ENERGY STATISTICS
INDIA 2023

GOVERNMENT OF INDIA

MINISTRY OF STATISTICS AND PROGRAMME IMPLEMENTATION

National Statistical Office

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निवेदिता गुप्ता, भारतीय सांख्यिकी सेवा
महानिदेशक
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Director General

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आज़ादी का अमृत महोत्सव

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Foreword

Energy is fundamental to human development from industrial revolution to contribution to near-continuous economic growth of recent times, the part played by energy as an enabler of modern development and growth can only be described as 'Foundational'.

In 2015, 193 Member States of the United Nations including India, committed to the Post-2015 Development Agenda, adopted with the motto of "No one left behind" and pledging 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 renewables and energy-efficient technologies can spur innovation besides reinforcing local, regional and national industrial and employment objectives. In India, ensuring Indian citizens have access to power and clean cooking by shifting to renewable and efficient modern energy systems; 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 recognizing that "We are focusing on the basics: housing, power, water and sanitation for all – important not just for welfare, but also for human dignity".

This publication of Energy Statistics, the 30th in the series, presents an integrated database on Energy Statistics in the country against the financial year 2021-22. 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 Ministry of 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 from the combustion of fuels and fugitive emissions which impact climate changes and stability of different ecosystems.

I hope the publication provides requisite evidence to the policy makers in the field of Energy for formulation of key approaches and the needed course corrections on the pathway to sustainable and reliable energy for all.

09th March 2023

Smt. Nivedita Gupta
DG, NSO

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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

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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:

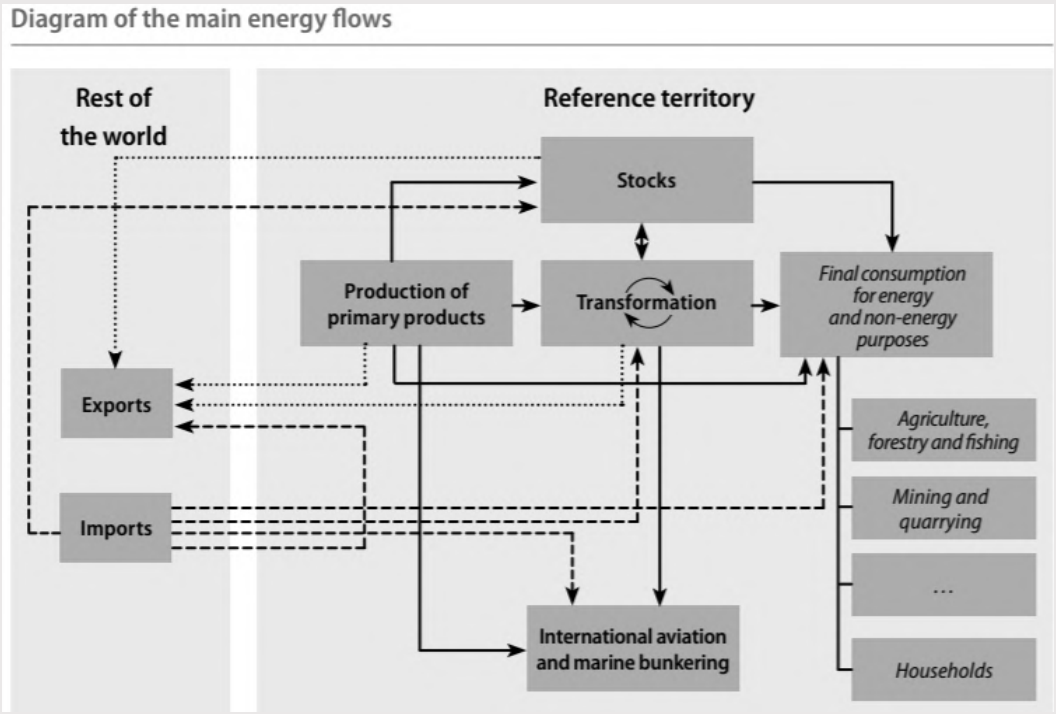
Recommended units for dissemination

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.



Source: IRES, 2011, United Nations

The present publication, Energy Statistics India 2023, is fully compliant with the IRES 2011 and follows the practices prescribed therein.

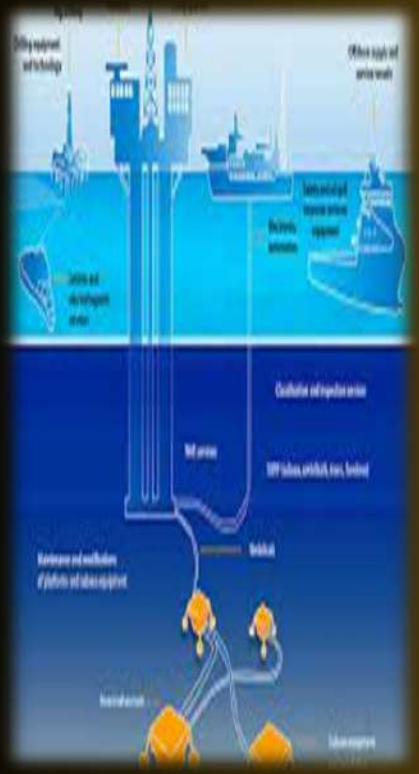
The publication in its various chapters presents the concepts of production, consumption, trade, energy balance etc. The data is collected from various line Ministries/Departments of Government of India including Ministry of Coal, Ministry of Petroleum and Natural Gas, Ministry of Power, Ministry of 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 30th 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.

