wani, Kartikay Coal washeries pvt. Ltd.	Maharashtra	2.50
12	Talcher, Global coal Mining (P) Ltd.	Odisha	4.00
13	Ib Valley, Global coal Mining (P) Ltd.	Odisha	3.50
14	Ramagundam, Global coal Mining (P) Ltd.	Telangana	1.00
15	Manuguru, Global coal Mining (P) Ltd.	Telengana	1.50
16	Talcher, Spectrum Coal & Power Ltd.	Odisha	9.52
17	Ratija, Spectrum Coal & Power Ltd.	Chattisgarh	11.00
18	Maruti, Maruti Clean Coal.	Chattisgarh	6.60
19	Ael, Adani Enterprises Limited.	Chattisgarh	15.00
20	Jpl, Jindal Power Limited.	Chattisgarh	4.75
	(B) Private		**101.88**
	TOTAL NON-COKING (A+B)		**113.60**
	Gross Total (Coking + Non-Coking)		**143.44**

* Provisional

Source: Office of Coal Controller, Ministry of Coal

Table 2.2: Installed Capacity and Utilization of Refineries of Crude Oil

Sl. No.	Refinery	Refinery Capacity (TMTPA)		Crude Oil Processed (TMT)		Capacity Utilisation (%)		Change in Utilisation
		31.03.2019	31.03.2020	2018-19	2019-20(P)	2018-19	2019-20(P)	
1	2	3	4	5	6	7	8	9
(a)	**PUBLIC SECTOR**	**142066**	**142566**	**150976**	**144716**	**106.27**	**101.87**	**-4.41**
	IOCL, Guwahati, Assam	1000	1000	863	892	86.32	89.24	2.92
	IOCL, Barauni, Bihar	6000	6000	6661	6516	111.02	108.59	-2.43
	IOCL, Koyali, Gujarat	13700	13700	13505	13075	98.58	95.44	-3.14
	IOCL, Haldia, West Bengal	7500	8000	7965	6463	106.20	86.18	-20.02
	IOCL, Mathura, Uttar Pradesh	8000	8000	9737	8948	121.71	111.85	-9.86
	IOCL, Digboi, Assam	650	650	676	664	103.93	102.19	-1.74
	IOCL, Panipat, Haryana	15000	15000	15281	15038	101.87	100.25	-1.62
	IOCL, Bongaigaon, Assam	2350	2350	2513	2045	106.93	87.01	-19.91
	IOCL, Paradip, Odisha	15000	15000	14616	15778	97.44	105.19	7.75
	Total IOC	**69200**	**69700**	**71816**	**69419**	**103.78**	**100.32**	**-3.46**
	BPCL, Mumbai, Maharashtra	12000	12000	14773	15017	123.11	125.14	2.03
	BPCL, Kochi, Kerala	15500	15500	16051	16515	103.55	106.55	3.00
	Total BPCL	**27500**	**27500**	**30823**	**31532**	**112.09**	**114.66**	**2.58**
	HPCL, Mumbai, Maharashtra	7500	7500	8671	8065	115.61	107.54	-8.08
	HPCL, Visakh, Andhra Pradesh	8300	8300	9773	9115	117.75	109.82	-7.93
	Total HPCL	**15800**	**15800**	**18444**	**17180**	**116.73**	**108.74**	**-8.00**
	CPCL, Manali, Tamil Nadu	10500	10500	10271	10161	97.82	96.77	-1.05
	CPCL, Narimanam, Tamil Nadu	1000	1000	423	0	42.34	0.00	-42.34
	Total CPCL	**11500**	**11500**	**10695**	**10161**	**93.00**	**88.35**	**-4.64**
	NRL, Numaligarh, Assam	3000	3000	2900	2383	96.68	79.44	-17.23
	ONGC, Tatipaka, Andhra Pradesh	66	66	66	87	100.24	131.71	31.47
	MRPL, Mangalore, Karnataka	15000	15000	16231	13953	108.21	93.02	-15.19
(b)	**PRIVATE SECTOR**	**88200**	**88200**	**88041**	**89515**	**99.82**	**101.49**	**1.67**
	RIL, Jamnagar, Gujarat	33000	33000	31752	33019	96.22	100.06	3.84
	RIL, SEZ-Jamnagar, Gujarat	35200	35200	37393	35876	106.23	101.92	-4.31
	ESSAR Oil Ltd. Vadinar	20000	20000	18896	20620	94.48	103.10	8.62
(c)	**JOINT VENTURE**	**19100**	**19100**	**18189**	**20155**	**105.14**	**105.52**	**0.39**
	BORL, Bina, M.P.	7800	7800	5716	7913	95.26	101.45	6.18
	HMEL, GGS, Bathinda, Punjab	11300	11300	12473	12242	110.38	108.34	-2.04
	Total (a+b+c)	**249366**	**249866**	**257205**	**254386**	**103.14**	**102.01**	**-1.13**

Note: 1.Total may not tally due to rounding off P:Provisional

2. Crude throughput in terms of crude oil processed.

3. Capacity utilisation is equal to crude oil processsed in current year divided by refineing capacity at the end of previous year*100

Source: M/o Petroleum & Natural Gas

Table 2.3 (A) : Yearwise Installed Capacity of Electicity Generation in Utilities and Non-utilities

(in Mega Watt = 10^3 Kilo Watt)

As on	Utilities							
	Thermal				Hydro	Nuclear	RES*	Total
	Steam	Diesel	Gas	Total				
1	2	3	4	5	6	7	8	9
31.03.2011	93,918	1,200	17,706	1,12,824	37,567	4,780	18,455	1,73,626
31.03.2012	1,12,022	1,200	18,381	1,31,603	38,990	4,780	24,503	1,99,877
31.03.2013	1,30,221	1,200	20,110	1,51,530	39,491	4,780	27,542	2,23,344
31.03.2014	1,45,273	1,200	21,782	1,68,255	40,531	4,780	34,988	2,48,554
31.03.2015	1,64,636	1,200	23,062	1,88,898	41,267	5,780	38,959	2,74,904
31.03.2016	1,85,173	994	24,509	2,10,675	42,783	5,780	45,924	3,05,162
31.03.2017	1,92,163	838	25,329	2,18,330	44,478	6,780	57,244	3,26,833
31.03.2018	1,97,172	838	24,897	2,22,907	45,293	6,780	69,022	3,44,002
31.03.2019	2,00,705	638	24,937	2,26,279	45,399	6,780	77,642	3,56,100
31.03.2020 (P)	2,05,135	510	24,955	2,30,600	45,699	6,780	87,028	3,70,106
Growth rate of 2019-20 over 2018-19(%)	**2.21**	**-20.06**	**0.07**	**1.91**	**0.66**	**0.00**	**12.09**	**3.93**
CAGR 2010-11 to 2019-20 (%)**	**9.07**	**-9.07**	**3.89**	**8.27**	**2.20**	**3.96**	**18.81**	**8.77**

Note: Data for RES has been revised with respect to year 2014, 2015 along with 2016 as per the data supplied by CEA

* RES= Renewable Energy Sources excluding Hydro

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

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

Source : Central Electricity Authority.

Table 2.3 (B) : Yearwise Installed Capacity of Electicity Generation in Utilities and Non-utilities

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

As on	Non-Utilities							Grand Total (Utility + Non-Utility)
	Thermal				Hydro	RES*	Total	
	Steam	Diesel	Gas	Total				
	10	11	12	13	14	15	16	17= 9+16
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	2,90,812
31.03.2015	26,089	12,009	5,193	43,291	65	1,301	44,657	3,19,561
31.03.2016	28,688	12,347	5,819	46,853	59	1,368	48,279	3,53,442
31.03.2017	30,572	13,350	6,109	50,031	65	1,433	51,529	3,78,362
31.03.2018	32,854	13,145	7,156	53,155	51	1,726	54,933	3,98,935
31.03.2019	47,679	15,571	8,787	72,037	103	3,067	75,207	4,31,307
31.03.2020 (P)	49,957	15,813	8,937	74,707	108	3,185	78,000	4,48,106
Growth rate of 2019-20 over 2018-19(%)	**4.78**	**1.56**	**1.70**	**3.71**	**4.41**	**3.87**	**3.71**	**3.89**
CAGR 2010-11 to 2019-20 (%)**	**10.09**	**5.06**	**5.87**	**8.25**	**6.62**	**18.84**	**8.52**	**7.97**

* RES= Renewable Energy Sources excluding Hydro

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

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

Source : Central Electricity Authority.

Table 2.4 : Regionwise and Statewise Installed Capacity of Electricity Generation (Utilities)

(in GW)

States/UTs	Hydro		Thermal		Nuclear		RES*		Total		Growth Rate (2019-20 to 2018-19) (%)
	31.03.19	31.03.20	31.03.19	31.03.20	31.03.19	31.03.20	31.03.19	31.03.20	31.03.19	31.03.20	
Chandigarh	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.04	0.03	0.04	**16.83**
Delhi	0.00	0.00	2.49	2.36	0.00	0.00	0.18	0.22	2.67	2.57	**-3.62**
Haryana	1.10	0.20	5.03	4.82	0.00	0.00	0.41	0.53	6.55	5.55	**-15.28**
Himachal Pradesh	2.48	2.48	0.00	0.00	0.00	0.00	0.88	0.95	3.36	3.43	**2.03**
Jammu & Kashmir	1.23	1.23	0.18	0.18	0.00	0.00	0.19	0.20	1.60	1.60	**0.37**
Punjab	2.60	1.24	6.92	6.92	0.00	0.00	1.28	1.45	10.80	9.62	**-11.00**
Rajasthan	1.10	0.43	10.31	10.97	0.00	0.00	7.33	9.24	18.73	20.64	**10.20**
Uttar Pradesh	0.72	0.72	12.77	12.77	0.00	0.00	2.91	3.21	16.41	16.70	**1.79**
Uttarakhand	1.98	1.98	0.55	0.55	0.00	0.00	0.59	0.66	3.13	3.19	**2.13**
Central Sector NR	8.60	11.52	13.56	14.22	1.62	1.62	0.38	0.38	24.16	27.74	**14.82**
Sub-Total (NR)	19.81	19.81	51.82	52.80	1.62	1.62	14.20	16.87	87.45	91.09	**4.17**
Chhattisgarh	0.12	0.12	16.45	16.25	0.00	0.00	0.54	0.55	17.10	16.92	**-1.07**
Gujarat	0.77	0.77	19.63	20.37	0.00	0.00	8.40	10.34	28.80	31.48	**9.33**
Madhya Pradesh	1.70	1.70	11.75	11.80	0.00	0.00	4.26	4.70	17.72	18.19	**2.68**
Maharashtra	3.33	3.33	24.29	23.37	0.00	0.00	9.19	9.59	36.81	36.29	**-1.43**
Daman & Diu	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.01	0.02	**37.25**
D. & N. Haveli	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	**0.00**
Goa	0.00	0.00	0.05	0.05	0.00	0.00	0.00	0.01	0.05	0.05	**2.31**
Central Sector WR	1.52	1.52	19.36	20.68	1.84	1.84	0.67	0.67	23.39	24.71	**5.64**
Sub-Total (WR)	7.45	7.45	91.52	92.51	1.84	1.84	23.08	25.87	123.89	127.67	**3.05**
Andhra Pradesh	1.67	1.67	12.84	12.30	0.00	0.00	7.49	8.11	22.00	22.09	**0.42**
Telangana	2.48	2.48	6.25	6.38	0.00	0.00	3.98	4.01	12.71	12.88	**1.32**
Karnataka	3.59	3.59	7.23	7.11	0.00	0.00	13.83	15.23	24.65	25.92	**5.17**
Kerala	1.86	1.86	0.33	0.33	0.00	0.00	0.36	0.38	2.55	2.57	**0.56**
Tamil Nadu	2.18	2.18	8.51	8.51	0.00	0.00	12.41	14.12	23.10	24.81	**7.38**
Puducherry	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.01	0.04	0.04	**6.65**
Lakshadweep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Central Sector SR #	0.00	0.00	12.75	13.10	3.32	3.32	0.54	0.54	16.61	16.96	**2.11**
Sub-Total (SR)	11.77	11.77	47.95	47.77	3.32	3.32	38.62	42.41	101.66	105.27	**3.55**
Bihar	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.34	0.33	0.34	**5.31**
Jharkhand	0.13	0.13	2.25	2.25	0.00	0.00	0.04	0.05	2.42	2.43	**0.32**
Odisha	2.06	2.06	4.22	5.54	0.00	0.00	0.50	0.51	6.78	8.11	**19.64**
West Bengal	0.99	0.99	7.54	7.43	0.00	0.00	0.47	0.53	9.00	8.95	**-0.57**
Sikkim	0.76	0.76	0.00	0.00	0.00	0.00	0.05	0.05	0.81	0.81	**0.01**
A. & N. Islands	0.00	0.00	0.04	0.04	0.00	0.00	0.01	0.01	0.05	0.05	**0.89**
Central Sector ER $	1.01	1.01	18.38	19.71	0.00	0.00	0.02	0.02	19.40	20.73	**6.86**
Sub-Total (ER)	4.94	4.94	32.43	34.97	0.00	0.00	1.42	1.51	38.79	41.42	**6.80**
Arunachal Pradesh	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.14	0.14	0.14	**0.16**
Assam	0.10	0.10	0.35	0.35	0.00	0.00	0.03	0.05	0.48	0.50	**3.89**
Manipur	0.00	0.00	0.04	0.04	0.00	0.00	0.01	0.01	0.04	0.05	**3.83**
Meghalaya	0.32	0.32	0.00	0.00	0.00	0.00	0.03	0.05	0.35	0.37	**3.89**
Mizoram	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.04	0.04	**2.76**
Nagaland	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.03	**0.00**
Tripura	0.00	0.00	0.17	0.17	0.00	0.00	0.02	0.02	0.19	0.19	**2.33**
Central Sector NER	1.01	1.31	2.00	2.00	0.00	0.00	0.03	0.03	3.04	3.34	**9.87**
Sub-Total (NER)	1.43	1.73	2.56	1.73	0.00	0.00	0.32	0.36	4.31	4.65	**7.88**
Total States	**33.27**	**30.35**	**160.22**	**160.88**	**0.00**	**0.00**	**76.01**	**85.40**	**269.50**	**276.63**	**2.64**
Total Central	**12.13**	**15.35**	**66.06**	**69.72**	**6.78**	**6.78**	**1.63**	**1.63**	**86.60**	**93.48**	**7.95**
Total All India	**45.40**	**45.70**	**226.28**	**230.60**	**6.78**	**6.78**	**77.64**	**87.03**	**356.10**	**370.11**	**3.93**

$ Damodar Valley Corporation (DVC) installed capacity is considered under central sector(ER)

* RES: Renewable Energy Sources excluding hydro

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

Source : Central Electricity Authority.

Table 2.5: State-wise cumulative Installed Capacity of Grid Interactive Renewable Power by Type

S. No.	STATES / UTs	Small Hydro Power (MW)		Wind Power (MW)		Bio-Power-BM Power/Cogen (MW)		Waste to Energy (MW)		Solar Power (MW)		Total Capacity (MW)		Growth Rate (2019 to 2020)
		2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	
1	Andhra Pradesh	162.11	162.11	4090.45	4092.45	477.18	477.18	23.16	23.16	3085.68	3610.02	7838.58	8364.92	**6.71**
2	Arunachal Pradesh	131.11	131.11	-	-	-	-	-	-	5.39	5.61	136.50	136.72	**0.16**
3	Assam	34.11	34.11	-	-	-	-	-	-	22.40	41.23	56.51	75.34	**33.32**
4	Bihar	70.70	70.70	-	-	121.20	121.20	-	-	142.45	151.57	334.35	343.47	**2.73**
5	Chhatisgarh	76.00	76.00	-	-	230.50	244.50	-	-	231.35	231.35	537.85	551.85	**2.60**
6	Goa	0.05	0.05	-	-	-	-	-	0.34	3.92	4.78	3.97	5.17	**30.23**
7	Gujarat	61.30	68.95	6073.07	7541.52	77.30	77.30	-	-	2440.13	2948.37	8651.80	10636.14	**22.94**
8	Haryana	73.50	73.50	-	-	205.66	205.66	-	-	224.52	252.14	503.68	531.30	**5.48**
9	Himachal Pradesh	860.61	911.51	-	-	7.20	7.20	-	-	22.68	32.93	890.49	951.64	**6.87**
10	Jammu & Kashmir	179.03	180.48	-	-	-	-	-	-	14.83	19.30	193.86	199.78	**3.05**
11	Jharkhand	4.05	4.05	-	-	4.30	4.30	-	-	34.95	38.40	43.30	46.75	**7.97**
12	Karnataka	1254.73	1280.73	4694.90	4790.60	1798.80	1881.80	1.00	1.00	6095.56	7277.93	13844.99	15232.06	**10.02**
13	Kerala	222.02	222.02	52.50	62.50	0.72	0.72	-	-	138.59	142.23	413.83	427.47	**3.30**
14	Madhya Pradesh	95.91	95.91	2519.89	2519.89	105.35	105.35	15.40	15.40	1840.16	2258.46	4576.71	4995.01	**9.14**
15	Maharashtra	375.57	379.58	4794.13	5000.33	2516.10	2516.10	12.59	12.59	1633.54	1801.80	9331.93	9710.40	**4.06**
16	Manipur	5.45	5.45	-	-	-	-	-	-	3.44	5.16	8.89	10.61	**19.35**
17	Meghalaya	32.53	32.53	-	-	13.80	13.80	-	-	0.12	0.12	46.45	46.45	**0.00**
18	Mizoram	36.47	36.47	-	-	-	-	-	-	0.50	1.52	36.97	37.99	**2.76**
19	Nagaland	30.67	30.67	-	-	-	-	-	-	1.00	1.00	31.67	31.67	**0.00**
20	Odisha	64.63	64.63	-	-	59.22	59.22	-	-	394.73	397.84	518.58	521.69	**0.60**
21	Punjab	173.55	173.55	-	-	317.10	317.10	9.25	10.75	905.62	947.10	1405.52	1448.50	**3.06**
22	Rajasthan	23.85	23.85	4299.72	4299.72	121.30	121.30	-	-	3226.79	5137.91	7671.66	9582.78	**24.91**
23	Sikkim	52.11	52.11	-	-	-	-	-	-	0.01	0.07	52.12	52.18	**0.12**
24	Tamil Nadu	123.05	123.05	8968.91	9304.34	997.55	997.55	6.40	6.40	2575.22	3915.88	12671.13	14347.22	**13.23**
25	Telangana	90.87	90.87	128.10	128.10	159.10	159.10	18.50	26.00	3592.09	3620.75	3988.66	4024.82	**0.91**
26	Tripura	16.01	16.01	-	-	-	-	-	-	5.09	9.41	21.10	25.42	**20.47**
27	Uttar Pradesh	25.10	25.10	-	-	2115.51	2115.51	-	-	960.10	1095.10	3100.71	3235.71	**4.35**
28	Uttarakhand	214.32	214.32	-	-	130.50	130.50	-	-	306.75	315.90	651.57	660.72	**1.40**
29	West Bengal	98.50	98.50	-	-	319.92	319.92	-	-	75.95	114.46	494.37	532.88	**7.79**
30	Andaman & Nicobar	5.25	5.25	-	-	-	-	-	-	11.73	12.19	16.98	17.44	**2.71**
31	Chandigarh	-	-	-	-	-	-	-	-	34.71	40.55	34.71	40.55	**16.83**
32	Dadar & Nagar Haveli	-	-	-	-	-	-	-	-	5.46	5.46	5.46	5.46	**0.00**
33	Daman & Diu	-	-	-	-	-	-	-	-	14.47	19.86	14.47	19.86	**37.25**
34	Delhi	-	-	-	-	-	-	52.00	52.00	126.89	165.16	178.89	217.16	**21.39**
35	Lakshwadeep	-	-	-	-	-	-	-	-	0.75	0.75	0.75	0.75	**0.00**
36	Puducherry	-	-	-	-	-	-	-	-	3.14	5.51	3.14	5.51	**75.48**
37	Others	-	-	4.30	4.30	-	-	-	-	-	-	4.30	4.30	**0.00**
Total (MW)		**4593.15**	**4683.16**	**35625.97**	**37743.75**	**9778.31**	**9778.31**	**138.30**	**147.64**	**28180.71**	**34627.82**	**78316.44**	**87077.68**	**11.19**

Source: Ministry of New and Renewable Energy

Table 2.6 : Installation of Off-grid / Decentralised Renewable Energy Systems/ Devices as on 31.03.2020