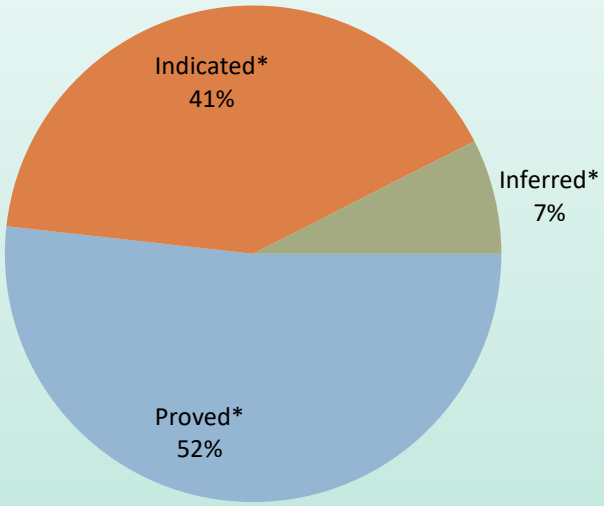
India has one of the largest proven coal reserves in the world. However, one of the objectives of India's energy mix has been to promote the production of energy through the use of renewable energy sources in accordance with climate, environment and macroeconomic considerations in order to reduce dependence 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 as on 01-04-2022 were 361.41 billion tonnes, an addition of 9.28 billion tonnes over the corresponding period of previous year. In terms of percentage, there has been a growth of 2.64% in the total estimated coal reserves during the year 2021-22 over 2020-21 (Table 1.1.).
- The top three states with highest coal reserves in India are Odisha, Jharkhand, Chhattisgarh, which account for approximately 69% 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 52% of the total as depicted below in Fig 1.1.

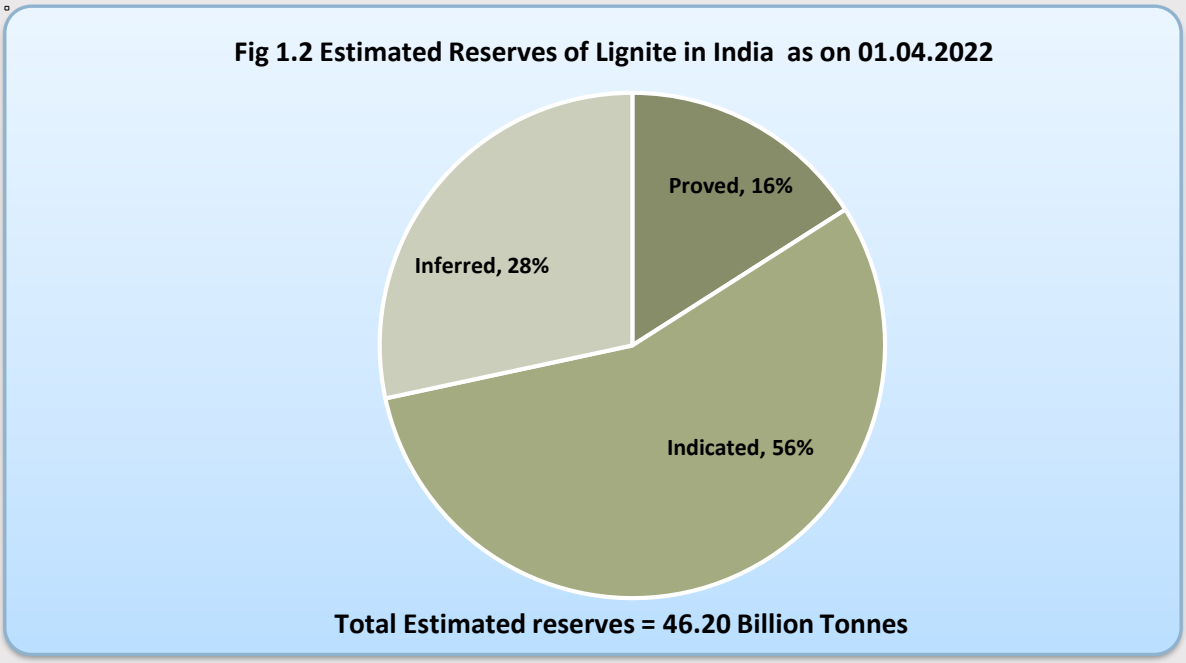
Fig 1.1 Estimated Reserves of Coal in India as on 01.04.2022



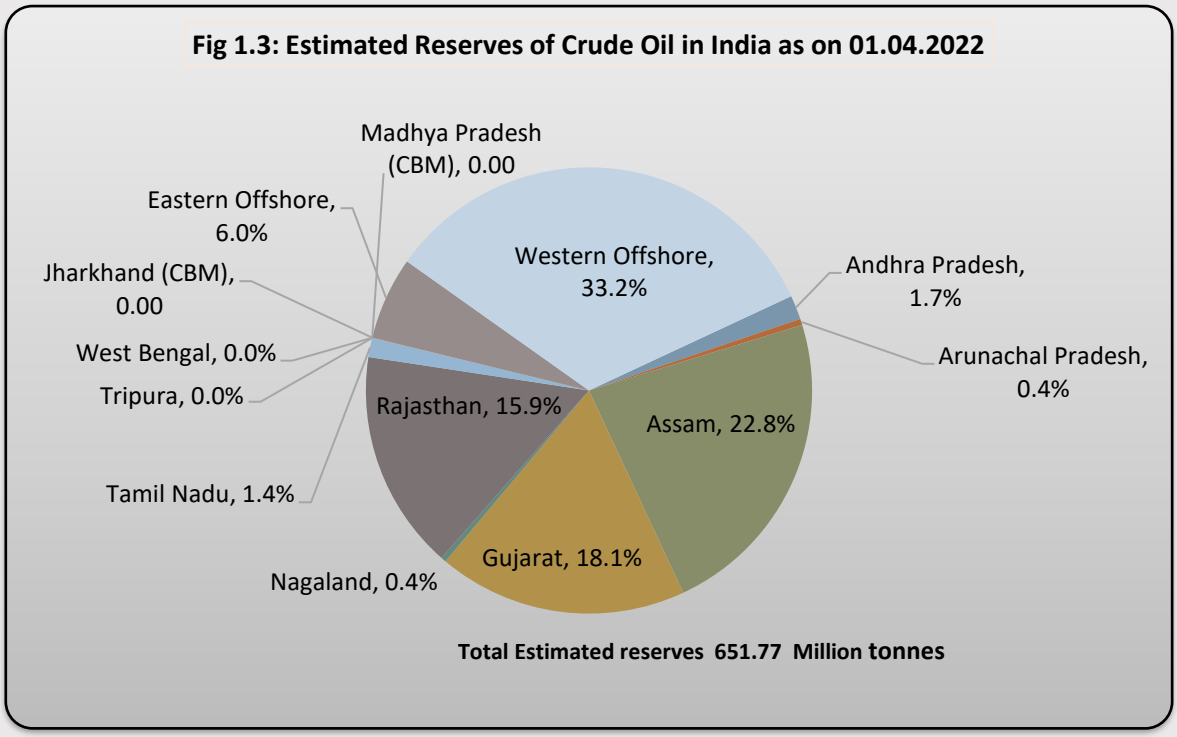
Total Estimated reserves = 361.41 Billion

- Total estimated of lignite as on 01-04-2022 were 46.20 billion tonnes, an addition of 0.18 billion tonnes over the corresponding period of previous year. In terms of percentage, there has been a growth of 0.39% in the total estimated lignite reserves during the year 2021-22 over 2020-21 (Table 1.1A). The highest reserves of lignite are found in the state of Tamil Nadu. Out of the total Lignite reserves in the country, proven reserves account for almost only 16% of the total as depicted below in Fig 1.2.

** Brief about the Proved, Inferred and Indicated has been given under* ***Annexure – I.***

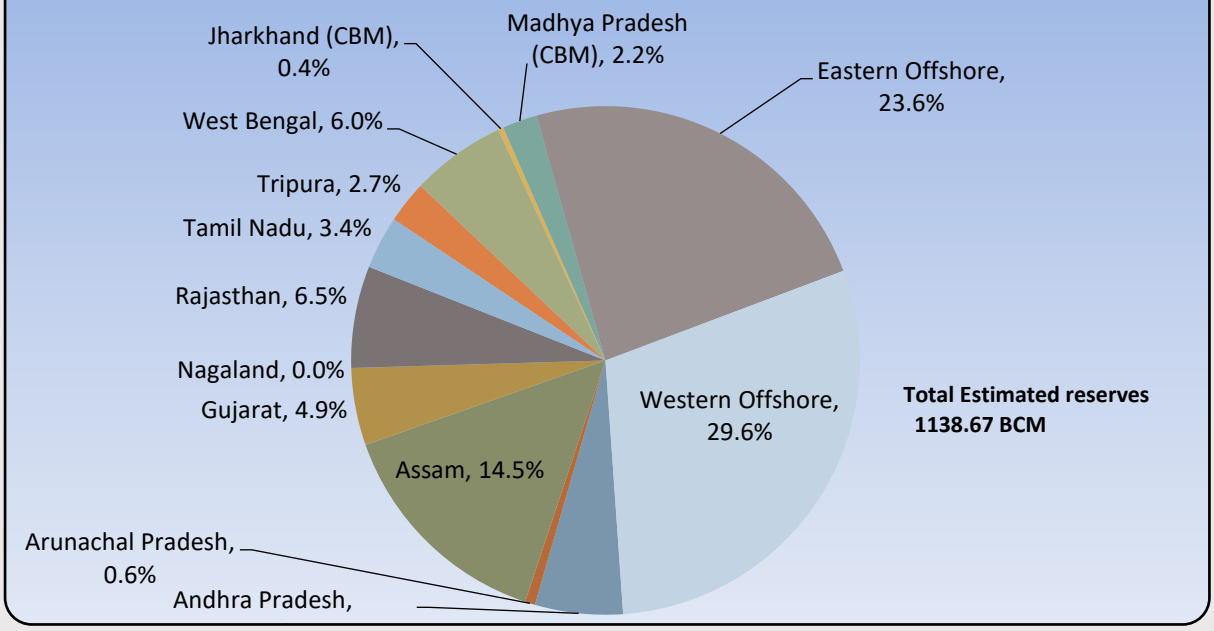


- The estimated reserves of crude oil in India as on 01-04-2022 stood at 651.77 million tonnes against 591.92 million tonnes in the previous year. An increase of over 10% over last year. Geographical distribution of Crude Oil indicates that the maximum reserves are in the Western Offshore (33%) followed by Assam (23%) (Table 1.2).