Sl. No.	State/UT	Biogas Plants (Nos.)	SPV Pumps (Nos.)	Solar Photovoltaic (SPV) Systems				Waste to Energy (MW)
				SLS (Nos.)	HLS (Nos.)	SL (Nos.)	PP (KWP)	
1	2	3	4	5	6	7	8	9
1	Andhra Pradesh	266744	34045	10487	22972	77803	3816	28.205
2	Arunachal Pradesh	3609	22	5410	35065	36694	963	-
3	Assam	138483	45	10556	46879	647761	1605	-
4	Bihar	129925	2813	38432	12303	1735227	6770	1
5	Chhattisgarh	59700	61970	2042	42232	3311	31372	0.33
6	Goa	4226	15	707	393	1093	33	-
7	Gujarat	435287	11522	4754	9253	31603	13577	19.245
8	Haryana	63436	1293	34625	56727	93853	2321	4.885
9	Himachal Pradesh	47706	6	78100	22592	33909	1906	1
10	Jammu & Kashmir	3200	39	15387	144316	51224	8130	-
11	Jharkhand	7855	4670	12733	9450	790515	3770	-
12	Karnataka	510942	7420	3210	52638	7781	7854	13.622
13	Kerala	152771	818	1735	41912	54367	15825	0.23
14	Madhya Pradesh	376221	17813	11683	7920	529101	3654	4.901
15	Maharashtra	924092	11315	10420	3497	239297	3858	31.042
16	Manipur	2128	40	11967	24583	9058	1581	-
17	Meghalaya	11156	19	5800	14874	40750	2004	-
18	Mizoram	5856	37	5625	12060	34512	3175	-
19	Nagaland	7953	3	6235	1045	6766	1506	-
20	Odisha	271690	9551	17597	5274	99843	1322	-
21	Punjab	185583	4413	42758	8626	17495	2066	7.455
22	Rajasthan	72497	48175	7114	187968	225851	30449	3.833
23	Sikkim	9044	0	504	15059	23300	850	-
24	Tamil Nadu	223894	5459	39419	296505	16818	13052	17.74
25	Telangana	316665	424	1958	0	0	7450	4.092
26	Tripura	3710	151	1990	32723	64801	867	-
27	Uttar Pradesh	440949	28650	278905	235909	2330083	10638	50.235
28	Uttarakhand	364582	26	27739	91595	163386	4060	9.22
29	West Bengal	1072	653	11813	145332	17662	1730	1.167
30	Andaman & Nicobar	97	5	390	468	6296	167	-
31	Chandigarh	169	12	898	275	1675	730	-
32	Dadar & Nagar Haveli	681	0	0	0	0	0	-
33	Daman & Diu	0	0	0	0	0	0	-
34	Delhi	0	90	301	0	4807	1269	-
35	Lakshadweep	578	0	4168	600	5289	2190	-
36	Puducherry	17541	21	417	25	1637	121	-
37	Others*	-	4621	9150	140273	125797	23885	-
	Total	**5060042**	**2,56,156**	**7,15,029**	**17,21,343**	**75,29,365**	**2,14,565**	**198.20**

* 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;

MW = Mega Watt; KWP = Kilowatt peak

Source : Ministry of New and Renewable Energy

Chapter | 3

Production of Energy Resources

CHAPTER 3
Production of Energy Resources

Production

Energy production and consequently its' availability directly affects future production, imports, exports and investment, all of which have a significant impact on a country's economy. Detailed and high-quality energy statistics provide policy makers with the information needed to make informed decisions and evaluate possible trade-offs including planning for global price shocks in energy commodities.

Data on production of energy commodities, and stock changes are also required for monitoring national energy security. In a rapidly changing energy scenario of the world in terms of trade, consumption and stock levels, problems with national energy supply often are perceived threatening to national independence, especially if national energy resources do not meet energy demands.

In Energy Statistics, production is defined as the capture, extraction or manufacture of fuels or energy informs that are ready for general use. 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.

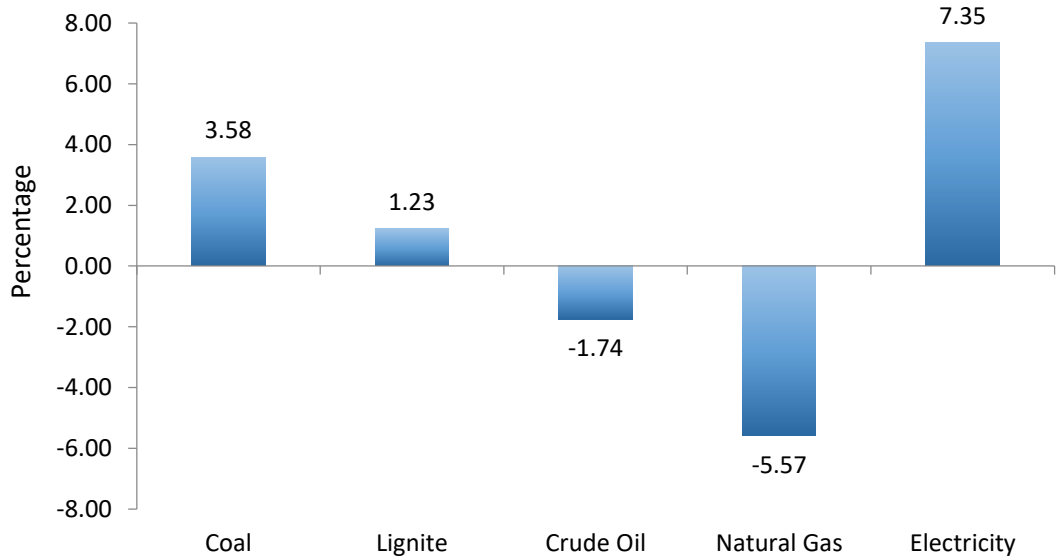
Secondary production is the manufacture of energy products through the process of transformation of other fuels or energy, whether primary or secondary. The quantities of secondary fuels reported as production include quantities lost through venting and flaring during and after production.

This chapter presents the production of different energy resources and electricity.

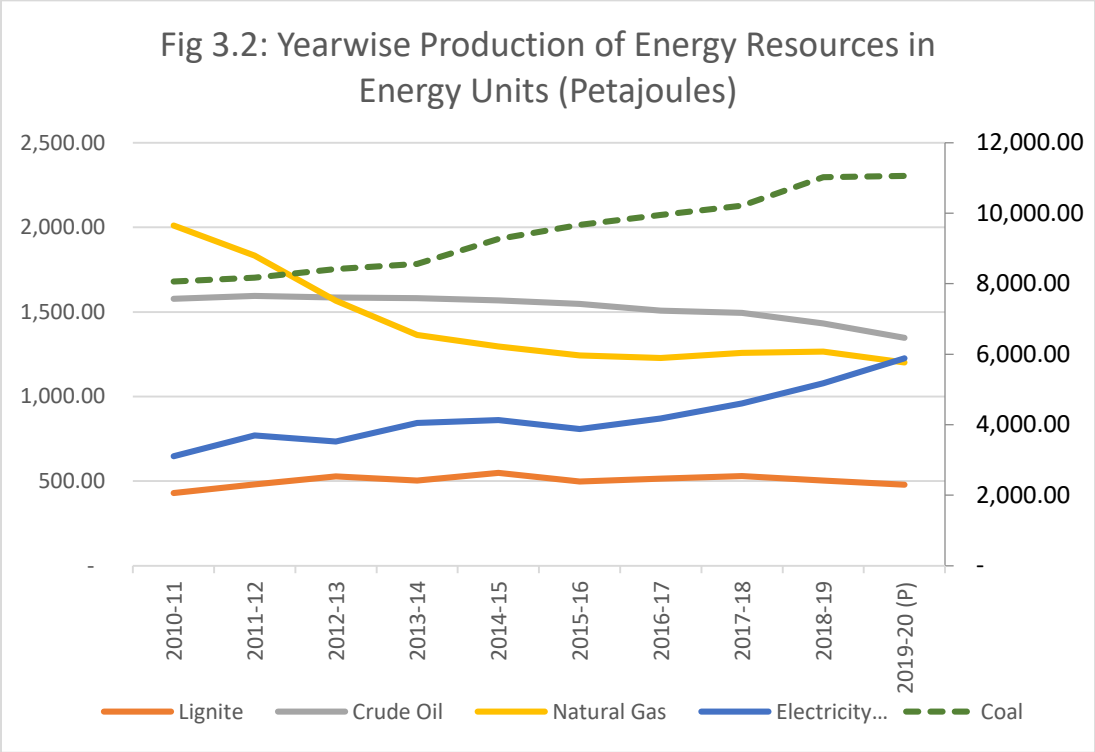
Highlights

- Coal production in the country during the year 2019-20(P) was 730.87 million tonne as compared to 728.72 million tonnes during 2018-19, growing at the rate of 0.30%. The overall trend of production in the last ten years i.e. 2010-11 to 2019-20 has shown a steady increase with a CAGR of 3.58%(Table 3.1).
- The Lignite production during 2019-20 (P) reduced to 42.10 million tonnes from the figure of 44.28 million tonnes in 2018-19 which is 4.92% lower than the production in 2018-19. However, the CAGR of Lignite was about 1.23% with production increasing from 37.73 million tonnes in 2010-11 to 42.10 million tonnes in 2019-20 (P).
- Similarly, Production of crude oil for 2019-20 (P) was 32.17 MT as compared to 34.2 MT in the previous year which is a fall of 5.95%.
- The CAGRs for natural gas and electricity were (-) 5.57% and 7.35% respectively for the period 2010-11 to 2019-20 (P) with Electricity showing the highest CAGR among all the resources of energy during this period.

Fig 3.1: Compound Annual Growth Rate of Production of Energy Resources from 2010-11 to 2019-20 (P)

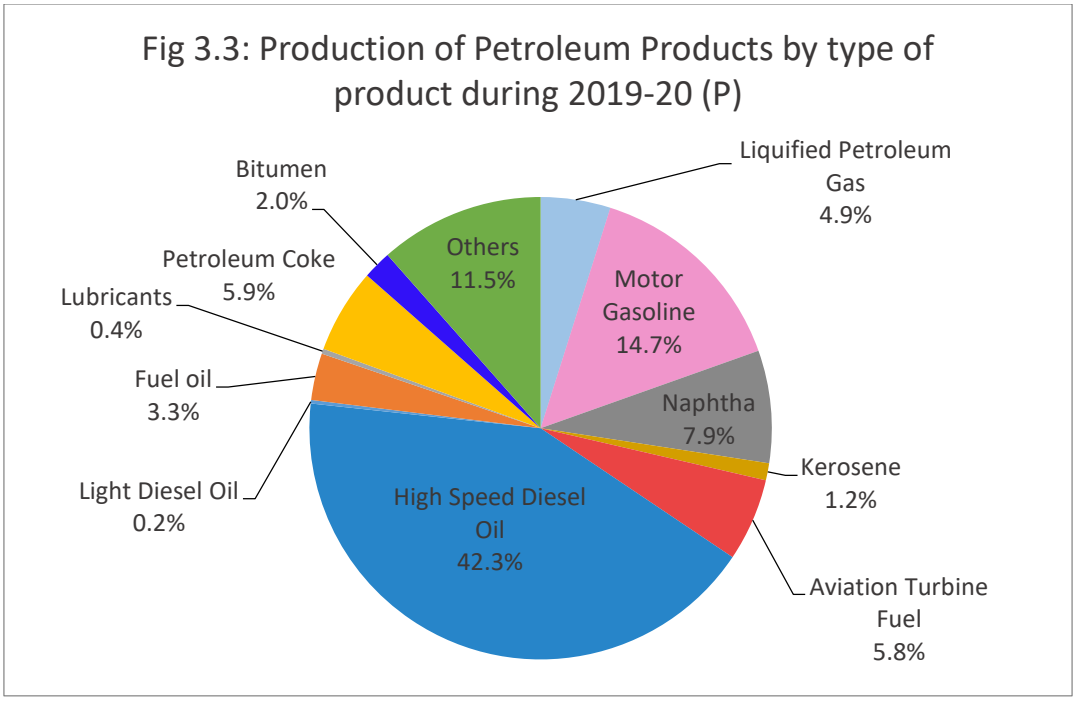


- To allow comparison among and aggregation of production by different sources of energy, production has been converted in terms of energy units, Petajoules. It may be seen that the total production of energy resources increased from 15305.45 petajoules during 2018-19 to 15311 petajoules during 2019-20(P), showing an increase of 0.04%(Table 3.2).
- Coal was the major source of energy, accounting for about 72.22% of the total production during 2019-20 (P). However, although Crude Oil was the second major resource but only 8.79% of the total production of energy was contributed by Crude Oil.

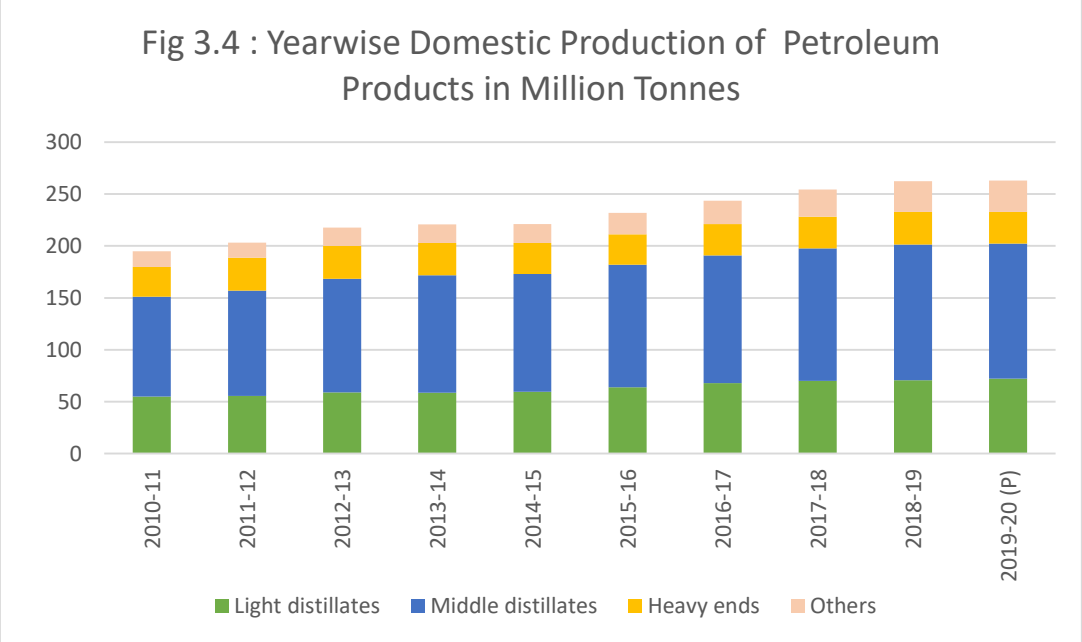


**Coal is plotted on the secondary axis on the right side

- In the year 2018-19, the production of Petroleum Products in the country was 262.36 MT as against 262.94 MT during 2019-20(P), an increase of 0.22%. In the total production of Petroleum Products during 2019-20(P), High Speed Diesel Oil accounted for the maximum share (42.13%), followed by Motor Gasoline (14.70%). (Table 3.4).



- The year-wise growth of domestic production of Petroleum Products for different categories of distillates has seen an increasing trend over the years 2010-11 to 2019-20(P) with middle and light distillates moving more rapidly than heavy ends over the same period.



- Net production of Natural Gas for consumption decreased from to 32.05 Billion Cubic Meters(BCM) in 2018-19 to 30.26 BCM in 2019-20(P) registering a shrinkage of 5.61% (Table 3.5).
- The gross electricity generation from utilities grew at a CAGR of 5.63% in the last ten years from 2010-11 to 2019-20(P).
- Also, in terms of year on year growth, from 2018-19 to 2019-20(P), gross generation of electricity from Hydro, Nuclear and other Renewable Resources from Utilities grew at 15.48%, 22.90% and 9.13% respectively whereas a decline in growth rate of 2.75% is seen from Thermal resources. Thus depicting the shift and focus on using more renewable and clean sources of energy in this year to meet the growing energy demands of the country. (Table 3.6).

Table 3.1 : Yearwise Production of Energy Resources in Physical Units

Year	Coal (million tonnes)	Lignite (million tonnes)	Crude Oil (million tonnes)	Natural Gas (Billion Cubic Metres)	Electricity (Hydro, Nuclear and RES) (GWh)
1	2	3	4	5	6
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	40.68	2,04,035.31
2013-14	565.77	44.27	37.79	35.41	2,34,595.01
2014-15	612.44	48.27	37.46	33.66	2,38,908.43
2015-16	639.23	43.84	36.94	32.25	2,24,571.11
2016-17	657.87	45.23	36.01	31.90	2,41,841.64
2017-18	675.40	46.64	35.68	32.65	2,66,308.30
2018-19	728.72	44.28	34.20	32.87	2,99,465.00
2019-20 (P)	730.87	42.10	32.17	31.18	3,40,578.57
Growth rate of 2019-20 over 2018-19 (%)	**0.30**	**-4.92**	**-5.95**	**-5.14**	**13.73**
CAGR 2010-11 to 2019-20 (%)	**3.58**	**1.23**	**-1.74**	**-5.57**	**7.35**

(P): provisional

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

#For Natural Gas Gross Production is reported

Sources:

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

Table 3.2 : Yearwise Production of Energy Resources in Energy Units

(in Petajoules) @

Year	Coal	Lignite	Crude Oil	Natural Gas	Electricity (Hydro, Nuclear and RES)	Total
1	2	3	4	5	6	7= 2 to 6
2010-11	8,059.66	429.02	1,577.66	2,011.51	647.74	12,725.60
2011-12	8,169.44	481.31	1,594.83	1,832.01	770.49	12,848.08
2012-13	8,418.36	528.17	1,585.20	1,566.99	734.53	12,833.25
2013-14	8,560.02	503.36	1,582.20	1,363.87	844.54	12,854.00
2014-15	9,266.22	548.83	1,568.49	1,296.48	860.07	13,540.09
2015-16	9,671.55	498.48	1,546.75	1,242.24	808.46	13,767.48
2016-17	9,953.54	514.27	1,507.69	1,228.66	870.63	14,074.79
2017-18	10,218.80	530.34	1,494.10	1,257.65	958.71	14,459.61
2018-19	11,025.50	503.50	1,432.09	1,266.28	1,078.07	15,305.45
2019-20 (P)	11,058.11	478.71	1,346.93	1,201.22	1,226.08	15,311.05
Growth rate of 2019-20 over 2018-19 (%)	**0.30**	**-4.92**	**-5.95**	**-5.14**	**13.73**	**0.04**
CAGR 2010-11 to 2019-20 (%)	**3.58**	**1.23**	**-1.74**	**-5.57**	**7.35**	**2.08**

(P): provisional

* Electricity from hydro, Nuclear and other Renwable energy sources from utilities

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

Sources:

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

Table 3.3 : Yearwise Production of Coal - Typewise and Sectorwise

(Million Tonnes)

Year	Coking	Non-coking	Total	Public	Private	Total
1	2	3	4=(2)+(3)	5	6	7=(5)+(6)
2010-11	49.55	483.15	532.69	485.06	47.63	532.69
2011-12	51.66	488.29	539.95	503.84	36.11	539.95
2012-13	51.58	504.82	556.40	521.68	34.73	556.40
2013-14	56.82	508.95	565.77	528.08	37.69	565.77
2014-15	57.45	551.73	609.18	567.03	42.15	609.18
2015-16	60.89	578.34	639.23	606.68	32.55	639.23
2016-17	61.66	596.21	657.87	625.20	32.67	657.87
2017-18	40.15	635.25	675.40	641.77	33.63	675.40
2018-19	41.13	687.59	728.72	694.98	33.74	728.72
2019-20(P)	52.94	677.94	730.87	695.56	35.31	730.87
Growth rate of 2019-20 over 2018-19 (%)	**28.71**	**-1.40**	**0.30**	**0.08**	**4.67**	**0.30**
CAGR 2010-11 to 2019-20 (%)	**0.74**	**3.84**	**3.58**	**4.09**	**-3.27**	**3.58**

(P): Provisional

Source : Office of Coal Controller of India

Table 3.4: Yearwise Domestic Production of Petroleum Products

(Million Tonnes)

Year	Light distillates			Middle distillates			
	LPG	MG	Naphtha	Kerosene	ATF	HSD	LDO
1	2	3	4	5	6	7	8
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	19.02	7.97	10.09	91.10	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	10.57	35.32	17.86	7.50	11.79	98.59	0.43
2016-17	11.33	36.59	19.95	6.04	13.83	102.48	0.63
2017-18	12.38	37.78	20.01	4.41	14.59	107.90	0.56
2018-19	12.79	38.04	19.79	4.07	15.48	110.53	0.70
2019-20 (P)	12.82	38.62	20.68	3.14	15.24	111.20	0.64
Growth rate of 2019-20 over 2018-19(%)	**0.29**	**1.52**	**4.51**	**-22.84**	**-1.56**	**0.60**	**-8.31**
CAGR 2010-11 to 2019-20 (%)	**3.14**	**4.43**	**0.83**	**-9.62**	**5.28**	**4.01**	**0.96**

(p) : Provisional LPG=Liquified Petroleum Gas, MG= Motor Gasoline, ATF= Aviation Turbine Fuel
HSD= High Speed Diesel Oil, LDO= Light Diesel Oil

Source : Ministry of Petroleum & Natural Gas.

Table 3.4 (Contd.): Yearwise Domestic Production of Petroleum Products

(Million Tonnes)

Year	Heavy ends				Others*	Total
	Fuel oil	Lubes	Pet. Coke	Bitumen		
1	9	10	11	12	13	14 = Sum (2-13)
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	17.65	217.74
2013-14	13.41	0.94	12.07	4.79	17.93	220.76
2014-15	11.92	0.95	12.45	4.63	18.19	221.14
2015-16	9.73	1.04	13.32	5.16	20.62	231.92
2016-17	9.96	1.03	13.94	5.19	22.59	243.55
2017-18	9.49	1.04	14.75	5.28	26.21	254.40
2018-19	10.03	0.95	14.68	5.80	29.50	262.36
2019-20 (P)	8.61	0.93	15.53	5.24	30.29	262.94
Growth rate of 2019-20 over 2018-19(%)	**-14.18**	**-1.81**	**5.80**	**-9.63**	**2.67**	**0.22**
CAGR 2010-11 to 2019-20 (%)	**-9.20**	**0.59**	**21.40**	**1.77**	**8.01**	**3.39**

(P): Provisional Lubes= Lubricant, Pet.Coke= Petroleum Coke

$: Includes other Light distillates from 2006-07

* Others include VGO, Benzene, MTO, CBFS, Sulphur, Waxes, MTBE & Reformate, etc.

Source : Ministry of Petroleum & Natural Gas.

Table 3.5 : Yearwise Gross and Net Production of Natural Gas

(in Billion Cubic Metres)

Year	Gross Production	Internal Consumption	Flared	Losses	Net Production (For Sales)	Net Production (For Consumption)
1	2	3	4	5	6=2-3-4-5	7=2-4-5
2010-11	52.22	5.21	0.97	**	46.04	51.25
2011-12	47.56	5.28	0.97	0.03	41.28	46.56
2012-13	40.68	5.40	0.90	0.03	34.35	39.75
2013-14	35.41	5.59	0.77	0.07	28.98	34.57
2014-15	33.66	5.91	0.87	0.10	26.78	32.69
2015-16	32.25	5.83	1.01	0.12	25.30	31.12
2016-17	31.90	5.86	0.98	0.07	24.99	30.85
2017-18	32.65	5.81	0.82	0.09	25.92	31.73
2018-19	32.87	6.02	0.73	0.09	26.04	32.05
2019-20 (P)	31.18	6.05	0.86	0.07	24.20	30.26
Growth rate of 2019-20 over 2018-19(%)	**-5.14**	**0.60**	**18.44**	**-27.53**	**-7.04**	**-5.61**
CAGR 2010-11 to 2019-20 (%)	**-5.57**	**1.68**	**-1.32**	**-**	**-6.89**	**-5.69**

P : Provisional **:Included in Internal consumption

Total may not tally due to rounding off.

Source : Ministry of Petroleum & Natural Gas.

Table 3.6 (A): Yearwise Gross Generation of Electricity from Utilities

(Giga Watt hour=10^6 Kilo Watt hour)

Year	Utilities							
	Thermal				Hydro	Nuclear	RES*	Total
	Steam	Diesel	Gas	Total				
1	2	3	4	5	6	7	8	9
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	8,95,340	551	47,122	9,43,013	1,21,377	37,414	65,781	11,67,584
2016-17	9,44,022	401	49,094	9,93,516	1,22,378	37,916	81,548	12,35,358
2017-18	9,86,591	348	50,208	10,37,146	1,26,123	38,346	1,01,839	13,03,455
2018-19	10,22,265	215	49,834	10,72,314	1,34,894	37,813	1,26,759	13,71,779
2019-20 (P)	9,94,197	199	48,443	10,42,838	1,55,769	46,472	1,38,337	13,83,417
Growth rate of 2019-20 over 2018-19(%)	**-2.75**	**-7.70**	**-2.79**	**-2.75**	**15.48**	**22.90**	**9.13**	**0.85**
CAGR 2010-11 to 2019-20(%)	**6.56**	**-26.53**	**-7.77**	**5.13**	**3.49**	**6.54**	**15.03**	**5.63**

(P)-Provisional * RES: Renewable Energy Sources excluding hydro

Source : Central Electricity Authority.

Table 3.6 (B) : Yearwise Gross Generation of Electricity from Non-Utilities

(Giga Watt hour= 10^6 x Kilo Watt hour)

Year	Non-Utilities							Grand Total
	Thermal				Hydro	RES*	Total	
	Steam	Diesel	Gas	Total				
1	10	11	12	13	14	15	16	17
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	1,36,721	8,412	21,083	1,66,216	110	2,046	1,68,372	13,35,956
2016-17	1,37,588	9,182	22,855	1,69,625	144	2,277	1,72,046	14,07,404
2017-18	1,43,868	8,107	25,362	1,77,337	112	2,328	1,79,777	14,83,232
2018-19	1,84,250	5,334	19,545	2,09,130	270	3,674	2,13,074	15,84,853
2019-20 (P)	1,86,578	4,819	19,473	2,10,869	280	3,851	2,15,000	15,98,417
Growth rate of 2019-20 over 2018-19(%)	**1.26**	**-9.66**	**-0.37**	**0.83**	**3.73**	**4.81**	**0.90**	**0.86**
CAGR 2010-11 to 2019-20(%)	**7.58**	**-4.64**	**2.35**	**5.81**	**6.53**	**15.36**	**5.92**	**5.17**

(P)-Provisional * RES: Renewable Energy Sources excluding hydro

Source : Central Electricity Authority.

Chapter | 4

Foreign Trade & Prices of Energy Resources

CHAPTER 4
Foreign Trade and Prices of Energy Resources

Trade and Prices

Issues that face the developing countries and the international community include ensuring, through national and international measures, that energy is (a) accessible to households and industries; (b) affordable for all, especially the poor; (c) sustainably produced and consumed; and (d) available for promoting development locally and globally coupled with the imperative to mitigate climate change.

Drastic "de-carbonization" of energy generation and use by households and industries, intensifies high volatility present in the international energy market trends, and thus impacts energy importers/exporters countries equally.

Countries need to encourage a more efficient management of energy resources, coupled with an accelerated growth of renewable and sustainable sources of energy. The need of the hour, thus, is increased investment, development of necessary infrastructure and also improvement in trade regimes in order to achieve self-sufficiency in terms of import dependency.

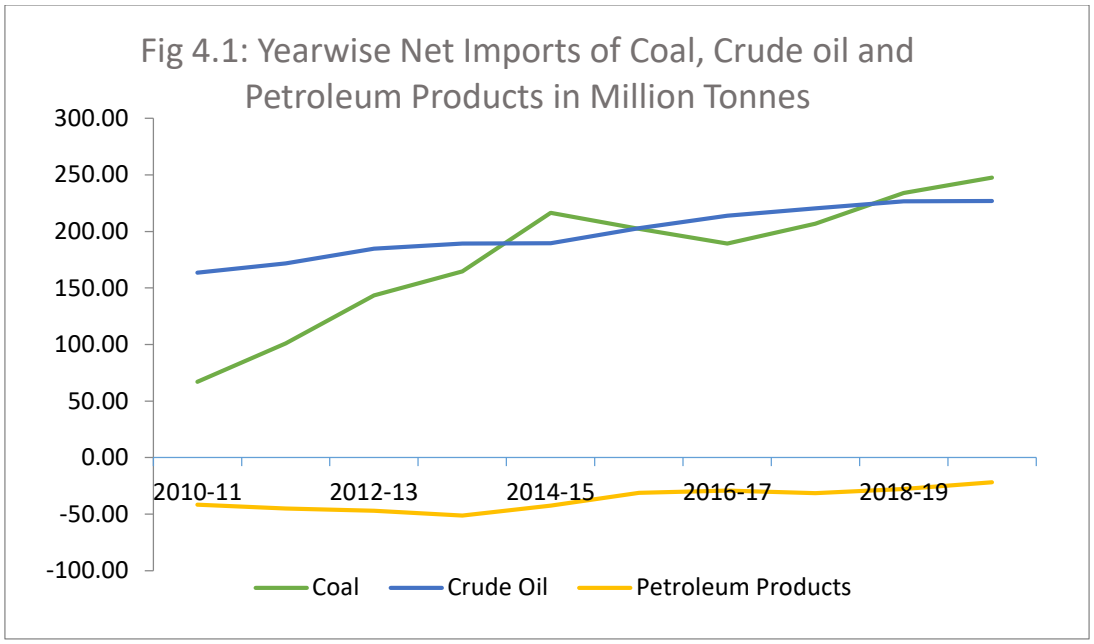
To holistically mitigate the effects of the situation, Energy policies in India in the recent years have been designed to address the country's growing energy deficit and to focus on developing alternative sources of energy, particularly nuclear, solar, and wind energy.

India has been focusing on reducing its dependence on energy imports and diversifying its energy basket. The aim is to achieve Energy Security - the continuous availability of energy in varied forms, in sufficient quantities, at reasonable prices, to fuel economic growth in the coming years. Moreover, the international community should promote an enabling environment for the development and utilization of financing mechanisms for exchange of new energy technology and infrastructure.

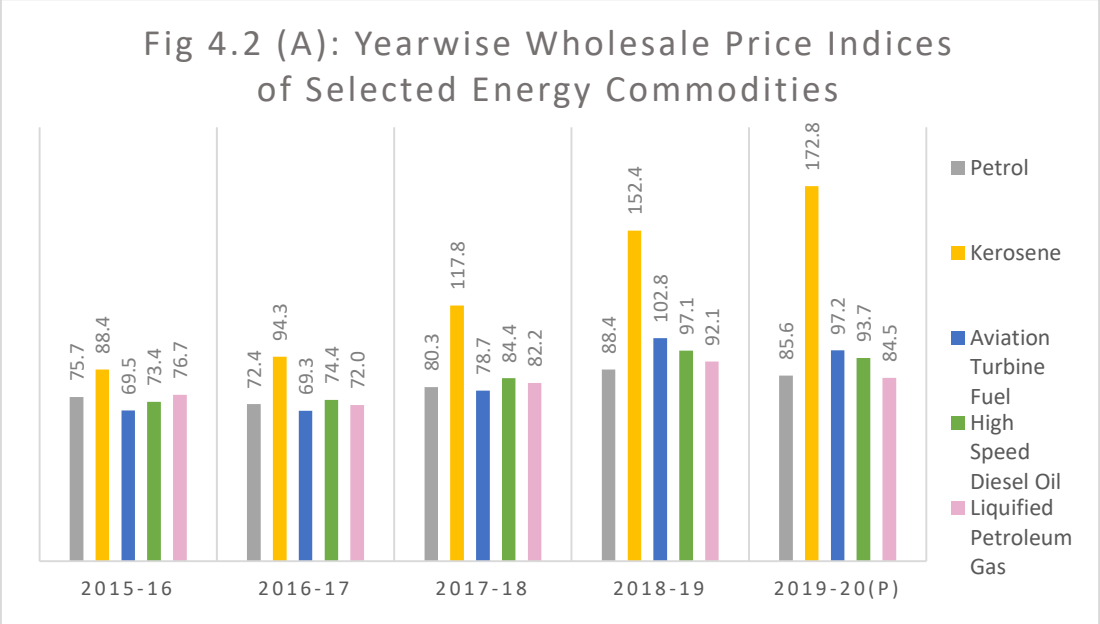
This chapter presents glimpses of trade and price statistics of major energy resources and products in the country.

Highlights

- There has been an increasing trend in the net import of coal in the recent years. Over the last ten years, Net Import of coal steadily increased from 67.04 MTs in 2010-11 to 210.87 MTs in 2014-15. This was followed by a marginal decline in the succeeding 2 years but again started increasing though the increase in 2019-20(P) over 2018-19 was only 5% as compared to 13% in 2018-19 over 2017-18. (Table 4.1).
- India is also highly dependent on imports of crude oil to meet domestic consumption. Imports of crude oil have increased from 163.60 MTs during 2010-11 to 226.95 MTs during 2019-20(P). While the increase of 0.20% in the imports of crude oil during 2019-20(P) over 2018-19 is marginal, the overall CAGR of Net imports of crude oil in the last ten years from 2010-11 to 2019-20(P) has been a rate of 3.70%.
- However, India is an exporter of Petroleum Products. The export of petroleum products has increased from 59.08 MT during 2010-11 to 65.69 MT during 2019-20(P). The CAGR of exports of petroleum products from 2010-11 to 2019-20(P) is 1.19 %. However, during 2019-20(P), exports witnessed decrease of (-) 21.08% from the previous year 2018-19.
- The import of Natural Gas stood at 28.74 BCM for the year 2018-19 as compared to 33.89 BCM in the 2019-20(P) recording an annual growth of 17.91%. The import of natural gas has also increased from 12.93 BCM in 2010-11 to 33.89 BCM in 2019-20(P) recording a CAGR of 11.30%.
- India's exports of electricity started rising as compared to gross imports since 2016-17. The export of electricity has increased from 128 GWh in 2010-11 to 9491 GWh in 2019-20(P) with a CAGR of 61.29%.
- As compared to the previous year, 2018-19, export of electricity grew by 12.07%. Import has also shown an increasing trend during the period but at a slower pace with the exception of 2018-19. Import in that year was the lowest during the ten years' period 2010-11 to 2019-20(P).



- Wholesale Price Index (WPI) of Petroleum Products varied for different products ranging from a growth rate year on year of 13.39%(Kerosene) to (-) 3.17%(Petrol). Index was highest for kerosene (172.8) (Table 4.2).



- The Wholesale Price Index (WPI) among non-petroleum products showed a positive growth rate of 7.32% (lignite) followed by 3.91% (Coking Coal) and 2.01% (Electricity).

Fig 4.2(B): Yearwise Wholesale Price Indices of Selected Energy Commodities

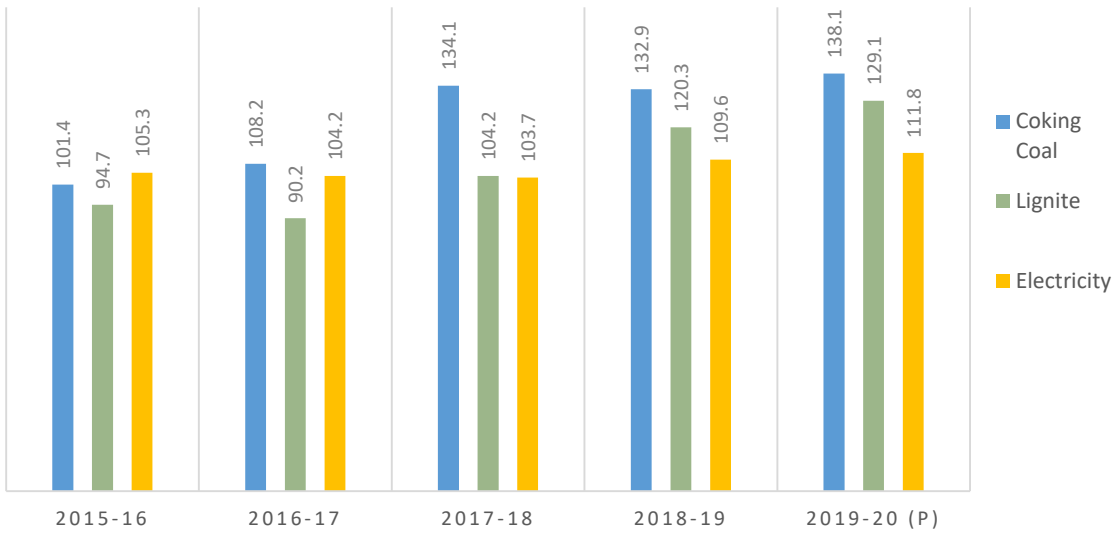


Table 4.1: Yearwise Foreign Trade in Coal, Crude Oil, Petroleum Products, Natural Gas and Electricity

Year	Coal (Million Tonnes)			Crude Oil (Million Tonnes)			Petroleum Products (Million Tonnes)		
	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)
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	100.83	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	16.35	63.41	-47.05
2013-14	166.86	2.19	164.67	189.24	0.00	189.24	16.70	67.86	-51.17
2014-15	212.10	1.24	210.87	189.43	0.00	189.43	21.30	63.93	-42.63
2015-16	203.95	1.58	202.37	202.85	0.00	202.85	29.46	60.54	-31.08
2016-17	190.95	1.77	189.18	213.93	0.00	213.93	36.29	65.51	-29.23
2017-18	208.27	1.50	206.77	220.43	0.00	220.43	35.46	66.83	-31.37
2018-19	235.24	1.31	233.93	226.50	0.00	226.50	33.35	61.10	-27.75
2019-20 (P)	248.54	1.05	247.49	226.95	0.00	226.95	43.79	65.69	-21.90
Growth rate of 2019-20 over 2018-19(%)	**12.95**	**-12.64**	**5.80**	**0.20**	**-**	**0.20**	**31.30**	**7.51**	**-21.08**
CAGR 2010-11 to 2019-20 (P) (%)	**15.32**	**-6.29**	**15.62**	**3.70**	**-**	**3.70**	**10.81**	**1.19**	**-6.91**

(P): Provisional

Sources:

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

Table 4.1 (Contd): Yearwise Foreign Trade in Coal, Crude Oil, Petroleum Products, Natural Gas and Electricity

Year	Natural Gas (BCM)			Electricity (Gwh)		
	Gross Imports	Exports	Net Imports	Gross Imports	Exports	Net Imports
1	11	12	13=(11)-(12)	14	15	16=(14)-(15)
2010-11	12.93	0.00	12.93	5611	128	5482
2011-12	18.00	0.00	18.00	5253	135	5118
2012-13	17.61	0.00	17.61	4795	154	4641
2013-14	17.80	0.00	17.80	5598	1651	3947
2014-15	18.61	0.00	18.61	5008	4433	575
2015-16	21.39	0.00	21.39	5244	5150	94
2016-17	24.85	0.00	24.85	5617	6710	-1093
2017-18	27.44	0.00	27.44	5072	7203	-2131
2018-19	28.74	0.00	28.74	4396	8469	-4073
2019-20 (P)	33.89	0.00	33.89	6351	9491	-3140
Growth rate of 2019-20 over 2018-19(%)	**17.91**	**-**	**17.91**	**44.47**	**12.07**	**-22.90**
CAGR 2010-11 to 2019-20 (P) (%)	**11.30**	**-**	**11.30**	**1.39**	**61.29**	**-**

(P): Provisional.

Sources:

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

Table 4.2 : Yearwise Wholesale Price Indices of Energy Commodities

(Base Year 2011-12=100)

Year	Petrol	Kero-sene	Aviation Turbine Fuel	High Speed Diesel Oil	Bitumen	Furnace Oil	Lubri-cants	LPG	Coking Coal	Petroleum Coke	Lignite	Electricity
1	2	3	4	5	6	7	8	9	10	11	12	13
2012-13	114.9	107.1	112.6	111.6	101.3	107.7	109.6	107.8	100.0	99.4	98.9	100.5
2013-14	124.6	109.3	119.7	126.3	112.1	111.5	114.2	118.6	101.2	92.8	99.2	103.6
2014-15	108.6	103.5	105.1	114.8	106.1	93.6	118.8	103.5	101.4	94.3	99.2	105.7
2015-16	75.7	88.4	69.5	73.4	77.1	54.3	120.8	76.7	101.4	78.3	94.7	105.3
2016-17	72.4	94.3	69.3	74.4	68.0	58.1	116.8	72.0	108.2	93.0	90.2	104.2
2017-18	80.3	117.8	78.7	84.4	71.3	68.8	114.0	82.2	134.1	117.2	104.2	103.7
2018-19	88.4	152.4	102.8	97.1	85.6	94.7	124.8	92.1	132.9	149.7	120.3	109.6
2019-20 (P)	85.6	172.8	97.2	93.7	82.8	81.0	131.7	84.5	138.1	128.6	129.1	111.8
Increase in 2019-20 over 2018-19 (%)	**-3.17**	**13.39**	**-5.45**	**-3.50**	**-3.27**	**-14.47**	**5.53**	**-8.25**	**3.91**	**-14.09**	**7.32**	**2.01**

* Annual average of monthly index, Financial Year wise

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

Chapter | 5

Availability of Energy Resources

CHAPTER 5
Availability of Energy Resources

Availability

The availability of and access to energy and energy sources are particularly essential for poverty reduction and further improvements in standards of living.