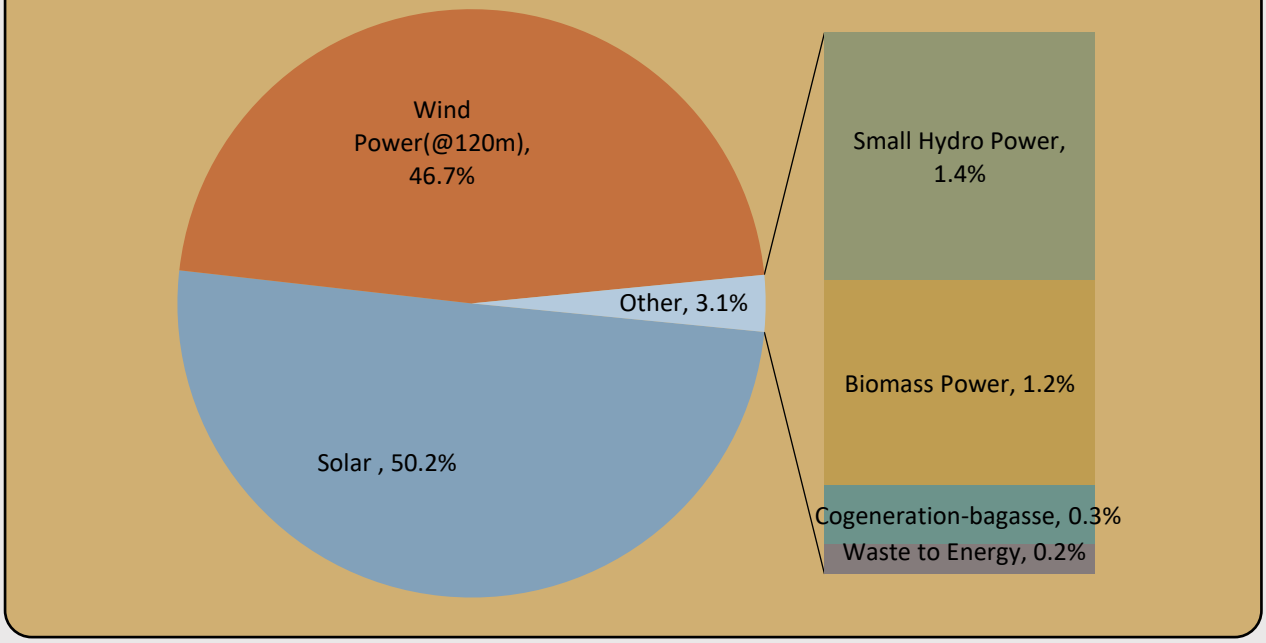
- The estimated reserves of Natural Gas as on 01-04-2022 was at 1138.67 Billion Cubic Meters. The maximum reserves of Natural Gas are in the Western Offshore (29.6%) followed by Eastern offshore (23.6%).

Fig 1.4 : Estimated Reserves of Natural Gas in India as on 01.04.2022



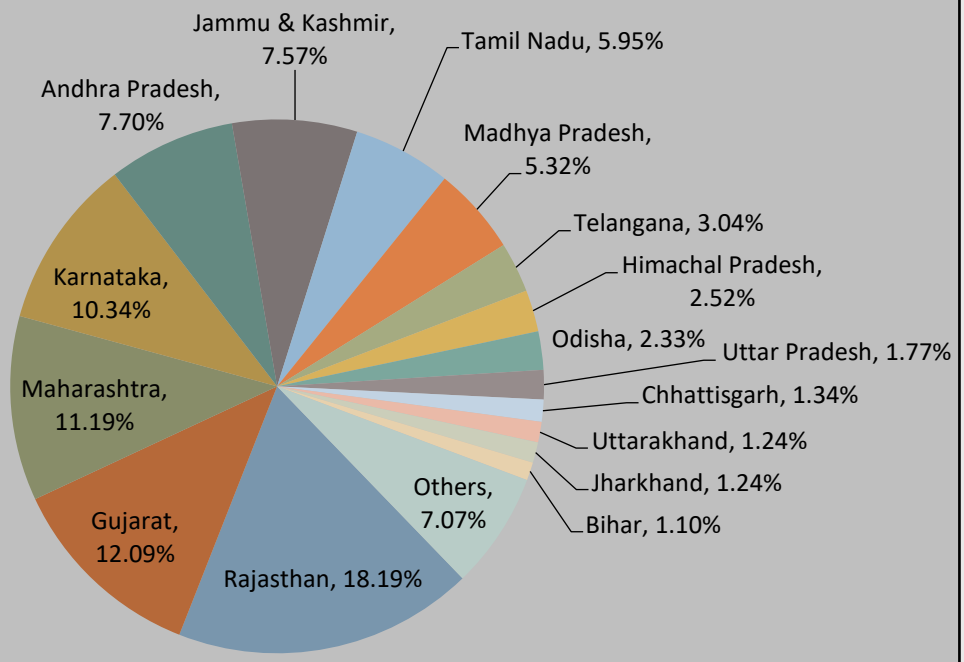
- There is a high potential for generation of renewable energy from various sources like wind, solar, biomass, small hydro and cogeneration bagasse in India. The total potential for renewable power generation in the country as on 31.03.2022 is estimated at 14,90,727 MW This includes solar power potential of 7,48,990 MW (50.24%), wind power potential of 6,95,509 MW (46.66%) at 120m hub height, SHP (small-hydro power) potential of 21,134 MW (1.42%), Biomass power of 17,538 MW (1.18%), 5,000 MW (0.34%) from bagasse-based cogeneration in sugar mills and 2,556 MW (0.17%) from waste to energy (Table 1.3).