Data on availability of energy resources within the national territory of a given country during a reference period along with reliable and timely monitoring of the supply and use of energy becomes indispensable for sound decision-making.

Data items, particularly, on mineral and energy resources are important for the assessment of their availability in the environment, as well as for the assessment of their depletion. This information is often used in the compilation of asset accounts in the SNA, as well as in SEEA-Energy accounts to assess their availability in the long run.

More importantly, it is essential for countries to track their depletion of energy related natural resources, as this directly affects their availability for future generations and increasing dependence of an economy on trade to balance the deficit. Thus, there has been a thrust to rely on renewable and cleaner forms of energy in the recent years, world over, – to bridge the gap between demand and supply without affecting the environment drastically.

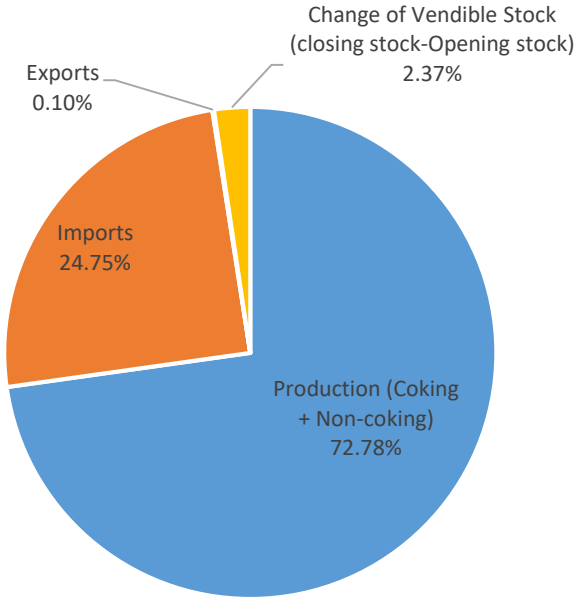
Owing to the necessity of Energy security in the current world and availability of energy being an enabler of life improvement, access and availability of Clean Energy for all has been recognized as an agenda point of the Sustainable Development Goals which are to be achieved by countries till 2030.

This chapter presents the availability of primary energy resources, petroleum products and electricity in the economy.

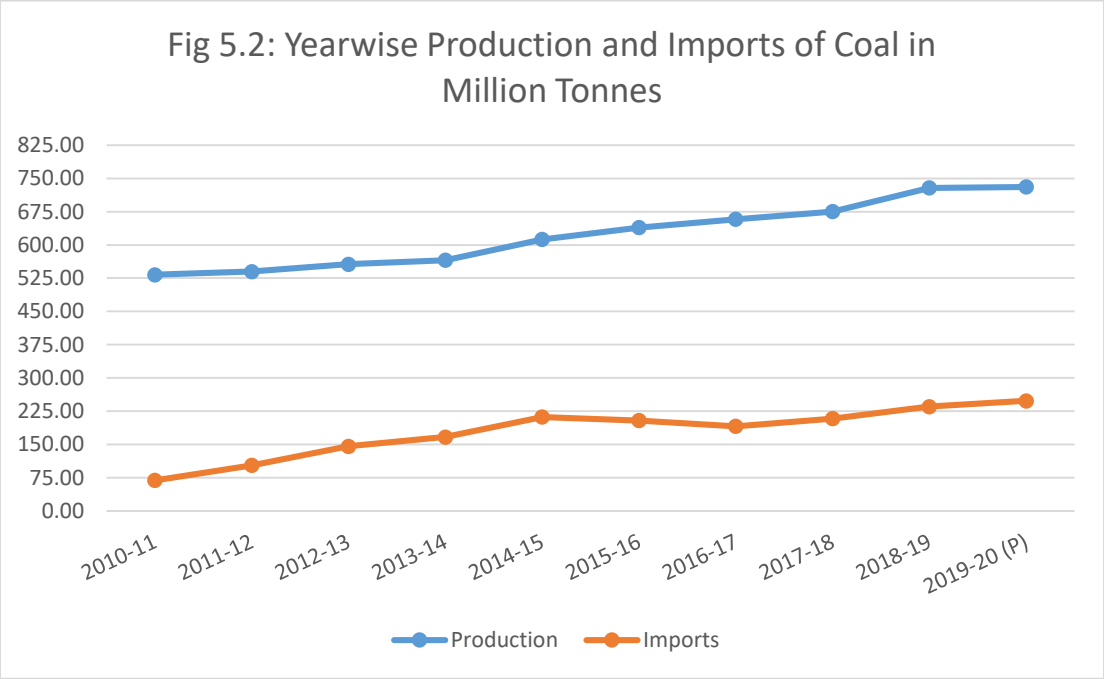
Highlights

- Over the previous year, 2018-19, in comparison to the current year, 2019-20(P), the total availability of energy resources has seen a growth in Coal and Natural Gas, whereas, it has decreased for Lignite and Crude Oil. While Coal and Natural Gas showed a growth of 4.58% and 5.51% in this period, that for Lignite and Crude oil shrunk by (-) 1.87% and (-) 0.60% respectively (Table 5.1).
- Availability of coal has shown an increasing trend during the period from 2010-11 to 2019-20(P) with a CAGR of about 5.73%. However, though availability of crude oil has decreased as compared to last year, the CAGR is positive (2.85%) and has experienced a continuous growth during the ten years' period except for a small decline in 2014-15. Though CAGR of availability of lignite is 1.15%, it has been falling continuously since 2016-17. While CAGR of natural gas availability has decreased marginally by 0.003%, its availability has shown an increasing trend from 2014-15.
- The total availability of Coal in 2019-20(P) stood at 1002.15 MT as compared to 958.25 MT in 2018-19 indicating a total increase of 43.90 MT in a year. Out of the 1002.15 MT available for consumption in 2019-20(P), a major portion (72.93%) is produced domestically and 248.54 MT is imported.

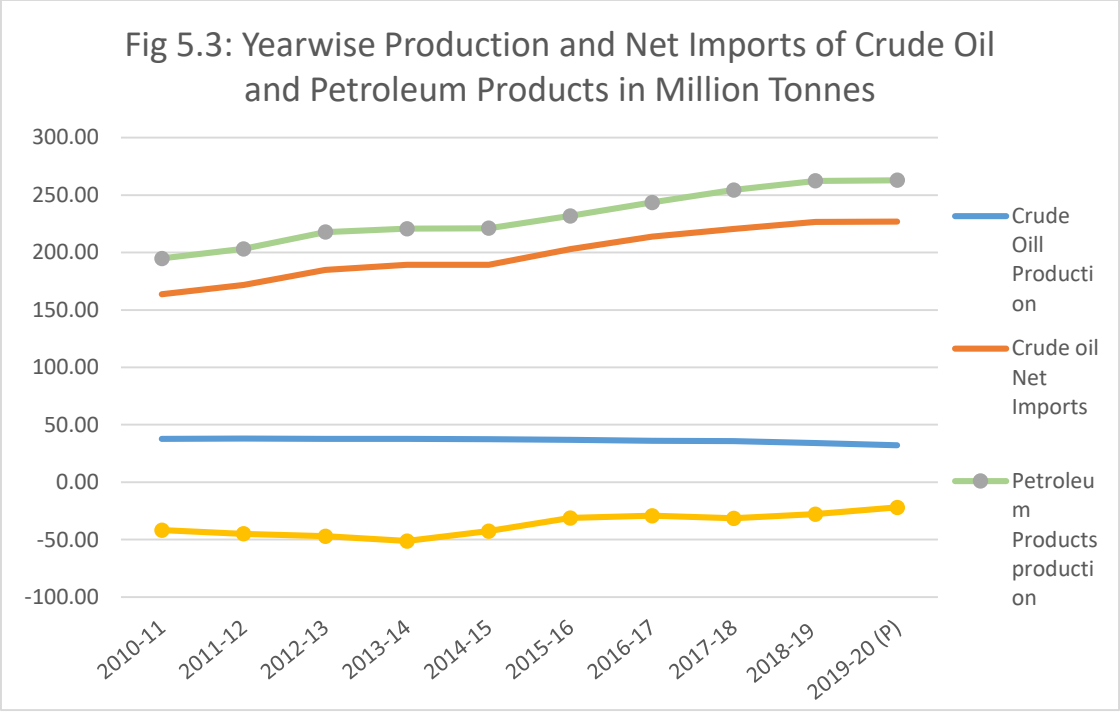
Fig 5.1: Breakup of Availability of Coal in 2019-20 (P)



Total Availability of 1002.15 Million Tonnes



- There has been a marginal change of -0.60% in the availability of crude oil in the country over the previous year. The availability of Crude Oil decreased from 260.70 MT in 2018-19 to 259.12 MT during 2019-20(P). This is attributed to marginal decrease in production of domestic crude oil (Table 5.3).
- Production of Petroleum Products during 2018-19 was 262.36 MT and remained steady at 262.94 MT in 2019-20(P). However, due to a better growth rate in imports (31.30%) than in exports (7.51%) in 2019-20 over 2018-19, the total availability of petroleum products in the country has increased from 234.61 MT in 2018-19 to 241.05 MT in 2019-20(P).



- Electricity available for supply increased from 8,11,635 Gwh in 2010-11 to 13,11,176 Gwh in 2019-20(P), thus recording a CAGR of 5.47% during this period. The availability of electricity increased at 0.27% in 2019-20(P) over its value in previous year.

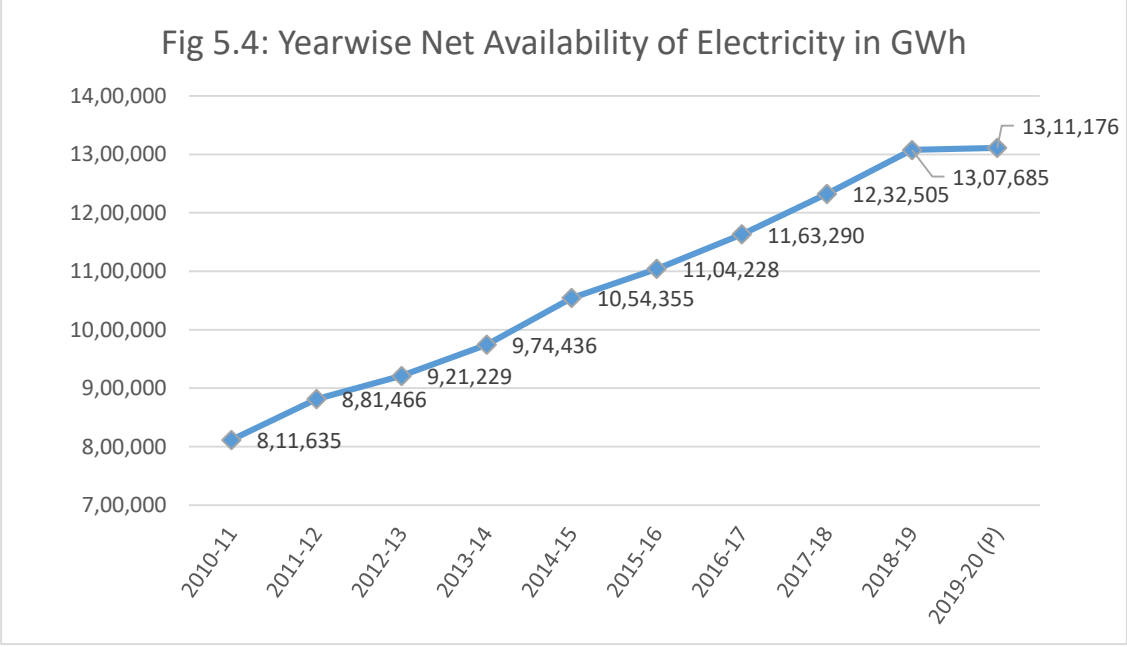


Table 5.1 : Yearwise Availability of Energy Resources

Year	Coal (Million Tonnes)	Lignite (Million Tonnes)	Crude Oil (Million Tonnes)	Natural Gas (Billion Cubic Metres)
2010-11	607.06	37.78	201.28	64.16
2011-12	642.63	42.77	209.82	64.45
2012-13	688.75	46.83	222.66	57.36
2013-14	722.56	44.64	227.03	52.37
2014-15	827.52	49.58	226.90	51.30
2015-16	847.58	45.48	239.79	52.51
2016-17	858.58	47.32	249.94	55.70
2017-18	896.09	46.98	256.12	59.17
2018-19	958.25	42.69	260.70	60.79
2019-20 (P)	1002.15	41.89	259.12	64.14
Growth rate of 2019-20 over 2018-19(%)	**4.58**	**-1.87**	**-0.60**	**5.51**
CAGR 2010-11 to 2019-20 (%)	**5.73**	**1.15**	**2.85**	**-0.003**

(P) - Provisional

Note: Availability is defined as below:

Coal/lignite: Production+Net Imports+change in stocks

Crude Oil: Production +Net Imports

Natural gas:Net Production i.e. (Gross production -Flared - Losses) + Net imports

Sources:

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

Table 5.2 : Yearwise Availability of Coal and Lignite

(Million Tonnes)

Year	Coal					Lignite				
	Production (Coking + Non-coking)	Imports	Exports	Change of Vendible Stock (closing stock-Opening stock)	Availability for Consumption	Production	Imports	Exports	Change of Vendible Stock (closing stock-Opening stock)	Availability for Consumption
1	2	3	4	5	6=2+3-4+5	7	8	9	10	11=7+8-9+10
2010-11	532.69	68.92	1.88	7.33	607.06	37.73	-	-	0.045	37.78
2011-12	539.95	102.85	2.02	1.85	642.63	42.33	-	-	0.441	42.77
2012-13	556.40	145.79	2.44	-10.99	688.75	46.45	0.001	0.069	0.442	46.83
2013-14	565.77	166.86	2.19	-7.87	722.56	44.27	0.001	0.002	0.367	44.64
2014-15	612.44	212.10	1.24	4.21	827.52	48.27	0.001	0.003	1.316	49.58
2015-16	639.23	203.95	1.58	5.97	847.58	43.84	0.001	0.001	1.633	45.48
2016-17	657.87	190.95	1.77	11.53	858.58	45.23	0.019	0.005	2.074	47.32
2017-18	675.40	208.27	1.50	13.92	896.09	46.64	0.010	0.004	0.327	46.98
2018-19	728.72	235.24	1.31	-4.40	958.25	44.28	0.019	0.079	-1.538	42.69
2019-20 (P)	730.87	248.54	1.05	23.79	1002.15	42.10	0.054	0.093	-0.177	41.89
Growth rate of 2019-20 over 2018-19(%)	**0.30**	**5.65**	**-20.24**	**-641.20**	**4.58**	**-4.92**	**180.07**	**17.38**	**-88.49**	**-1.87**

(P): Provisional

Total may not tally due to rounding off

Source : Office of the Coal Controller, Ministry of Coal

Table 5.3 : Yearwise Availability of Energy Resources

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
2010-11	37.68	163.60	201.28	194.82	-41.70	153.12	51.23	12.93	64.16
2011-12	38.09	171.73	209.82	203.20	-44.99	158.21	46.45	18.00	64.45
2012-13	37.86	184.80	222.66	217.74	-47.05	170.68	39.75	17.61	57.36
2013-14	37.79	189.24	227.03	220.76	-51.17	169.59	34.57	17.80	52.37
2014-15	37.46	189.43	226.90	221.14	-42.63	178.50	32.69	18.61	51.30
2015-16	36.94	202.85	239.79	231.92	-31.08	200.84	31.12	21.39	52.51
2016-17	36.01	213.93	249.94	243.55	-29.23	214.32	30.85	24.85	55.70
2017-18	35.68	220.43	256.12	254.40	-31.37	223.03	31.73	27.44	59.17
2018-19	34.20	226.50	260.70	262.36	-27.75	234.61	32.05	28.74	60.79
2019-20 (P)	32.17	226.95	259.12	262.94	-21.90	241.05	30.26	33.89	64.14
Growth rate of 2019-20 over 2018-19 (%)	**-5.95**	**0.20**	**-0.60**	**0.22**	**-21.08**	**2.74**	**-5.61**	**17.91**	**5.51**

* : Net production = Gross Production-Flared- Losses

Total may not tally due to rounding off.

(P): Provisional;

Source : Ministry of Petroleum & Natural Gas.

Table 5.4 : Yearwise Availability of Electricity

(in Giga Watt hour = 10^6 Kilo Watt hour)

Year	Gross Electricity Generated from Utilities	Consumption in Power Station Auxiliaries	Net Electricity Generated from Utilities	Purchases from Non-Utilities + Net Import from Other Countries	Net Availability (For Supply)
1	2	3	4=2-3	5	6=4+5
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	11,67,584	79,302	10,88,282	15,947	11,04,228
2016-17	12,35,358	81,044	11,54,314	8,977	11,63,290
2017-18	13,03,455	82,148	12,21,307	11,198	12,32,505
2018-19	13,71,779	83,386	12,88,393	19,291	13,07,685
2019-20 (P)	13,83,417	84,795	12,98,621	12,554	13,11,176
Growth rate of 2019-20 over 2018-19(%)	**0.85**	**1.69**	**0.79**	**-34.92**	**0.27**
CAGR 2010-11 to 2019-20 (%)	**5.63**	**5.37**	**5.65**	**-4.96**	**5.47**

(P): Provisional

Source:Central Electricity Authority.

Chapter | 6

Consumption of Energy Resources

CHAPTER 6
Consumption of Energy Resources

Consumption

The study of consumption patterns of energy in any economy is vital to understand how final demand drives energy use or consumption. SEEA – Energy states that "resource uses and environmental pressures, which occur at the level of production, can in fact be viewed as determined by final use, which initiated the production chain".

Moreover, to fully understand the climate-change process, the data on many consumption activities, such as heating of houses and buildings, usage of electricity, various industrial processes and transportation, which entail combustion processes are required.

Energy-related air emissions are being measured and tracked by global economies, because most economic activities are linked to combustion/consumption that is needed for energy production.

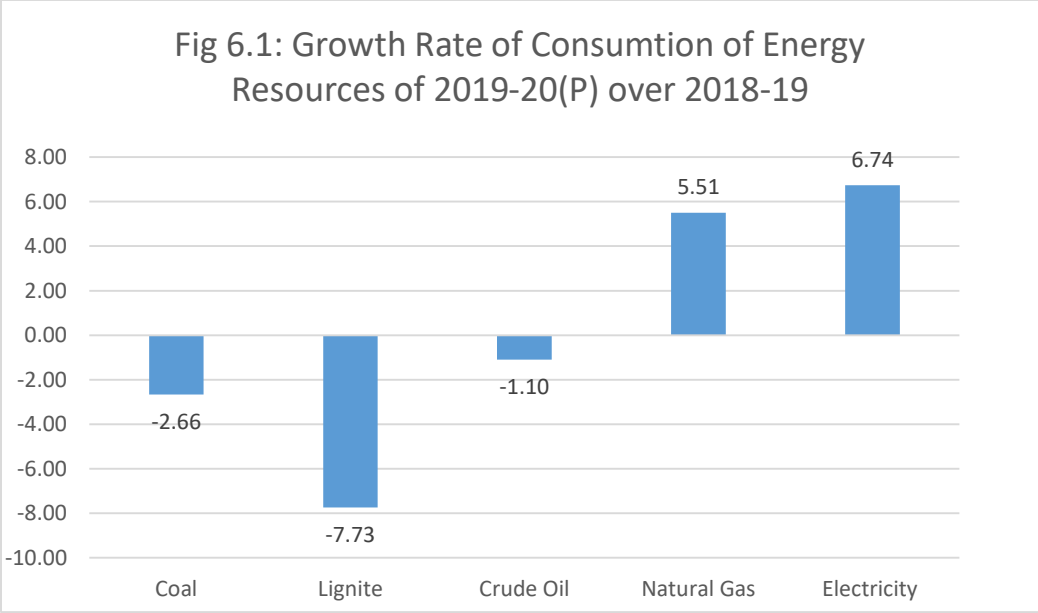
With the increasing focus on sustainable consumption and production patterns world over, resource uses and environmental pressures are being viewed as determinants or drivers of the final use and consumption of products.

According to the International Energy Agency, where India is an Association country since March 2017, Total Energy Consumption (TEC) in an economy is a good indicator of efficient or non-efficient end-use in economic activities and may indicate course-correction measures to sustainability. It is defined to include the sum of the consumption in the end-use sectors and for non-energy use. Energy used for transformation processes and for own use of the energy producing industries is excluded. Thus, final consumption reflects for the most part, deliveries to consumers and represents the quantity of all energy necessary to satisfy inland consumption.

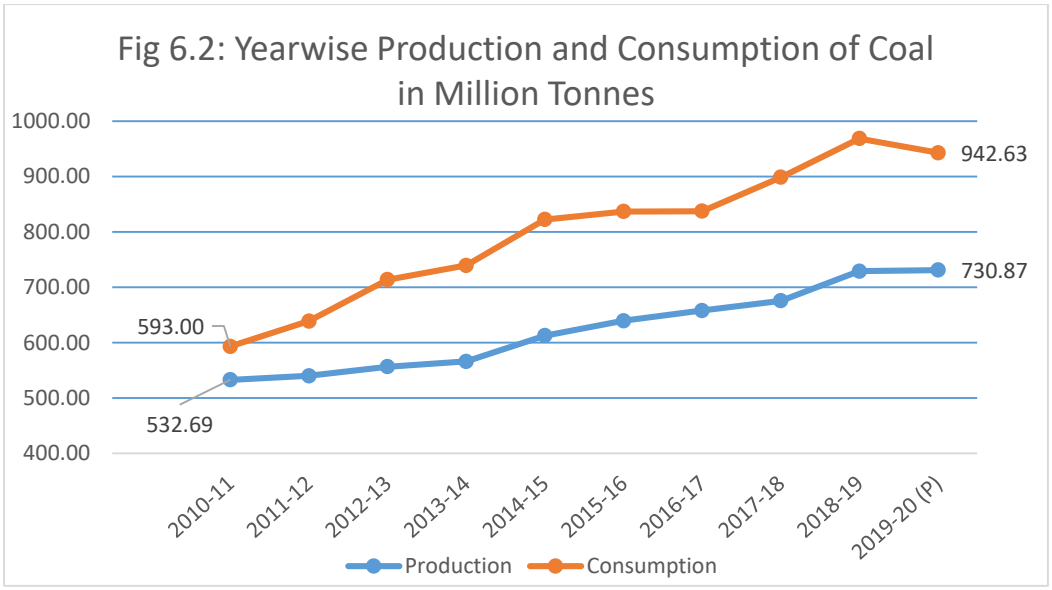
This chapter presents the total consumption of energy resources along with sector wise end use of different energy resources and products in India.

Highlights

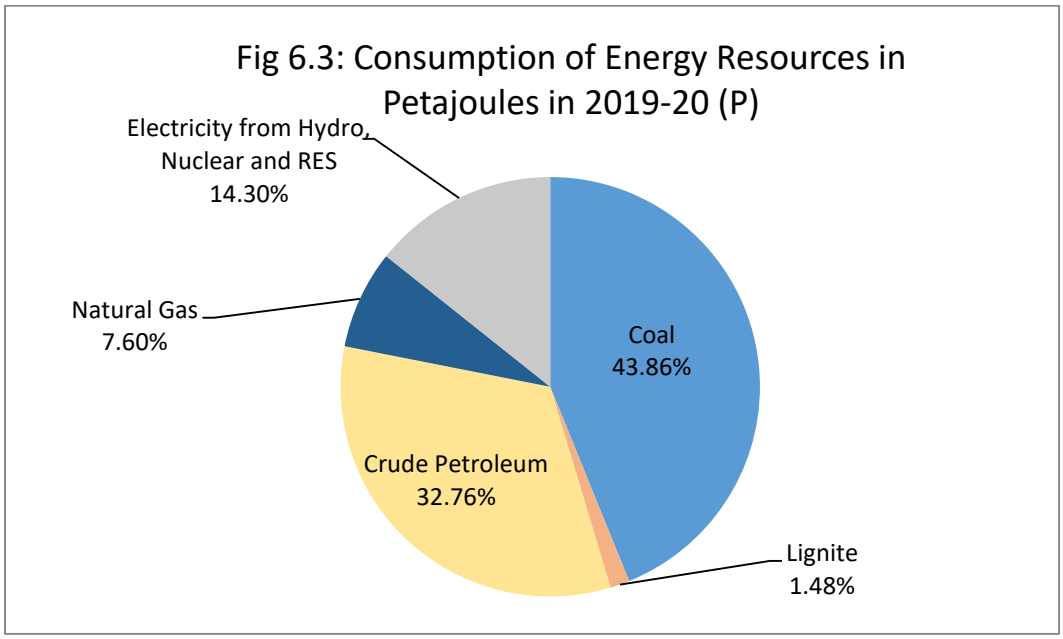
- The total consumption of energy resources in 2019-20(P) has increased as compared to 2018-19 for Natural Gas (5.51%) and Electricity from Hydro, Nuclear and other renewable sources from utilities (6.74%) (Table 6.1).



- India is one of the largest producer and consumer of coal in the world. Though there is a small decline of 2.66% in 2019-20 over 2018-19, there has been an upward trend in the consumption of coal in the country during the period 2010-11 to 2018-19. CAGR is 5.28% from 2010-11 to 2019-20(P).

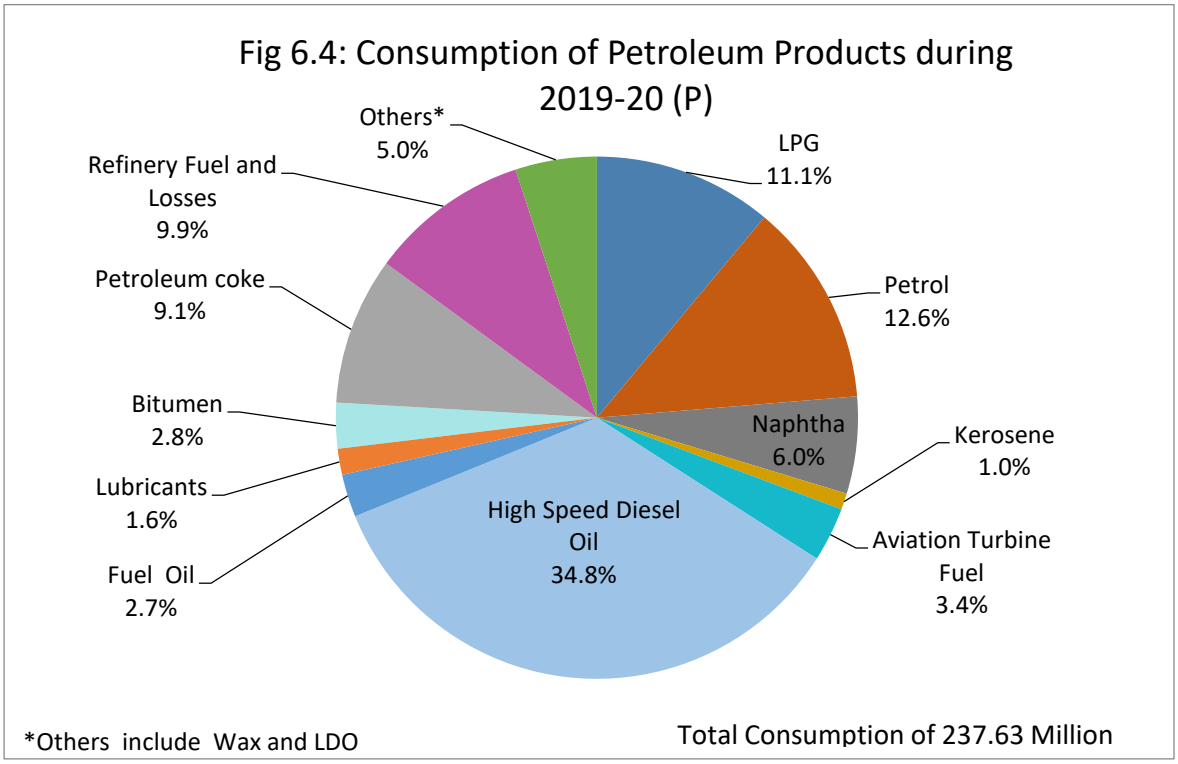


- The total consumption of energy has decreased from 32639 PJ in 2018-19 to 32514 PJ in 2019-20(P), a decrease of 125 PJ. This may be attributed to decrease in consumption noticed in three resources of energy – coal, lignite and crude oil. However, the consumption of Natural Gas and Electricity (from Hydro, Nuclear and other renewable sources from utilities) increased by 129 PJ and 293 PJ respectively over the previous year (Table 6.2).
- The consumption of energy in petajoules from Coal and Lignite was highest which accounted for about 45.34% of the total consumption during 2019-20(P) followed by Crude Oil (32.76%) and Electricity (14.3%).

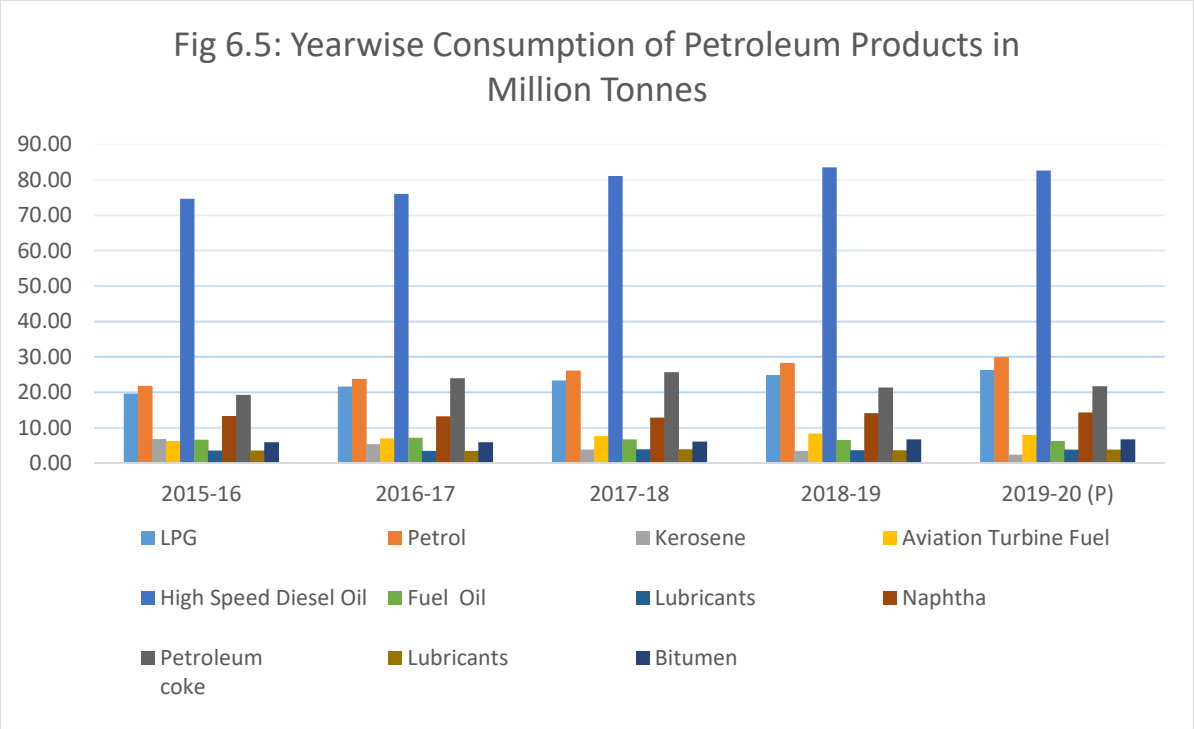


- Electricity Sector remains the biggest consumer of Raw Coal and Lignite in India with this sector consuming as much as 64.86% of the total consumption of coal and 85.96% of total consumption of lignite in India in 2019-20(P). (Table 6.3 & Table 6.4)
- Consumption of Lignite decreased from 45.81 MT in 2018-19 to 42.27 MT in 2019-20(P). The consumption in Textile sector saw the sharpest decrease in percentage terms –with a decrease of 95.33% in 2019-20(P) over 2018-19 (Table 6.4).

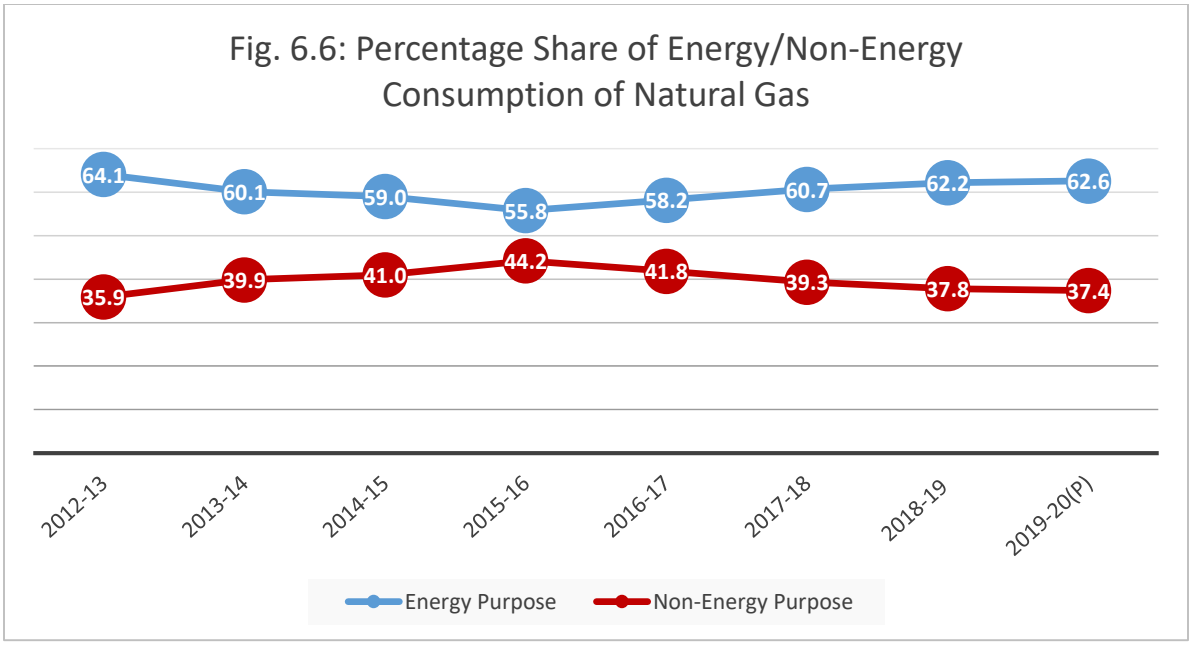
- High speed diesel oil accounted for 34.80 % of total consumption of all types of petroleum products including losses in 2019-20(P). This was followed by Petrol (12.60%), LPG (11.1%), Pet Coke (9.10%) (Table 6.5).



- The consumption of major petroleum products has seen an upward trend from 2010-11 to 2019-20(P) with LPG consumption increasing at a CAGR of 6.99% followed by Petrol (8.66%).
- Consumption of petroleum coke also increased almost five times by 2017-18 as compared to 2010-11 but experienced a decline in 2018-19 (by around 16% over 2017-18) with a marginal upward movement again in 2019-20.
- However, the impact of energy policies of recent times may be seen on the consumption of kerosene as a fuel in the country – the consumption of Kerosene has seen a steady decreasing trend with a CAGR of (-) 13.59% from 2010-11 to 2019-20(P).

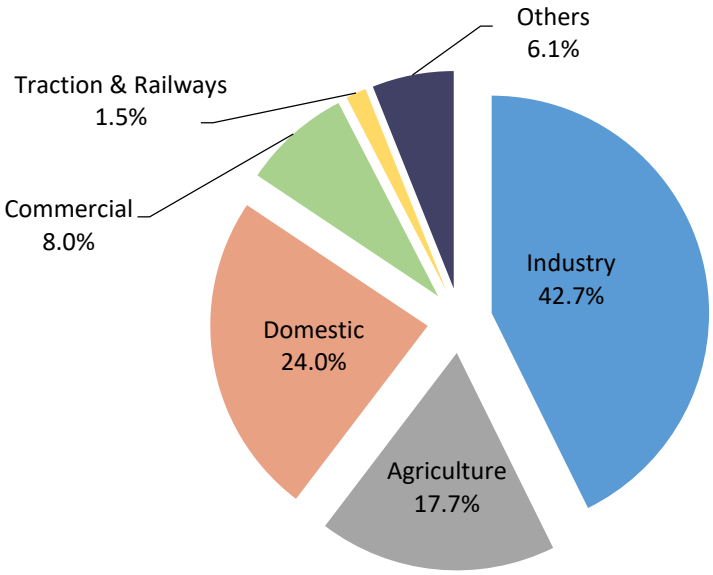


- The maximum use of Natural Gas is in fertilizers industry (25.12%) followed by power generation (17.19%). Industry wise off-take of natural gas shows that while 55.08% of natural gas has been used for Energy purposes, 32.91% is used for Non-energy purposes (Table 6.7).



- The estimated electricity consumption increased from 6,94,392 GWh during 2010-11 to 12,91,494 GWh during 2019-20(P), showing a CAGR of 6.74%. Of the total consumption of electricity in 2019-20(P), industry sector accounted for the largest share (42.69%), followed by domestic (24.01%), agriculture (17.67%) and commercial sectors (8.04%).