Fig 1.5: Source wise Estimated Potential of Renewable Power in India as on 31.03.2022



- The geographic distribution of the estimated potential of renewable power as on 31.03.2022 shows that Rajasthan has the highest share of about 18.2% (271219 MW). This is followed by Gujarat with 12.1% (share 180215 MW). Maharashtra and Karnataka come next with a 11.2% and 10.3% share (166743MW and 154162 MW respectively). These four (4) states are having more than 50% of the total potential of Renewable Power in India.

Fig 1.6: Statewise Estimated Potential of Renewable Power in India as on 31.03.2022



Total Estimated Potential of Renewable Power =14,90,727 MW

Table 1.1: Statewise Estimated Reserves of Coal (as on 01st April)

(in Million Tonnes)

States/ UTs	Proved		Indicated		Inferred		Total		Distribution (%)	
	2021-22	2022-23	2021-22	2022-23	2021-22	2022-23	2021-22	2022-23	2021-22	2022-23
Andhra Pradesh	921	921	901	2,443	425	778	2,247	4,142	0.64	1.15
Arunachal Pradesh	31	31	40	40	19	19	90	90	0.03	0.02
Assam	465	465	57	55	3	3	525	522	0.15	0.14
Bihar	310	310	3,143	4,080	11	48	3,464	4,437	0.98	1.23
Chhattisgarh	31,562	32,053	40,425	40,701	1,437	1,437	73,424	74,192	20.85	20.53
Jharkhand	52,046	53,245	28,882	28,260	5,288	5,155	86,217	86,660	24.48	23.98
Madhya Pradesh	13,479	14,052	13,060	12,723	3,678	4,142	30,217	30,917	8.58	8.55
Maharashtra	7,770	7,984	3,320	3,390	1,847	1,847	12,936	13,221	3.67	3.66
Meghalaya	89	89	17	17	471	471	576	576	0.16	0.16
Nagaland	9	9	22	22	416	448	446	478	0.13	0.13
Odisha	43,326	48,573	35,222	34,080	6,330	5,452	84,878	88,105	24.10	24.38
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	0.30	0.29
West Bengal	15,199	17,234	13,296	12,859	4,597	3,779	33,092	33,871	9.40	9.37
Telangana	11,089	11,257	8,328	8,344	3,433	3,433	22,851	23,034	6.49	6.37
All India Total	**1,77,179**	**1,87,105**	**1,46,949**	**1,47,250**	**27,998**	**27,054**	**3,52,126**	**3,61,409**		
Distribution (%)	**50.32**	**51.77**	**41.73**	**40.74**	**7.95**	**7.49**	**100.00**	**100.00**		

Total may not tally due to rounding off

Source: Office of Coal Controller, Ministry of Coal

Table 1.1(A): Statewise Estimated Reserves of Lignite (as on 01st April)

(in Million Tonnes)

States/ UTs	Proved		Indicated		Inferred		Total		Distribution (%)	
	2021-22	2022-23	2021-22	2022-23	2021-22	2022-23	2021-22	2022-23	2021-22	2022-23
Gujarat	1279	1279	284	284	1160	1160	2722	2722	6	6
Jammu & Kashmir	0	0	20	20	7	7	28	28	0	0
Kerala	0	0	0	0	10	10	10	10	0	0
Puducherry	0	0	406	406	11	11	417	417	1	1
Rajasthan	1169	1169	3030	3030	2151	2259	6349	6458	14	14
Tamil Nadu	4927	4927	21910	21981	9653	9653	36490	36561	79	79
West Bengal	0	0	1	1	3	3	4	4	0	0
All India	**7374**	**7374**	**25651**	**25722**	**12994**	**13102**	**46018**	**46198**	**100**	**100**
Distribution (%)	**16**	**16**	**56**	**56**	**28**	**28**	**100**	**100**		

Total may not tally due to rounding off

Source: Office of Coal Controller, Ministry of Coal

Table 1.2: Statewise Estimated Reserves of Crude Oil and Natural Gas (as on 01st April)

States/ UTs/ Region	Crude Oil (Million Tonnes)				Natural Gas (Billion Cubic Metres)			
	2021-22		2022-23		2021-22		2022-23	
	Estimated Reserves	Distribution (%)	Estimated Reserves	Distribution (%)	Estimated Reserves	Distribution (%)	Estimated Reserves	Distribution (%)
Andhra Pradesh	7.33	1.2%	11.39	1.7%	64.80	4.7%	63.58	5.6%
Arunachal Pradesh	3.64	0.6%	2.89	0.4%	3.14	0.2%	7.30	0.6%
Assam	153.05	25.9%	148.60	22.8%	166.55	12.1%	165.09	14.5%
Gujarat	115.41	19.5%	117.86	18.1%	57.22	4.2%	55.87	4.9%
Nagaland	2.38	0.4%	2.38	0.4%	0.09	0.0%	0.09	0.0%
Rajasthan	35.26	6.0%	103.67	15.9%	59.07	4.3%	73.65	6.5%
Tamil Nadu	9.01	1.5%	8.98	1.4%	37.90	2.8%	38.46	3.4%
Tripura	0.07	0.0%	0.07	0.0%	29.27	2.1%	30.35	2.7%
West Bengal	0.02	0.0%	0.11	0.0%	32.17	2.3%	68.63	6.0%
Jharkhand (CBM)	-	-	-	-	8.56	0.6%	4.12	0.4%
Madhya Pradesh (CBM)	-	-	-	-	30.88	2.3%	25.18	2.2%
Eastern Offshore	42.96	7.3%	39.19	6.0%	557.07	40.6%	269.04	23.6%
Western Offshore	222.79	37.6%	216.63	33.2%	325.65	23.7%	337.29	29.6%
Total	**591.92**	**100%**	**651.77**	**100%**	**1372.37**	**100%**	**1138.67**	**100%**