Fig 6.7: Consumption of Electricity by Sectors during 2019-20(P)



Total Consumption of 12,91,494 GWh

Table 6.1: Yearwise Consumption of Energy Resources in Physical Units

Year	Coal # (Million Tonnes)	Lignite (Million Tonnes)	Crude Oil** MMT	Natural Gas (Billion Cubic Metres)	Electricity (GWh)
1	2	3	4	5	6
2010-11	593.00	37.69	196.99	64.16	6,94,392.00
2011-12	638.73	41.88	204.12	64.45	7,85,194.00
2012-13	713.39	46.31	219.21	57.36	8,24,300.99
2013-14	739.34	43.90	222.50	52.37	8,74,208.57
2014-15	822.13	46.95	223.24	51.30	9,48,521.82
2015-16	836.73	42.21	232.86	52.51	10,01,190.68
2016-17	837.22	43.16	245.36	55.70	10,61,182.64
2017-18	898.50	46.32	251.93	59.17	11,23,426.86
2018-19	968.36	45.81	257.20	60.79	12,09,971.63
2019-20 (P)	942.63	42.27	254.39	64.14	12,91,493.75
Growth rate of 2019-20 over 2018-19(%)	**-2.66**	**-7.73**	**-1.10**	**5.51**	**6.74**
CAGR 2010-11 to 2019-20 (P) (%)	**5.28**	**1.28**	**2.88**	**-0.003**	**7.14**

(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: Yearwise Consumption of Energy Resources in Energy Units

(In Petajoules)

Year	Coal	Lignite	Crude Oil *	Natural Gas	Electricity #	Total
1	2	3	4	5	6	7
2010-11	8972	428	8248	2471	2500	22620
2011-12	9664	476	8547	2483	2827	23996
2012-13	10794	527	9178	2210	2967	25676
2013-14	11186	499	9316	2017	3147	26166
2014-15	12439	534	9347	1976	3415	27710
2015-16	12660	480	9750	2023	3604	28517
2016-17	12667	491	10273	2145	3820	29397
2017-18	13594	527	10549	2279	4044	30993
2018-19	14651	521	10769	2342	4356	32639
2019-20(P)	14262	481	10651	2471	4649	32514
% Share in total consumption for 2019-20	**43.9**	**1.5**	**32.8**	**7.6**	**14.3**	**100.0**
CAGR 2010-11 to 2019-20(%)	**5.28**	**1.28**	**2.88**	**-0.003**	**7.14**	**4.11**

*: Crude oil in terms of refinery crude processed. (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: Yearwise Consumption of Coal - Industrywise

(Million tonnes)

Year	Electricity	Steel & Washery&	Cement	Paper	Textile	Sponge Iron	Fertilizers &chemicals	Bricks	Others*	Total
1	2	3	4	5	6	7	8	9	10	11 = 2 to 10
2010-11	395.84	38.11	15.08	2.43	0.28	22.79	3.45	0.27	114.75	593.00
2011-12	410.37	47.86	13.18	2.03	0.26	21.69	3.19	0.13	140.04	638.73
2012-13	446.76	51.70	31.11	2.12	0.30	20.90	2.86	2.01	173.62	731.39
2013-14	448.95	53.05	11.94	1.91	0.36	18.49	2.64	4.01	198.00	739.34
2014-15	497.70	56.24	11.36	1.65	0.42	17.77	2.70	0.09	234.22	822.13
2015-16	517.77	57.08	8.99	1.21	0.27	7.76	2.62	0.07	240.95	836.73
2016-17	535.04	51.98	6.36	1.18	0.24	5.56	2.45	0.10	234.31	837.22
2017-18	585.49	58.45	7.71	1.51	0.24	8.53	2.16	0.12	234.30	898.49
2018-19	621.64	64.65	8.82	1.64	0.20	12.09	1.79	0.09	257.44	968.36
2019-20 (P)	611.41	68.97	8.60	1.37	0.12	10.44	1.76	0.03	239.92	942.62
Percentage share in Total Consumption (%)	**64.86**	**7.32**	**0.91**	**0.14**	**0.01**	**1.11**	**0.19**	**0.00**	**25.45**	**100.00**
Growth rate of 2019-20 over 2018-19(%)	**-1.65**	**6.69**	**-2.48**	**-16.62**	**-40.20**	**-13.64**	**-1.51**	**-72.04**	**-6.80**	**-2.66**
CAGR 2010-11 to 2019-20(%)	**4.95**	**6.81**	**-6.05**	**-6.22**	**-8.63**	**-8.31**	**-7.20**	**-22.99**	**8.54**	**5.28**

(P): Provisional &: includes import of coking coal

* Includes Sponge Iron, colliery consumption, jute, bricks, coal for soft coke, fertilisers & other industries, import of non coking coal

Source : Office of the Coal Controller, Ministry of Coal

Table 6.4: Yearwise Consumption of Lignite - Industrywise

(Million tonnes)

Year	Electricity	Steel & Washery	Cement	Paper	Textile	Others *	Total
1	2	3	4	5	6	7	8=2 to 7
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	3.47	3.81	46.31
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	37.56	0.01	0.23	0.43	1.73	2.26	42.21
2016-17	38.82	0.04	0.29	0.53	1.29	2.19	43.16
2017-18	38.84	0.12	1.09	0.76	2.46	3.05	46.32
2018-19	37.73	0.09	1.80	0.60	2.61	2.97	45.81
2019-20 (P)	36.33	0.02	0.77	0.55	0.12	4.47	42.27
Percentage share in total consumption (%)	**85.96**	**0.05**	**1.82**	**1.29**	**0.29**	**10.59**	**100.00**
Growth rate of 2019-20 over 2018-19 (%)	**-3.70**	**-77.66**	**-57.24**	**-9.30**	**-95.33**	**50.64**	**-7.73**
CAGR 2010-11 to 2019-20 (%)	**2.19**	**-**	**8.80**	**-4.71**	**-22.25**	**-3.65**	**1.03**

(P): Provisional

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

From 2009-10 onwards cotton is also included in others.

Source : Office of the Coal Controller, Ministry of Coal

Table 6.5 : Yearwise Consumption of Petroleum Products - Categorywise

(Million Tonnes)

Year	Light Distillates			Middle Distillates			
	LPG	Petrol	Naphtha	Kerosene	Aviation Turbine Fuel	High Speed Diesel Oil	Light Diesel Oil
1	2	3	4	5	6	7	8
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	0.41
2012-13	15.60	15.74	12.29	7.50	5.27	69.08	0.40
2013-14	16.29	17.13	11.31	7.16	5.50	68.36	0.39
2014-15	18.00	19.08	11.08	7.09	5.72	69.42	0.37
2015-16	19.62	21.85	13.27	6.83	6.26	74.65	0.41
2016-17	21.61	23.76	13.24	5.40	7.00	76.03	0.45
2017-18	23.34	26.17	12.89	3.85	7.63	81.07	0.52
2018-19	24.91	28.28	14.13	3.46	8.30	83.53	0.60
2019-20 (P)	26.33	29.98	14.27	2.40	8.00	82.60	0.63
% Distribution in 2019-20(P)	**12.30**	**14.00**	**6.66**	**1.12**	**3.74**	**38.58**	**0.29**
Growth rate of 2019-20 over 2018-19 (%)	**5.71**	**5.98**	**0.97**	**-30.72**	**-3.63**	**-1.11**	**4.99**
CAGR 2010-11 to 2019-20 (%)	**6.99**	**8.66**	**3.27**	**-13.59**	**5.18**	**3.60**	**3.63**

(P) : Provisional

Note: Consumption includes sales by oil companies, own consumption and direct private imports

Total may not tally due to rounding off.

Table 6.5 (Contd.) : Yearwise Consumption of Petroleum Products - Categorywise

(Million Tonnes)

Year	Heavy Ends				Others*	Total Consumption	Refinery Fuel and Losses	Total including Refinery Fuel and losses
	Fuel Oil	Lubricants	Bitumen	Petroleum coke				
	9	10	11	13	14	15=2 to 14	16	17
2010-11	10.79	2.43	4.54	4.98	4.57	141.04	16.38	157.42
2011-12	9.31	2.63	4.64	6.14	4.92	148.13	17.29	165.42
2012-13	7.66	3.20	4.68	10.13	5.51	157.06	18.35	175.40
2013-14	6.24	3.31	5.01	11.76	5.96	158.41	17.87	176.27
2014-15	5.96	3.31	5.07	14.56	5.87	165.52	17.67	183.19
2015-16	6.63	3.57	5.94	19.30	6.35	184.67	18.77	203.45
2016-17	7.15	3.47	5.94	23.96	6.59	194.60	20.07	214.67
2017-18	6.72	3.88	6.09	25.66	8.34	206.17	21.16	227.33
2018-19	6.56	3.67	6.71	21.35	11.72	213.22	21.45	234.67
2019-20 (P)	6.30	3.83	6.72	21.71	11.36	214.13	23.51	237.64
% Distribution in 2019-20(P)	**2.94**	**1.79**	**3.14**	**10.14**	**5.31**	**100.00**	**-**	**-**
Growth rate of 2019-20 over 2018-19 (%)	**-3.99**	**4.51**	**0.19**	**1.70**	**-3.07**	**0.43**	**9.58**	**1.26**
CAGR 2010-11 to 2019-20 (%)	**-5.80**	**5.20**	**4.47**	**17.77**	**10.65**	**4.75**	**4.10**	**4.68**

(P) : Provisional; Consumption includes sales by oil companies, own consumption and direct private imports

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

Total may not tally due to rounding off.

Source: Ministry of Petroleum & Natural Gas.

Table 6.6 (A): Yearwise Consumption of Selected Petroleum Products - Sectorwise(end use)

('000 tonnes)

Petroleum Product	Year	Transport	Plantation/ 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	2010-11	5417	616	166	1440	1366	48704	2170	193	60071
	2011-12	5529	684	168	1649	1181	53208	2262	70	64750
	2012-13	5160	617	214	1628	1073	58021	2320	47	69080
	2013-14	3203	429	204	687	873	61465	1426	77	68364
	2014-15	4617	575	197	794	998	60403	1748	83	69416
	2015-16	5765	630	224	1096	1184	63772	1922	55	74647
	2016-17	5658	607	208	1033	1224	65089	2161	46	76027
	2017-18	5999	618	223	1155	1255	69846	1887	90	81073
	2018-19	6210	639	222	1264	1465	71697	1938	93	83528
	2019-20 (P)	6011	616	214	1334	1542	70704	2064	117	82602
Growth rate of 2019-20 over 2018-19(%)		**-3.20**	**-3.56**	**-3.79**	**5.58**	**5.26**	**-1.39**	**6.49**	**24.84**	**-1.11**
CAGR 2010-11 to 2019-20 (%)		**1.16**	**0.01**	**2.88**	**-0.84**	**1.36**	**-**	**-0.56**	**-5.45**	**3.60**

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

Table 6.6 (B) : Yearwise Consumption of Selected Petroleum Products - Sectorwise(end use)

('000 tonnes)

Petroleum Product	Year	Transport	Plantation/ 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 to10
Light Diesel Oil	2010-11	5	2	137	127	3	**	182	0	455
	2011-12	3	1	127	102	2	**	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	4	1	154	61	2	1	184	0	407
	2016-17	7	2	174	60	2	1	203	0	449
	2017-18	7	9	143	149	6	3	207	0	524
	2018-19	10	16	277	175	22	33	65	0	598
	2019-20 (P)	5	12	342	153	14	38	63	0	628
Growth rate of 2019-20 over 2018-19(%)		**-54.37**	**-20.32**	**23.74**	**-12.27**	**-35.59**	**12.59**	**-3.03**	**-**	**4.99**
CAGR 2010-11 to 2019-20 (%)		**-0.84**	**23.78**	**10.71**	**2.11**	**20.21**	**-**	**-11.04**	**-**	**3.63**

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

Table 6.6 (C) : Yearwise Consumption of Selected Petroleum Products - Sectorwise(end use)

('000 tonnes)

Petroleum Product	Year	Transport	Plantation/ 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 to10
Furnace Oil	2010-11	780	70	823	2773	7	**	3979	374	8807
	2011-12	371	70	647	2408	45	**	3300	706	7547
	2012-13	277	79	587	2019	12	351	2357	608	6291
	2013-14	315	75	536	1833	38	309	1985	696	5787
	2014-15	346	56	446	1748	45	197	2175	570	5584
	2015-16	380	57	430	2136	53	270	2564	592	6482
	2016-17	444	51	361	2492	71	357	2485	784	7046
	2017-18	601	50	314	2346	68	321	2234	672	6605
	2018-19	786	78	339	2577	54	298	1449	611	6195
	2019-20 (P)	849	71	303	2143	84	290	1398	775	5912
Growth rate of 2019-20 over 2018-19(%)		**8.01**	**-9.66**	**-10.66**	**-16.87**	**-20.08**	**-7.10**	**-3.54**	**26.73**	**-4.56**
CAGR 2010-11 to 2019-20 (%)		**0.95**	**0.07**	**-10.52**	**-2.83**	**31.33**	**-**	**-10.97**	**8.43**	**-4.33**

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

Table 6.6 (D) : Yearwise Consumption of Selected Petroleum Products - Sectorwise(end use)

('000 tonnes)

Petroleum Product	Year	Plantation/ Agriculture	Power Generation	Industry	Mining & Quarrying	resellers/ Retail	Misc. Services	Pvt Imports	Total
1	2	3	4	5	6	7	8	9	10 =3 to 9
Low Sulphur Heavy Stock	2010-11	0.29	468.57	1031.16	0.22	0.00	481.75	0.00	1982.00
	2011-12	0.17	399.19	1066.99	0.92	0.00	291.87	0.00	1759.14
	2012-13	0.00	438.98	778.01	0.00	0.00	149.00	0.00	1365.99
	2013-14	0.00	328.14	76.32	0.00	44.25	0.00	0.00	448.71
	2014-15	0.00	226.18	103.59	0.00	47.50	0.00	0.00	377.26
	2015-16	0.00	50.70	70.45	0.00	29.23	0.00	0.00	150.38
	2016-17	0.00	16.43	50.88	0.00	36.91	0.00	0.00	104.23
	2017-18	1.18	0.00	53.78	0.31	46.33	14.67	0.00	116.27
	2018-19	7.90	9.31	175.13	0.00	128.67	48.04	0.00	369.04
	2019-20 (P)	6.42	17.88	201.93	0.00	113.02	50.29	0.00	389.54
Growth rate of 2019-20 over 2018-19(%)		**-**	**-**	**15.30**	**-**	**-**	**4.70**	**-**	**5.55**
CAGR 2010-11 to 2019-20 (%)		**40.86**	**-**	**-16.57**	**-**	**-**	**-22.20**	**-**	**-16.54**

Table 6.6 (E) : Yearwise Consumption of Selected Petroleum Products - Sectorwise(end use)

('000 tonnes)

Petroleum Product	Year	Transport	Plantation/ Agriculture	Power Generation	Manufacturing	Domestic Distribution	Non- Domestic/ Industry/ Commercial	Reseller/ Retail	Other/ Misc. Services	Private import	Total
1	2	3	4	5	6	7	8	9	10	11	12=3 to 11
Liquefied Petroleum Gas	2010-11	224	2	0	1150	12,369	N A	**	156	430	14,331
	2011-12	224	5	0	1255	13,296	N A	**	150	421	15,350
	2012-13	215	4	0	145	13,568	1,168	59	45	398	15,601
	2013-14	195	4	3	135	14,412	1,074	58	46	369	16,294
	2014-15	165	6	3	208	16,040	1,051	45	53	429	18,000
	2015-16	172	7	3	202	17,182	1,464	45	60	489	19,623
	2016-17	168	8	2	220	18,871	1,776	67	67	429	21,608
	2017-18	185	7	1	205	20,352	2,086	74	67	364	23,342
	2018-19	181	22	2	204	21,728	2,364	0	89	316	24,907
	2019-20 (P)	173	26	1	153	23,076	2,614	0	82	204	26,330
Growth rate of 2019-20 over 2018-19(%)		**-4.59**	**16.92**	**-16.07**	**-24.89**	**6.20**	**10.58**	**-101.08**	**-7.91**	**-35.43**	**5.71**
CAGR 2010-11 to 2019-20 (%)		**-2.56**	**26.92**	**-**	**-18.25**	**6.43**	**-**	**-**	**-6.26**	**-7.18**	**6.27**

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

Table 6.6 (F) : Yearwise Consumption of Selected Petroleum Products - Sectorwise(end use)

('000 tonnes)

Petroleum Product	Year	Fertilisers	Petro chemicals	Power	Steel Plants	Others	Private import	Total
1	2	3	4	5	6	7	8	9 =3 to 8
Naptha	2010-11	892.22	7500.00	419.33	0.01	154.74	1710.00	10676.30
	2011-12	962.25	8140.82	187.36	0.19	163.22	1767.66	11221.50
	2012-13	897.96	9412.21	342.01	0.00	203.07	1434.16	12289.40
	2013-14	515.90	9463.94	215.11	0.00	240.27	869.98	11305.20
	2014-15	301.49	9530.06	199.24	0.00	207.53	843.71	11082.03
	2015-16	315.89	10350.23	50.30	0.00	37.07	2517.36	13270.84
	2016-17	349.35	10350.89	60.20	0.00	57.59	2422.75	13240.78
	2017-18	367.74	10010.95	66.53	0.00	674.50	1768.89	12888.61
	2018-19	351.61	10601.63	5.26	0.00	1445.26	1727.48	14131.23
	2019-20 (P)	149.70	10874.50	0.40	0.00	1937.64	1305.55	14267.78
Growth rate of 2019-20 over 2018-19(%)		**-57.42**	**2.57**	**-92.39**	**-**	**34.07**	**-24.42**	**0.97**
CAGR 2010-11 to 2019-20 (%)		**-17.99**	**4.21**	**-53.83**	**-**	**32.42**	**-2.95**	**3.27**

Table 6.6 (G) : Yearwise Consumption of Selected Petroleum Products - Sectorwise(end use)

('000 tonnes)

Petroleum Product	Year	Domestic	Commercial/ Industry	Others	Total
1	2	3	4	5	6=3 to 5
SKO(Kerosene)	2010-11	8722.00	67.00	139.00	8928.00
	2011-12	8045.00	61.00	123.00	8229.00
	2012-13	7349.04	37.18	115.28	7501.50
	2013-14	7008.86	107.30	48.61	7164.77
	2014-15	6917.34	60.11	109.26	7086.72
	2015-16	6648.94	63.94	113.43	6826.31
	2016-17	5204.12	77.11	115.58	5396.81
	2017-18	3633.59	96.99	114.54	3845.12
	2018-19	3231.21	97.30	130.95	3459.46
	2019-20 (P)	2173.71	86.52	136.61	2396.83
Growth rate of 2019-20 over 2018-19(%)		**-32.73**	**-11.08**	**4.32**	**-30.72**
CAGR 2010-11 to 2019-20 (%)		**-12.97**	**2.59**	**-0.17**	**-12.32**

Source: Ministry of Petroleum and Natural Gas

Table 6.7: Yearwise Consumption of Natural Gas - Sectorwise

(Figures in MMSCM)

Sector	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20 (P)	% Share of Total
1	2	3	4	5	6	7	8	9	10	11
(a) Energy Purpose										
Power	22,628.46	16,077.71	11,283.62	10,719.80	10,889.20	11,616.26	12,028.29	12,004.70	11,028.89	**17.19**
Industrial & Manufacturing	313.36	269.40	260.72	532.81	545.32	793.65	999.27	1,086.07	700.59	**1.09**
CGD Network	5,598.79	5,779.84	5,904.09	5,415.51	5,463.90	7,350.00	8,585.37	9,206.00	10,883.06	**16.97**
Tea Plantation	175.28	182.10	195.72	180.48	187.06	183.33	188.56	192.26	200.27	**0.31**
Internal Consumption for Pipeline System	385.14	386.82	372.13	350.57	409.60	471.18	495.62	540.71	525.11	**0.82**
Refinery	4,256.87	3,890.54	3,968.48	4,575.20	5,076.54	5,374.37	6,533.13	7,047.31	7,785.99	**12.14**
Miscellaneous	9,063.73	7,975.90	7,479.30	5,941.23	4,111.65	3,745.96	3,226.49	3,392.60	4,209.00	**6.56**
Total (a)	**42,421.62**	**34,562.30**	**29,464.05**	**27,715.60**	**26,683.28**	**29,534.74**	**32,056.71**	**33,469.65**	**35,332.91**	**55.08**
(b) Non-Energy Purpose										
Fertilizer Industry	14,003.32	14,733.29	15,869.37	15,190.30	16,134.61	15,428.57	14,675.67	14,986.91	16,115.24	**25.12**
Petrochemical	1,857.69	2,485.96	2,404.66	2,889.67	3,733.28	4,170.06	4,024.13	3,386.09	3,568.79	**5.56**
Sponge Iron	1,333.26	1,105.74	274.12	153.59	544.32	885.05	1,278.00	1,123.71	567.00	**0.88**
LPG Shrinkage	1,068.37	1,027.29	981.85	1,005.48	754.19	759.45	797.87	873.52	857.94	**1.34**
Total (b)	**18,262.64**	**19,352.29**	**19,530.01**	**19,239.04**	**21,166.40**	**21,243.12**	**20,775.68**	**20,370.22**	**21,108.97**	**32.91**
Total Sectorial Sales (a+b)	**60,684.26**	**53,914.59**	**48,994.06**	**46,954.64**	**47,849.68**	**50,777.87**	**52,832.40**	**53,839.87**	**56,441.88**	**87.99**
Total Consumption **	**64,450.67**	**57,367.34**	**52,374.86**	**51,299.75**	**52,517.44**	**55,696.90**	**59,170.16**	**60,798.37**	**64,143.34**	**100.00**
Total Consumption in MMSCM per Day	**165.80**	**157.17**	**143.49**	**140.55**	**143.49**	**152.59**	**162.11**	**166.57**	**175.26**	**-**

Note: **: Availability Basis (Net Production+LNG Imports) P: Provisional

CGD Network: City or Local Natural Gas Distribution Network incl. Road Transport

1. Re-classification among the sectors of consumption of natural gas under energy and non-energy sectors, has been done depending on usage. Sectors where natural gas is

2. Sectorial Sales/consumption of natural gas includes RLNG.

3. Total may not tally due to rounding off.

4. The reasons for the variation between the consolidated availability and the consumption can be attributed to stock changes, conversion factor (volume/energy) and the provisional data reported by the companies.

Source: Ministry of Petroleum and Natural Gas

Table 6.8: Yearwise Consumption of Electricity - Sectorwise

(in Giga Watt Hour = 10^6 Kilo Watt Hour)

Year	Industry	Agriculture	Domestic	Commercial	Traction & Railways	Others	Total
1	2	3	4	5	6	7	8=2 to 7
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	4,23,523	1,73,185	2,38,876	86,037	16,594	62,976	10,01,191
2016-17	4,40,206	1,91,151	2,55,826	89,825	15,683	68,493	10,61,183
2017-18	4,68,613	1,99,247	2,73,545	93,755	17,433	70,834	11,23,427
2018-19	5,19,196	2,13,409	2,88,243	98,228	18,837	72,058	12,09,972
2019-20 (P)	5,51,362	2,28,172	3,10,151	1,03,883	19,577	78,348	12,91,494
% share in 2019-20 (%)	**42.69**	**17.67**	**24.01**	**8.04**	**1.52**	**6.07**	**100.00**
Growth rate of 2019-20 over 2018-19 (%)	**6.20**	**6.92**	**7.60**	**5.76**	**3.92**	**8.73**	**6.74**
CAGR 2010-11 to 2019-20 (%)	**8.14**	**6.27**	**6.96**	**4.94**	**3.79**	**7.99**	**7.14**

(P): Provisional

Source : Central Electricity Authority.