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

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: Sourcewise and Statewise Estimated Potential of Renewable Power in India duirng 2021-22

(in MW)

Sl. No.	States/ UTs	Wind Power @ 120m	Small Hydro Power	Biomass Power	Cogeneration-bagasse	Waste to Energy*	Solar Energy	Total	Distribution (%)
1	Andhra Pradesh	74906	409	578	300	123	38440	**114756**	**7.7%**
2	Arunachal Pradesh	274	2065	8			8650	**10997**	**0.7%**
3	Assam	246	202	212		8	13760	**14428**	**1.0%**
4	Bihar	3650	527	619	300	73	11200	**16369**	**1.1%**
5	Chhattisgarh	348	1098	236		24	18270	**19976**	**1.3%**
6	Goa	8	5	26			880	**919**	**0.1%**
7	Gujarat	1,42,560	202	1221	350	112	35770	**180215**	**12.1%**
8	Haryana	419	107	1333	350	24	4560	**6793**	**0.5%**
9	Himachal Pradesh	151	3460	142		2	33840	**37595**	**2.5%**
10	Jammu & Kashmir	3	1707	43			111050	**112803**	**7.6%**
11	Jharkhand	0	228	90		10	18180	**18508**	**1.2%**
12	Karnataka	1,24,155	3726	1131	450		24700	**154162**	**10.3%**
13	Kerala	2311	647	1044		36	6110	**10148**	**0.7%**
14	Madhya Pradesh	15404	820	1364		78	61660	**79326**	**5.3%**
15	Maharashtra	98213	786	1887	1250	287	64320	**166743**	**11.2%**
16	Manipur	0	100	13		2	10630	**10745**	**0.7%**
17	Meghalaya	1	230	11		2	5860	**6104**	**0.4%**
18	Mizoram	0	169	1		2	9090	**9262**	**0.6%**
19	Nagaland	0	182	10			7290	**7482**	**0.5%**
20	Odisha	8346	286	246		22	25780	**34680**	**2.3%**
21	Punjab	278	578	3172	300	45	2810	**7183**	**0.5%**
22	Rajasthan	127756	52	1039		62	142310	**271219**	**18.2%**
23	Sikkim	0	267	2			4940	**5209**	**0.3%**
24	Tamil Nadu	68750	604	1070	450	151	17670	**88695**	**5.9%**
25	Telangana	24835	102				20410	**45347**	**3.0%**
26	Tripura	0	47	3		2	2080	**2132**	**0.1%**
27	Uttar Pradesh	101	461	1617	1250	176	22830	**26435**	**1.8%**
28	Uttarakhand	54	1664	24		5	16800	**18547**	**1.2%**
29	West Bengal	1050	392	396		148	6260	**8246**	**0.6%**
30	Andaman & Nicobar	1277	7				0	**1284**	**0.1%**
31	Chandigarh	0				6	0	**6**	**0.0%**
32	Dadar & Nagar Haveli	0					0	**0**	**0.0%**
33	Daman & Diu	0					0	**0**	**0.0%**
34	Delhi	0				131	2050	**2181**	**0.1%**
35	Lakshadweep	31					0	**31**	**0.0%**
36	Puducherry	382				3	0	**385**	**0.0%**
37	Others$					1022	790	**1812**	**0.1%**
All India Total		**6,95,509**	**21,134**	**17,538**	**5,000**	**2,556**	**7,48,990**	**14,90,727**	**100%**
Distribution (%)		**46.66**	**1.42**	**1.18**	**0.34**	**0.17**	**50.24**	**100.00**	

$ Others includes installations through NGOs/IREDA in different states

* 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).

Development of an Energy systems which is 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.

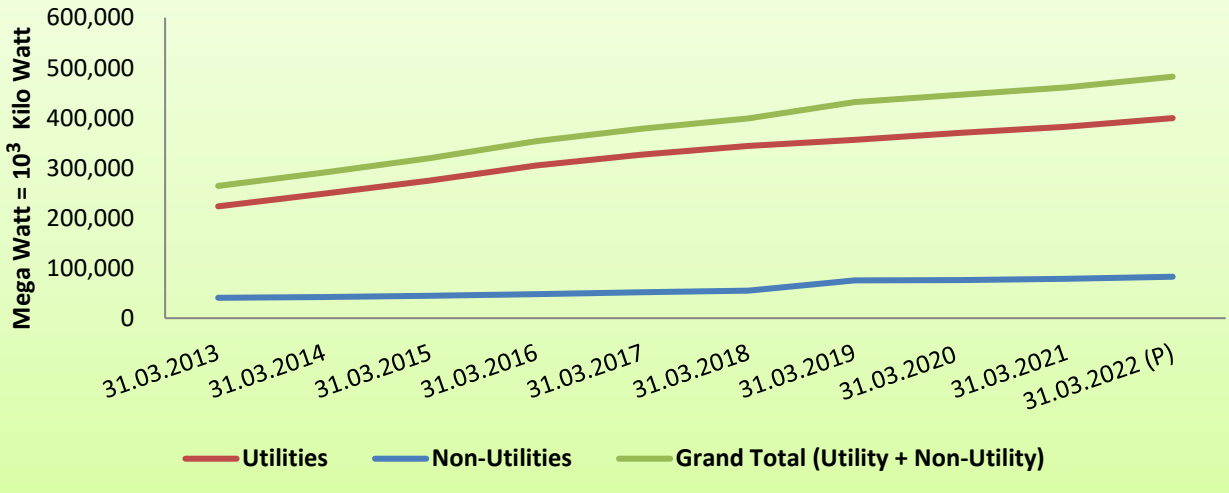
It is worthy to note here that not all potential is viable to be transformed into capacity, and overall capacity does not lead to an equal amount of generation due to production losses etc. Power plants have a capacity to produce a certain amount of power during a given time, but if they are taken offline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

Highlights

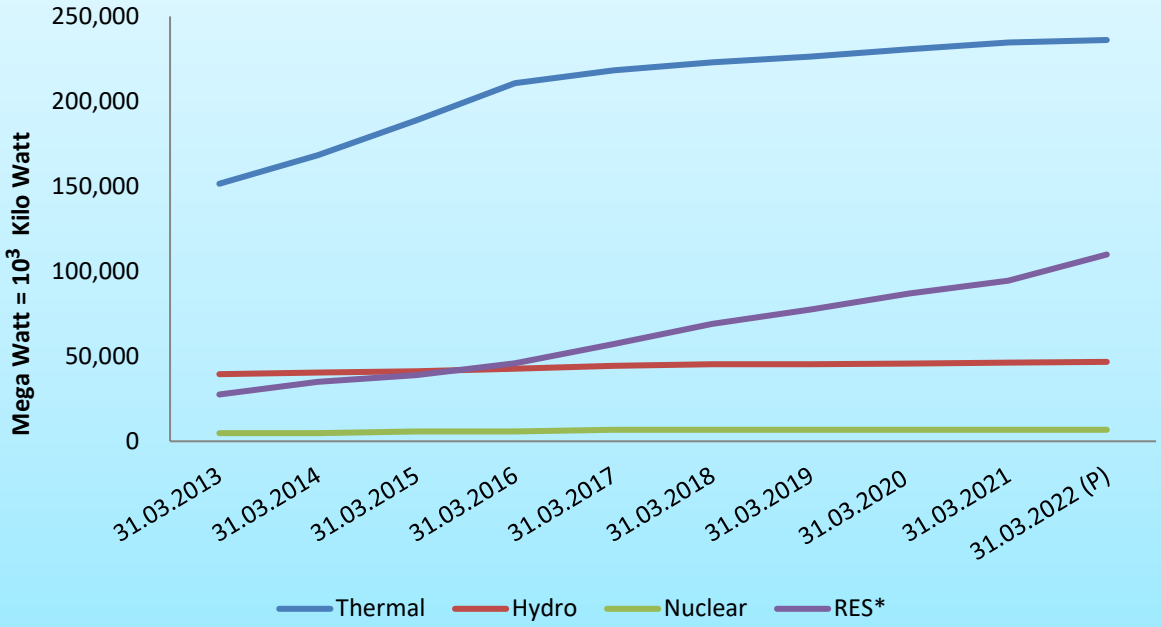
- Total installed capacity of coal washeries in India is 152.31 Million Tonne per year (MTY) as on 31.03.2022 (P). This comprises of 37.18 MTY in coking and 115.13 MTY in Non-Coking Coal Washeries (Table 2.1).
- Similarly, as on 31.03.2022, there were a total of 23 refineries in the country, 19 in the Public Sector, 4 in the Private sector and Joint Venture (Table 2.2).
- The refining capacity of the country is 2,51,216 TMTPA on 31.03.2021 which is 2000 TMTPA more than from the last year. Public sector refineries have the dominance of over 60% of the total capacity in India.
- The Refinery production (crude throughput) achievement was 2,21,773 TMT during 2020-21 which has increased to 2,41,703 TMT during 2021-22 i.e. a net increase of 9% over 2020-21.
- Hence, the overall Capacity utilization of the refineries which was 88.76% during 2020-21 has increased to 96.99% in 2021-22. In the Public Sector, Indian Oil Corporation (IOC) increased its capacity utilization from 89.46% in 2020-21 to 96.60% in 2021-22. The Private and Joint venture, have also experienced positive growth rate of 8.17% during FY:2021-22 over the previous year.
- In absolute terms, the installed capacity of electricity generation increased by 4.68% to 4,82,232 MW in 2021-22 over 4,60,659 MW in 2020-21 with the major share of installed capacity existing with utilities i.e. 82.84% (Table 2.3).