Table 6.9 : Electricity Generated (from Utilities), Distributed, Sold and Transmission Losses

in Giga Watt hour =10^6 Kilo Watt hour

Year	Net Electricity Generated from Utilities	Purchases from Non-Utilities + Net Import from Other Countries	Net Electricity Available for Supply	Sold to Ultimate Consumers & Other Countries	Loss in transmission & distribution	Loss in transmission & distribution (%)
1	2	3	4=2+3	5	6=4-5	7
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	8,14,250	2,40,105	22.77
2015-16	10,88,282	15,947	11,04,228	8,63,364	2,40,864	21.81
2016-17	11,54,314	8,977	11,63,290	9,14,093	2,49,197	21.42
2017-18	12,21,307	11,198	12,32,505	9,73,131	2,59,375	21.04
2018-19	12,88,393	19,291	13,07,685	10,37,518	2,70,167	20.66
2019-20 (P)	12,98,621	12,554	13,11,176	10,44,648	2,66,527	20.33
Growth rate of 2019-20 over 2018-19 (%)	**0.79**	**-34.92**	**0.27**	**0.69**	**-1.35**	**-1.61**
CAGR 2010-11 to 2019-20 (%)	**5.65**	**-4.96**	**5.47**	**6.02**	**3.56**	

(P): Provisional

Source : Central Electricity Authority.

Chapter | 7

Energy Balance and Sankey Diagram

CHAPTER 7
Energy Balance and Sankey Diagram

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 used as a final product as well as an 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 period (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 CO_2 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(TPES) and Total Final Consumption (TFC) 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.

A note on Methodology used for Energy Balance

Energy (in KToe) = Quantity of Commodity * Conversion factor

where 1 Toe = 41868 MJ

Therefore, $$\text{Conversion factor} = \frac{\text{Net Calorific Value (NCV)}}{\text{Mega joules per ton of oil equivalent}}$$

where Net Calorific Value (NCV) is in kj per kg and

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.

Sankey Diagram

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.

Highlights

- In 2019-20 (P), Primary Energy Supply added up to 9,46,087 Kilo Tonne of Oil equivalent (KToe) (Table 7.2).
- Two major contributors to the total energy supply in the country were Coal which accounted for 64.19% of the total and Crude Oil which accounted for 27.99%.
- In 2019-20 (P), final Energy Consumption (End Use) was 5,87,371 KToe. The industrial sector was the largest consumer of energy in the country with this sector itself using more than half, i.e., 55.85% of the total final energy consumption.
- Within the industry sector, the most energy intensive industries were iron and steel, which accounted for 16.65% of the industrial energy use followed by Chemicals and petrochemicals 4.21 % and construction 2.19%.
- The consumption of the residential, agriculture, commercial & public sectors and other sectors represented 30.63% of the total final consumption in the country, whereas, transport sector accounted for 10.22% of Total Final Consumption.

Table 7.1 : Energy Commodity Balance for the year 2019-20(P)

Supply	Coal	Lignite	LPG	Naphtha	Kerosene	Diesel (HSD+ LDO)	Fuel Oil	Lubricants	Bitumin	Petrol/ Motor Spirit	Other Petroleum Products*	Natural Gas	Electricity
	(000 tonnes)											MMSCM	GWh
Production	730873	42103	12823	20679	3141	111841	8609	932	5244	38616	61057	31184	1383417
From Other Sources													215000
Imports	248537	54	14809	1662	0	2796	4583	2675	1630	2146	13488	33887	6351
Exports	-1047	-93	-463	-8897	-176	-31653	-1527	-8	-25	-12710	-10225		-9491
Stock changes	23791	-177											
Domestic Supply	**1002154**	**41887**	**27169**	**13444**	**2965**	**82984**	**11665**	**3599**	**6849**	**28052**	**64320**	**65071**	**1595276**
Transfer													
Statistical difference	-59533	380	-838	823	-567	245	-5364	234	-129	1923	-23253	-2486	47540
Transformation	**611409**	**36333**	**1**	**0**		**556**	**321**					**11029**	**84795**
Electricity plants	611409	36333	1	0		556	321					11029	84795
Energy industry own use												**18045**	
Oil and Gas extraction												6052	
Petroleum refineries												7786	
Other energy sector												4209	
Distribution losses												**93**	**266527**
Final Consumption	**331212**	**5934**	**26330**	**14267**	**2398**	**82673**	**5980**	**3833**	**6720**	**29975**	**41067**	**33418**	**1291494**
Industry Sector	**331212**	**5934**	**2769**	**14267**		**3044**	**2427**				**33068**	**701**	**551362**
Iron and steel	79417	35				199	943						
Chemical and petroleum	1762	1		11024		140	640						
Non-ferrous metals						18	339						
Machinery						136	26						
Mining & Quarrying						1556	84						
Paper, pulp and print	1365	546											
Construction	8623	1235				911	160						
Textile and leather	122	122				22	43						
Non-specified	239923	3995	2769	3243		62	192				33068	701	551362
Transport Sector			**173**			**6015**	**850**			**29975**	**7999**	**11408**	**19577**
Road			173			2662	121			29975		10883	
Domestic Aviation						3							
Rail						2539							19577
Pipeline transport												525	
Domestic navigation						811	729				7999		
Non-specified													
Other Sectors			**23388**		**2398**	**73614**	**2703**	**3833**	**6720**			**200**	**720554**
Residential			23076		2174								310151
Comm. And public services					87								103883
Agriculture/forestry			26			628	77					200	228172
Non-specified			286		137	72986	2626	3833	6720				78348
Non-Energy Use												**21109**	

(P): Provisional

Statistical Difference is defined as final consumption + use for transformation processes and consumption by energy industry own use + losses - domestic supply

Final consumption = Total Consumption in Transport + Total Industrial Consumption+Consumption by Other sectors+Non energy Use

* Incluse ATF, 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 2019-20 (P)

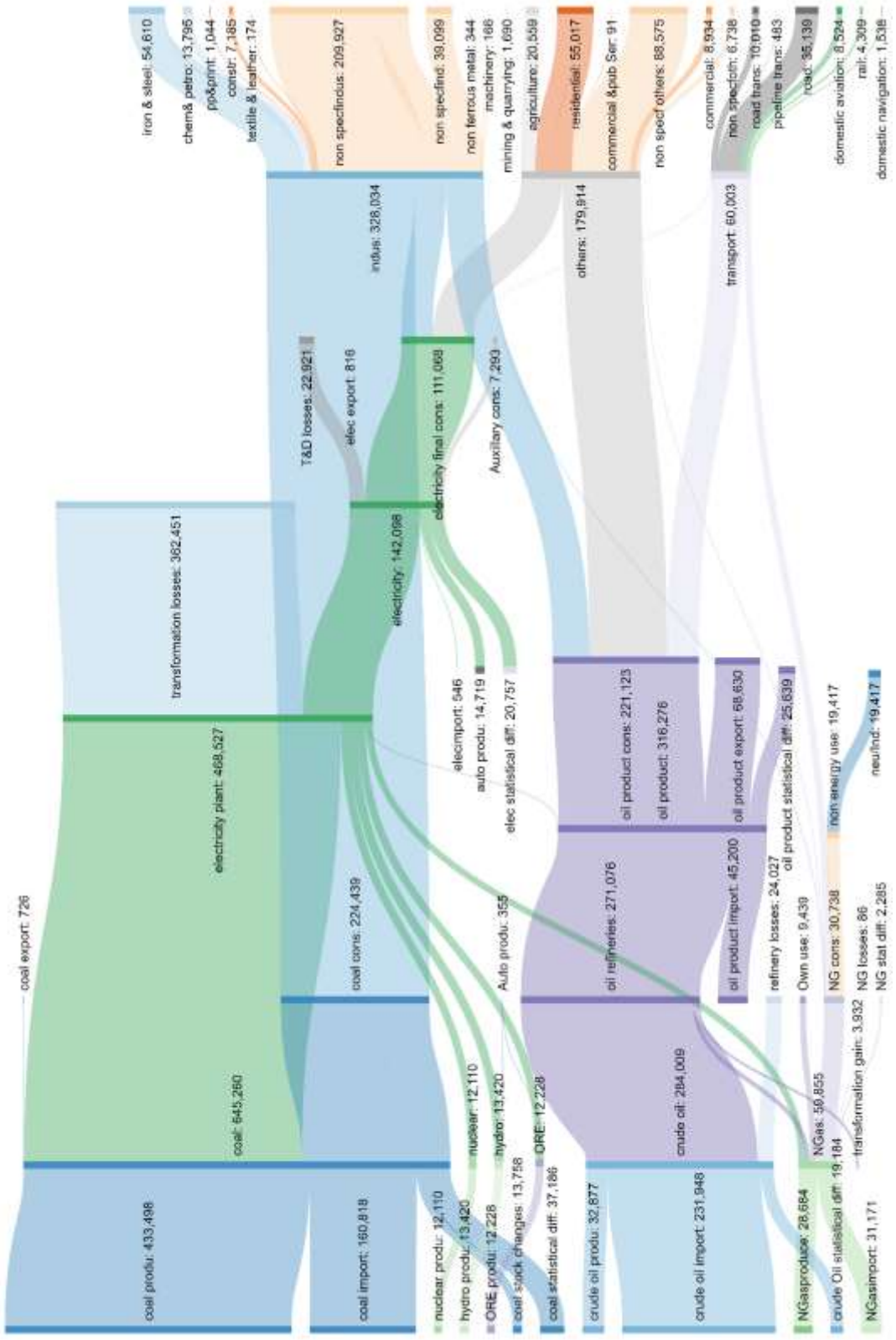
All figures in KToe

	Coal	Crude Oil	Oil Products	Natural Gas	Nuclear	Hydro	Solar, Wind, Others	Electricity	Total
Production	4,33,498.24	32,876.64		28,684.84	12,110.88	13,420.21	12,228.17		5,32,818.99
Imports	1,60,818.15	2,31,947.49	45,200.13	31,171.04				546.19	4,69,682.99
Exports	-726.41		-68,630.47					-816.23	-70,173.10
Stock changes	13,758.17								13,758.17
Total primary energy supply	**6,07,348.16**	**2,64,824.13**	**-23,430.35**	**59,855.88**	**12,110.88**	**13,420.21**	**12,228.17**	**-270.04**	**9,46,087.05**
Statistical differences	37,186.88	19,184.94	-25,639.26	-2,284.81				20,757.30	49,205.06
Main activity producer electricity plants	-4,20,095.74		-884.36	-10,145.01	-12,110.88	-13,396.13	-11,896.98	1,06,076.01	-3,62,453.10
Autoproducer electricity plants						-24.08	-331.19	14,718.81	14,363.55
Oil refineries		-2,59,981.91	2,71,077.85	-7,162.02					3,933.92
Energy industry own use				-9,438.67				-7,292.37	-16,731.04
Losses		-24,027.17		-85.54				-22,921.32	-47,034.03
Final consumption *	**2,24,439.29**		**2,21,123.88**	**30,739.84**				**1,11,068.40**	**5,87,371.41**
Industry	**2,24,439.29**		**55,533.57**	**644.45**				**47,417.13**	**3,28,034.44**
Iron and steel	53,498.94		1,111.24						54,610.18
Chemical and petrochemical	1,187.02		12,607.96						13,794.97
Non-ferrous metals			344.11						344.11
Machinery			165.62						165.62
Mining and quarrying			1,689.87						1,689.87
Paper, pulp and print	1,043.88								1,043.88
Construction	6,089.57		1,095.78						7,185.35
Textile and leather	109.99		64.04						174.03
Non-specified (industry)	1,62,509.91		38,454.95	644.45				47,417.13	2,49,026.44
Transport			**47,827.41**	**10,493.90**				**1,683.62**	**60,004.93**
Road			35,138.81	10,010.88					45,149.69
Domestic aviation			8,524.06						8,524.06
Rail			2,625.84					1,683.62	4,309.46
Pipeline transport				483.02					483.02
Domestic navigation			1,538.70						1,538.70
Non-specified (transport)									
Other			**1,17,762.91**	**184.21**				**61,967.64**	**1,79,914.77**
Residential			28,344.22					26,672.99	55,017.21
Commercial and public services			91.01					8,933.94	9,024.95
Agriculture/forestry			752.78	184.21				19,622.79	20,559.79
Non-specified (other)			88,574.89					6,737.93	95,312.82
Non-energy use				**19,417.28**					**19,417.28**
Non-energy use industry/transformation/energy				521.56					521.56
Non-energy use in transport				789.23					789.23
Non-energy use in other				18,106.48					18,106.48
Elect. output in GWh					**46,472.00**	**1,56,049.00**	**1,42,188.00**		**3,44,709.00**
Elec output-main activity producer ele plants					46,472.00	1,55,769.00	1,38,337.00		3,40,578.00
Elec output-autoproducer electricity plants						280.00	3,851.00		4,131.00

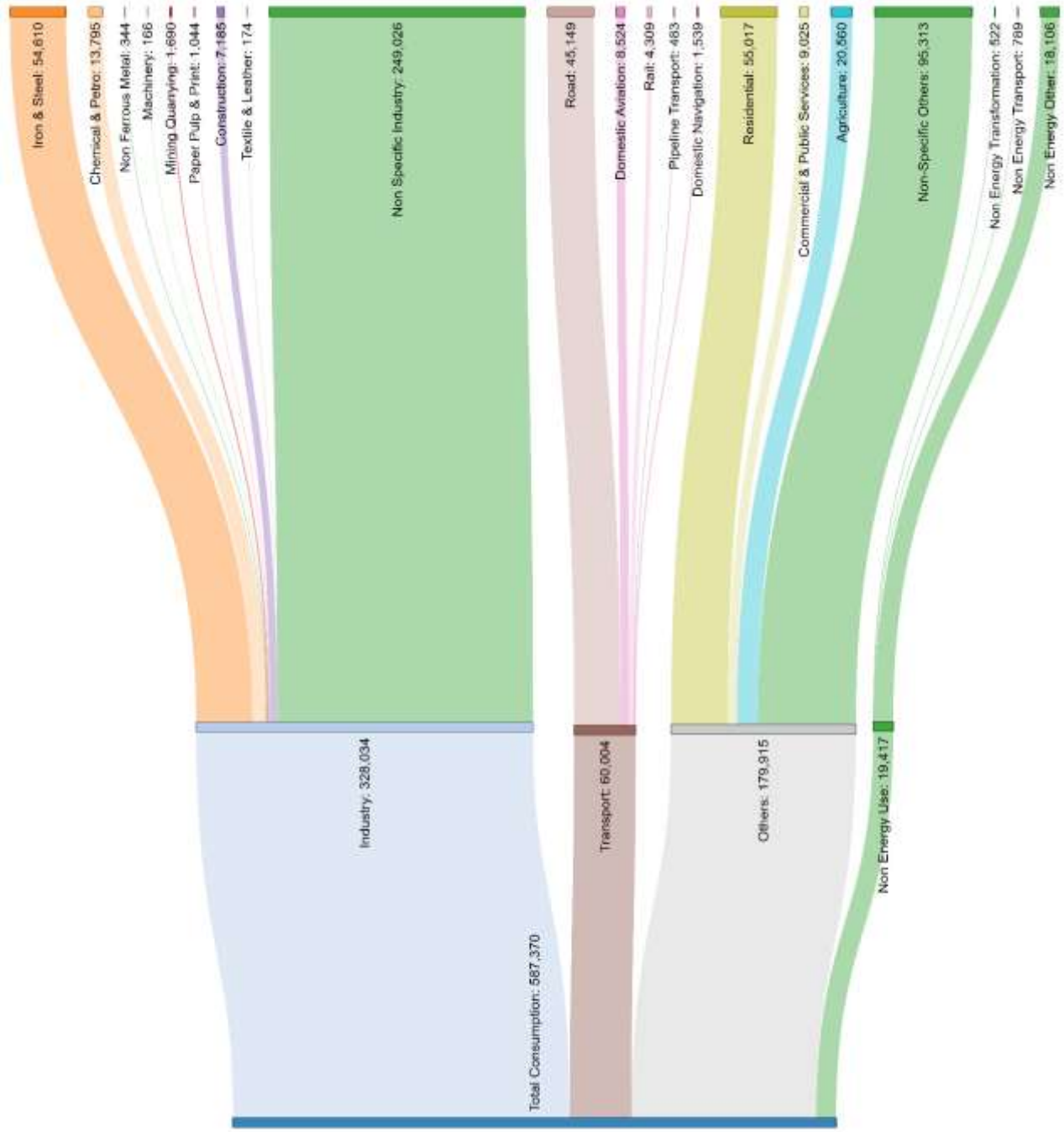
* Final consumption refers to End Use Consumption

P: Provisional

Sankey Diagram Overall Energy Balance of India 2019-20(P) in KToe



Sankey Diagram Final Consumption by sectors 2019-20(P) in KToe



Chapter | 8

Sustainability and Energy

CHAPTER 8
Sustainability and Energy

Sustainability

The United Nations (UN) General Assembly, in its 70th Session held on 25th September 2015, adopted the document titled "Transforming our World: The 2030 Agenda for Sustainable Development" consisting of 17 Sustainable Development Goals (SDGs) and associated 169 targets. The SDGs are a comprehensive list of global goals integrating social, economic and environmental dimensions of development.

Realizing that Energy is critical for people deprived of the opportunity of access to sustainable energy, Goal 7 with the aim to ensure access to affordable, reliable, sustainable and modern energy to all was adopted as one of the 17 SDGs. The goal also stresses more focused attention to improve access to clean and safe cooking fuels and technologies, improve energy efficiency, increase use of renewable sources and promotion of sustainable and modern energy for all. Energy from renewable resources – wind, water, solar, biomass and geothermal energy – is inexhaustible and clean.

The targets adopted as a part of the Goal 7 of SDGs 2030 Agenda are as follows:

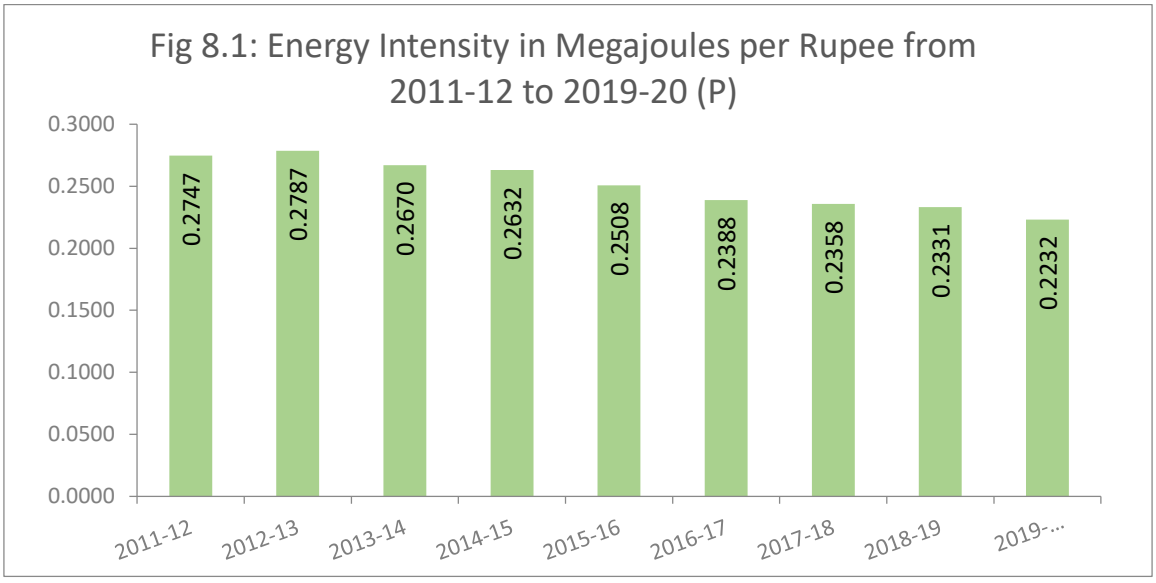
I. By 2030, ensure universal access to affordable, reliable and modern energy services.
II. By 2030, increase substantially the share of renewable energy in the global energy mix.
III. By 2030, double the global rate of improvement in energy efficiency.
IV. By 2030, enhance international co-operation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.
V. By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing states and land-locked developing countries, in accordance with their respective programmes of support.

This Chapter presents some of the concepts related to sustainable energy systems in continuation of the data presented earlier on renewable energy resources in the earlier chapters.

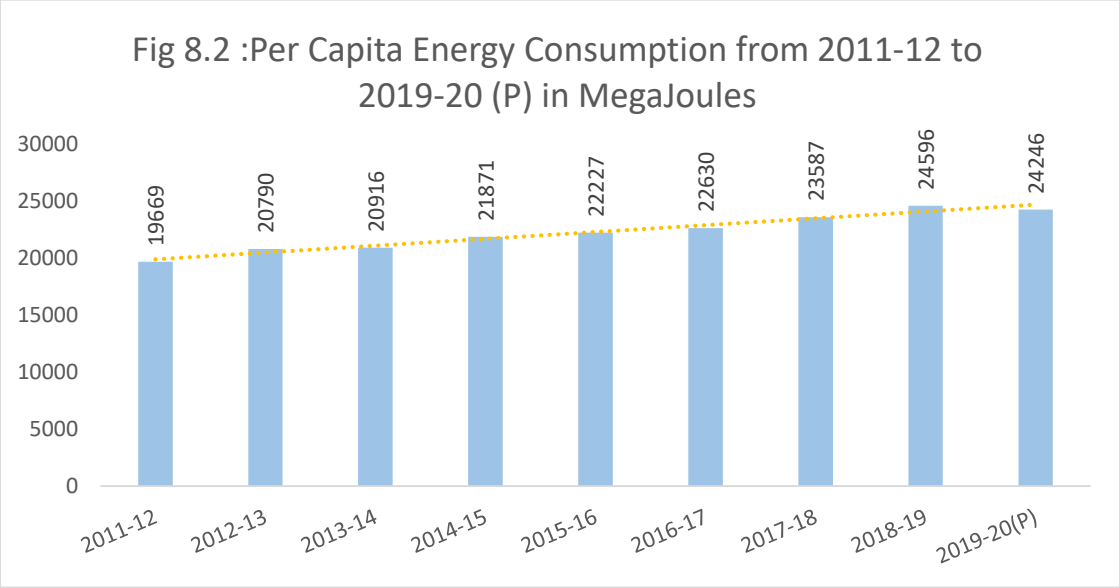
Further, "Energy Indicators for Sustainable Development: Guidelines and Methodology, 2005" by the International Atomic Energy Agency, United Nations Department of Economic And Social Affairs, International Energy Agency, Eurostat And European Environment Agency, has identified a core set of energy indicators, also called Energy Indicators for Sustainable Development, which are designed to provide information on current energy related trends in a format that aids decision making at the national level in order to help countries assess effective energy policies for action on sustainable development. 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 this report is restricted to the economic dimension only and presents some of these indicators in this chapter. The details of the indicators – theme, definition, purpose and measurement method etc. are provided in the Annexures.

Highlights

- One of the Targets identified by the Sustainable Development Goals focuses on making affordable, reliable and modern energy accessible to all people universally. To ensure the same, India has been focusing on availability of electricity to all citizens of the country.
- State-wise number of villages electrified as on 31.03.2020 (P) has reached 100% coverage (relative to 2011 census figures for total number of villages in the country). (Table 8.1).
- Sustainable energy systems also focus on increasing energy efficiency in the long run by improving energy intensity besides shifting to cleaner technologies, improving share of renewable energy in a countries energy mix etc.
- Energy Intensity is defined as the amount of energy consumed for generating one unit of Gross Domestic Product (at constant prices). Along with Energy Intensity, the indicator ''Per Capita Energy Consumption (PEC)'' is the most used policy indicator, both at national and international levels for this purpose. Per-capita Energy Consumption during a year is computed as the ratio of the estimate of total energy consumption during the year to the mid-year population of that year. 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 (Table 8.2).
- The Energy Intensity (at 2011-12 prices) decreased from 0.2747 Mega joules per rupee in 2011-12 to 0.2232 Mega Joules in 2019-20 (P).



- Similarly, Per-capita Energy Consumption increased from 19,669 Mega joules in 2011-12 to 23,889 Mega joules in 2019-20(P).



- Further, India's Total Emissions from the Energy Sector have increased from 1651928 GgCO2 Equivalent in 2011 to 2129428 GgCO2 Equivalent in 2016 as per the latest estimates by MoEFCC, February 2021. The major sector contributing to total emissions remains Energy Industries with its share increasing marginally from 55.95% in 2011 to 56.66 in 2016 (Table 8.3).

Table 8.1 : State-wise Number of Villages Electrified

Sl. No.	States/ UTs	No. of villages as per 2011 Census	Villages Electrified as on 31.3.2019	Villages Electrified as on 31.03.2020 (P)
1	Andhra Pradesh	16158	All Villages Electrified	
2	Arunachal Pradesh	5258		
3	Assam	25372		
4	Bihar	39073		
5	Chhatisgarh	19567		
6	Goa	320		
7	Gujarat	17843		
8	Haryana	6642		
9	Himachal Pradesh	17882		
10	Jammu & Kashmir	6337		
11	Jharkhand	29492		
12	Karnataka	27397		
13	Kerala	1017		
14	Madhya Pradesh	51929		
15	Maharashtra	40956		
16	Manipur	2379		
17	Meghalaya	6459		
18	Mizoram	704		
19	Nagaland	1400		
20	Odisha	47677		
21	Punjab	12168		
22	Rajasthan	43264		
23	Sikkim	425		
24	Tamil Nadu	15049		
25	Telangana	10128		
26	Tripura	863		
27	Uttar Pradesh	97813		
28	Uttarakhand	15745		
29	West Bengal	37463		
30	Andaman & Nicobar	396		
31	Chandigarh	5		
32	Dadar & Nagar Haveli	65		
33	Daman & Diu	19		
34	Delhi	103		
35	Lakshwadeep	6		
36	Puducherry	90		
Total		**597464**		

Source: Central Electricity Authority

Table 8.2: Per-Capita Energy Consumption and Energy Intensity

Year	Energy Consumption in petajoules *	Mid year population (in Million) **	GDP at 2011-12 prices (Rs. crore) **	Per Capita Energy Consumption (in Megajoules)	Energy Intensity (Megajoules per rupee)
2011-12	23996	1220	8736329	19669	0.2747
2012-13	25676	1235	9213017	20790	0.2787
2013-14	26166	1251	9801370	20916	0.2670
2014-15	27710	1267	10527674	21871	0.2632
2015-16	28517	1283	11369493	22227	0.2508
2016-17	29397	1299	1,23,08,193	22630	0.2388
2017-18	30993	1314	1,31,44,582	23587	0.2358
2018-19	32639	1327	1,40,03,316	24596	0.2331
2019-20(P)	32514	1341	1,45,69,268	24246	0.2232
Growth rate of 2019-20 (P) over 2018-19 (%)	**-0.38**	**1.06**	**4.04**	**-1.42**	**-4.25**
CAGR 2011-12 to 2019-20((P) (%)	**3.87**	**1.19**	**6.60**	**2.65**	**-2.56**

(P): Provisional

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

** GDP estimates are at base 2011-12 price as per the National Accounts Divisions's, NSO, MoSPI First Revised Estimates released on 29.01.2021

Mid-Year (as on 1st October) population has been taken from population projections for India and states 2011 – 2036; Report of the Technical Group On Population Projections, November, 2019, National Commission On Population Ministry Of Health & Family Welfare

Table 8.3 India's Total Emissions related to Energy Sector

(GgCO2 Equivalent)

GHG sources and removals	2011	2012	2013	2014	2015	2016
A. Fuel Combustion activities	**16,04,503**	**17,04,639**	**17,74,788**	**18,71,709**	**20,55,017**	**20,92,250**
1. Energy Industries	9,24,258	10,05,813	10,53,981	11,40,983	11,97,123	12,06,587
2. Manufacturing industries & construction	3,38,816	3,43,603	3,56,771	3,51,910	3,94,092	3,97,739
3. Transport	2,21,202	2,36,020	2,41,253	2,50,173	2,61,517	2,74,434
4. Other sectors	1,20,228	1,19,202	1,22,783	1,28,643	2,02,286	2,13,490
B. Fugitive emission from fuels	**47,426**	**43,047**	**38,771**	**38,057**	**37,084**	**37,179**
1. Solid fuels	16,388	16,086	15,568	16,547	16,614	17,121
2. Oil and natural gas	31,037	26,961	23,203	21,511	20,470	20,058
Total Energy (A+B)	**16,51,928**	**17,47,686**	**18,13,559**	**19,09,766**	**20,92,102**	**21,29,428**

Source: India Third Biennial Update Report to The United Nations Framework Convention on Climate Change, Ministry of Environment, Forest and Climate Change, February 2021

*GgCO2 Equivalent : Gigagrams of carbon dioxide equivalent

Table 8.4 Energy Indicators for Sustainability

Theme	Sub-theme	Indicator	Category	Unit	2019-20 (P)
Use and Production Pattern	Overall Use	Energy use per capita	TPES	toe/person	0.7055
			TFC	toe/person	0.4380
			Electricity	Kwh/person	963.0826
	Overall Productivity	Energy use per unit of GDP	TPES	toe/000'rupees	0.0065
			TFC	toe/000'rupees	0.0040
			Electricity	Kwh/000'rupees	8.8645
	Supply Efficiency	Efficiency of energy conversion and distribution	All	%	19.27
	Production	Reserves-to-production ratio	All	years	187
			coal	years	224
			lignite	years	161
		Resources-to-production ratio	All	years	412
			Crude oil	years	19
			Natural Gas	years	44
			Coal	years	471
			Lignite	years	1093
	End Use	Sectoral Energy Intensities	Industry	toe/000'rupees	0.00904
			Agriculture	toe/000'rupees	0.00104
			Transport	toe/000'rupees	0.00938
		Sectoral Electricity Intensities	Industry	Kwh/000'rupees	15.201
			Agriculture	Kwh/000'rupees	11.591
			Transport	Kwh/000'rupees	3.060
	Diversification (Fuel Mix)	Fuel shares in TPES	Crude Oil	%	27.99
			Natural Gas	%	6.33
			Coal	%	64.20
			RE &Others	%	3.99
		Fuel share in TFC	Oil Products	%	37.65
			Natural Gas	%	5.23
			Coal	%	38.21
			Electricity	%	18.91
		Fuel share in electricity	Thermal	%	78.43
			Nuclear	%	2.91
			Hydro	%	9.76
			RE (other than Hydro)	%	8.90
Security	Imports	Net energy import dependency	Overall	%	41.63
			Crude Oil	%	87.59
			Natural gas	%	52.08
			Coal	%	26.48
			Electricity	%	0.39
	Strategic Fuel Stocks	Stocks of critical fuels per corresponding fuel consumption	Coal	%	8.6387

Note: Import Dependency on Crude oil and Natural Gas for 2019-20(P) as released by Ministry of Pteroleum and Natural Gas is 85.02% and 52.83% respectively.
The difference in the figures computed by MoPNG and MoSPI arises due to methodolgical differences - MoSPI using data from supply side and MoPNG using consumption side.

Definitions of Energy Products and associated concepts

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/Oil** 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^{o} and a sweet crude oil may be assumed to have less than 0.5% sulphur content.

ii. **Liquefied Petroleum Gas (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 25ºC to 220ºC.

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 30ºC and 210ºC 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 145ºC to 300°C, but not usually above 250ºC and with a flash point above 38ºC.
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 100ºC and 250ºC. 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 refineryprocesses.

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 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 percent 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 gas liquids (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) orwith back-pressure turbines, and plants using

internal combustionengines 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.

5. **Production of Energy Products** 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.

6. **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**.**

7. **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**.**

8. **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.

9. **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.

10. Non-commercial Energy Sources

i. **Fuelwood, wood residues and by-products:** Fuelwood 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.

11. 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 is referred as transformation/conversion losses.

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%
WasheryGr.I	18%<=Ash content<21%
WasheryGr.II	21%<=Ash content<24%
WasheryGr.III	24%<=Ash content<28%
WasheryGr.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 and3700
G14	GCV between3101 and 3400
G15	GCV between 2801 and 3100
G16	GCV between 2501 and2800
G17	GCV between 2201 and 2500

Source: Coal Controller's Organisation, Ministry of Coal

Measurement Units in Energy Statistics

Physical Units

Energy products are measured in physical units by their mass, volume, and energy content. The measurement units that are specific to an energy product and employed at the point of measurement of an energy flow are often referred to as "original" or "natural" units. Coal, for example, is generally measured by its mass and crude oil by its volume. On the other hand, cross-fuel tabulations, such as the energy balances, are displayed in a "common" unit to allow comparison across energy products. These "common" units are usually energy units and require the conversion from an original unit through the application of an appropriate conversion factor.

Typical examples of original units are: mass units (e.g., kilograms or metric tons) for solid fuels; volume units (e.g., barrels or litres) or mass units (metric tons) for oil; and volume units (e.g., cubic metres) for gases.

Solid fuels, such as coal and coke, are generally measured in mass units. The SI unit for mass is the kilogram (kg). Metric tons (tons) are most commonly used to measure coal and their derivatives. One metric ton corresponds to 1000 kg.

Volume units are original units for most liquid and gaseous fuels, as well as some traditional fuels. The SI unit for volume is the cubic metre, which is equivalent to a kilolitre or one thousand litres. Other volume units include the British or Imperial gallon (approximately 4.546 litres), United States gallon (approximately 3.785 litres), the barrel (approximately 159 litres), and the cubic foot, which is also used to measure volumes of gaseous fuels.

Energy Units

In the realms of Energy Statistics, the terms - Energy, heat and work are considered to be three facets of the same concept. The coherent derived SI unit of energy, heat and work is the joule (J)- defined as the work done when a constant force of 1 Newton is exerted on a body with mass of 1 gram to move it a distance of 1 metre. Common multiples of the joule are the megajoule, gigajoule, terajoule and petajoule. Other units include: the kilogram calorie in the metric system, or kilocalorie (kcal) or one of its multiples; the British thermal unit (Btu) or one of its multiples; ton of coal equivalent (tce), ton of oil equivalent (toe); and the kilowatt hour (kWh).

Power is the rate at which work is done (or heat released, or energy converted, often measured in the kilowatt hour (kWh), which refers to the energy equivalent of 1000 watt (joules per second) over a one-hour period. Thus, 1 kilowatt-hour equals 3.6x106 joules.

Electricity is usually measured in kWh. Heat quantities, on the other hand, are usually measured in calories or joules.

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 petajoules of energy
One million tonnes of oil equivalent (MTOE)	=	41.87 petajoules of energy
One billion cubic meter of natural gas	=	38.52 petajoules of energy
One million cubic meter of natural gas	=	38.52 terajoules of energy
	=	0.03852 petajoules of energy
One billion kilowatt hour of electricity	=	3.60 petajoules of energy

Metadata: Publication

1. Contact	
1.1. Contact organization	National Statistical Office (NSO), Ministry of Statistics & Programme Implementation (MOSPI)
1.2. Division	Economic Statistics Division
1.3. Address	Level 4, East Block 6, R. K. Puram, New Delhi – 110066.
1.4. Email	dir-energy-esd@mospi.gov.in
1.5. Website	http:// www.mospi.gov.in

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 the Coal Controller, Ministry of New and Renewable Energy and Office of the Economic Adviser, Ministry of Commerce and Industry and National Accounts Division, Ministry of Statistics and Programme Implementation.
2.2. Data description
The statistics represent information about reserves, installed capacity, potential for generation, production, consumption, import, export and wholesale price of different energy commodities and Sustainability Energy Indicators of Economic Dimension.
2.3. Sector coverage
Coal & Lignite, Petroleum & Natural Gas, Renewable Energy Resources and Electricity. The indicators are based on the guidelines/approach followed by International Atomic Energy Agency in their publication "Energy Indicators for Sustainable Development: Guidelines and Methodologies", Vienna 2005, which was brought out in collaboration with United Nations Department of Economic and Social Affairs (UNDESA), International Energy Agency (IEA), Eurostat and European Environmental Agency(EEA). Also, the choice of indicators was made as per the availability of data from the subject ministries.
2.4. Data content
The Statistics are given by type of fuel and energy resource. The publication includes analytical indicators viz. Growth Rates, Compound Annual Growth Rates (CAGR), Percentage Distributions etc.
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 2010-11 to 2019-20(P) 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. The data for Office of the Economic Advisor, Ministry of Commerce and Industry and National Accounts Division has been sourced for the year 2011-12 to 2019-20(P). Energy Indicators on Economic Dimensions have been compiled for the year 2019-20(P).
2.9. Base period
2011-12 for WPI and GDP data
2.10. Statistical concepts and definitions
The main Concepts and Definitions and certain Conversion Factors are given in Annexures along with categorization of coal in India.

3. Unit of measure
Energy quantities data are recorded in physical units relevant to the product in question; Giga Watt hour (GWh) for electricity, Thousand Metric Tonne (TMT) for petroleum products etc. Prices are indicated by Wholesale Price Index. The Energy Balance is given in Kilo Tonne of oil equivalent (KToE). Consumption and Production of the Energy resources is also given in Petajoules(PJ).

4. Reference period
Reference period of the Publication of "Energy Statistics -2020" is the financial year 2018-19 and the previous financial years since 2009-10. For Energy Indicators reference period is Financial Year 2018-19.

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 at end of March every year.
7.2. User access
MoSPI disseminates Energy 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 data dissemination policy of Government of India.

8. Dissemination format
8.1. News release
None.
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 annexures of 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. ESD, NSO 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
Provisional data on energy production and consumption statistics for the year 2019-20 is published in current publication. Final data will be given in the next publication in March 2021.

13. Statistical processing
13.1. Source data
Energy data are collected from the source agencies at national level and presented in the publication. The publication is available on MoSPI website.
13.2. Frequency of data collection
Annual.
13.3. Data collection
Data is collected through e-mail or by publications brought out by the source agencies.
13.4. Data validation
Quality and coherence data 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.

Sustainability Energy Indicators of Economic Dimension

The publication "*Energy Indicators for Sustainable Development: Guidelines and Methodology, Vienna, 2005, IAEA*" presents a list of indicators on Social, Economic and Environment dimensions associated with sustainability in Energy.

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 this report is restricted to the economic dimension only.

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.

List of Sustainability Energy Indicators of Economic

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

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

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

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

Energy Indicator: 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.

Energy Indicator: 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

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 renewable 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

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:

a. TPES,
b. TFC and
c. Electricity generation

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.

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

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 2011-12. 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

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.

Theme: Security

SUB THEME: STRATEGIC FUEL STOCKS

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

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.

United Nations, *International Recommendations for Energy Statistics (IRES),* Statistical Papers, Series M, No. 93, 2018. Available at https://unstats.un.org/unsd/energy/ires/IRES-web.pdf

United Nations. (2018). *System of Environmental-Economic Accounting for Energy (SEEA-Energy*). Available at https: // seea. un. Org /sites /seea.un.org /files/documents/seeaenergy_final_web.pdf

United Nations, (2015), *Transforming our world: the 2030 Agenda for Sustainable Development,* A/RES/70/1, 70th Session.

International Atomic Energy Agency and others. *Energy Indicators for Sustainable Development: Guidelines and Methodologies.* Vienna, 2005. Available at www-pub.iaea.org/MTCD/ publications/PDF/Pub1222_web.pdf.

International Energy Agency (IEA), 2014, *Energy Efficiency Indicators: Fundamentals on Statistics*.

Organization for Economic Cooperation and Development, International Energy Agency and Eurostat. *Energy Statistics Manual*. Paris, 2005.

United Nations, Economic Commission for Europe. *United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources* 2009. ECE Energy Series, No. 39. 2010. Available at www.unece.org/fileadmin/DAM/energy/se/pdfs/UNFC/UNFC2009_ECE_EnergySeries39.pdf.

United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organization for Economic Cooperation and Development and World Bank. *System of Environmental-Economic Accounting 2012: Central Framework*. 2014

Ministry of Coal, Coal Controller's Organisation, Kolkata, Various Editions, *Provisional Coal Statistics* and *Coal Directory of India*.

Ministry of Petroleum and Natural Gas, Economics & Statistics Division, Various Editions, *Indian Petroleum & Natural Gas Statistics*.

Ministry of New and Renewable Energy Resources, *Annual Report and Generation Reports*, Various Editions.