Fig 2.1:Trends in Installed Electricity Generation Capacity (MW) in India during the period 2012-13 to 2021-22 (P)



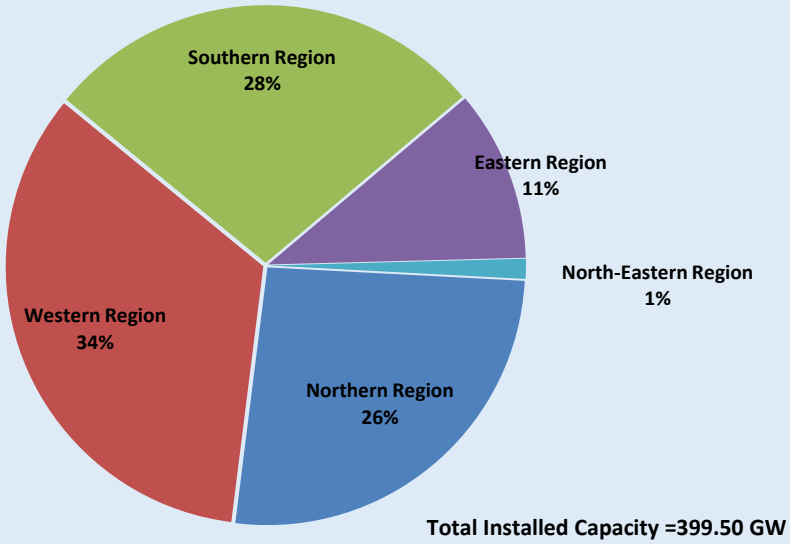
- India's Energy mix has been seeing a shift from more conventional resources of energy to renewable sources. The financial year 2021-22 has witnessed a growth of 16.4% over last year in the installed capacity of RES (Renewable Energy Sources, other than Hydro) under utility; while that of thermal sources grew only at 0.06%.

Fig 2.2: Trends in Installed Electricity Generation Capacity from Utilities (MW) in India - Sourcewise during the period 2012-13 to 2021-22 (P)



- The geographical distribution of installed capacity of electricity generating as on 31.03.2022 indicates that Western Region accounted for the highest share (34%) followed by Southern Region (28%) and Northern Region (26%). 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 3.63 GW and Rajasthan has the highest share of Other renewable resources of 16.70 GW. (Table 2.4).

Fig 2.3:Regionwise Installed Generation Capacity of Electricity (Utilities) as on 31.03.2022



- Region wise growth in the installed capacity during 2021-22 reveals that North Region (NR) registered highest annual growth of about 10.75%. The NR has also registered a growth of over 45% in the RES (Renewable Energy Sources) sector. Amongst all the major states Rajasthan registered highest annual growth (35.25%) in the installed capacity.
- The total installed capacity of grid interactive renewable power, which was 95,803 MW in 2021 increased to 1,09,885 MW (a growth of 14.70%) during a year (2022) (Table 2.5).
- Out of the total installed generation capacity of renewable sources of power in 2022, installed capacity of Solar power including roof tops accounted for about 49.1%, followed by Wind power (36.7%) and Bio Power & Waste to Energy (9.7%). However, in terms of growth rates year on year, Solar power installed capacity has a growth rate of 30.95% from FY: 2020-21 to FY: 2021-22.
- Rajasthan had the highest installed capacity of grid connected renewable power (17,040.62 MW) in 2022 followed closely by Gujarat (16,587.90 MW) mainly on account of wind and solar power.

Fig 2.4 : Sectorwise percentage distribution of Installed Grid-Interactive Renewable Power Capacity during 2021-22(P)

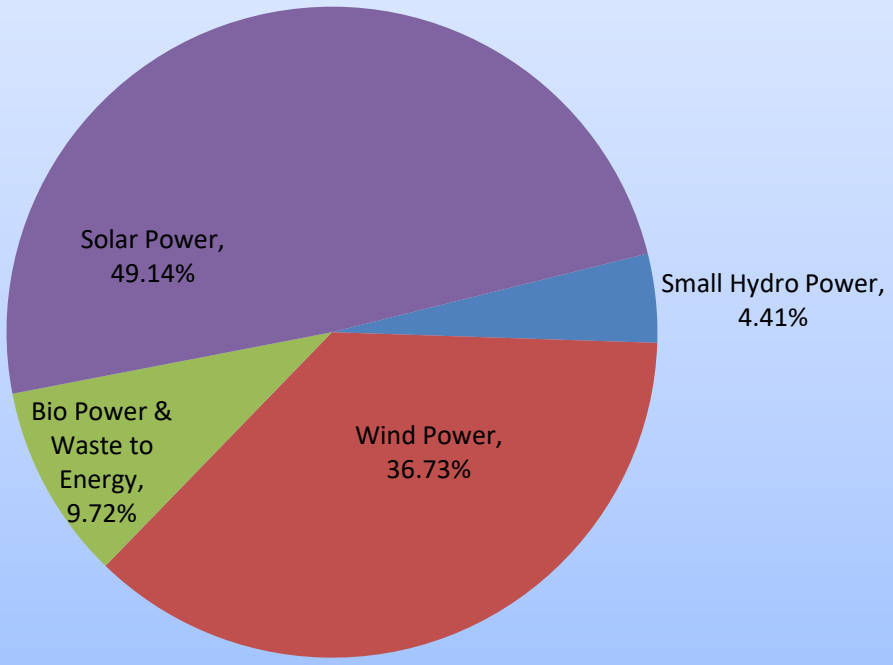
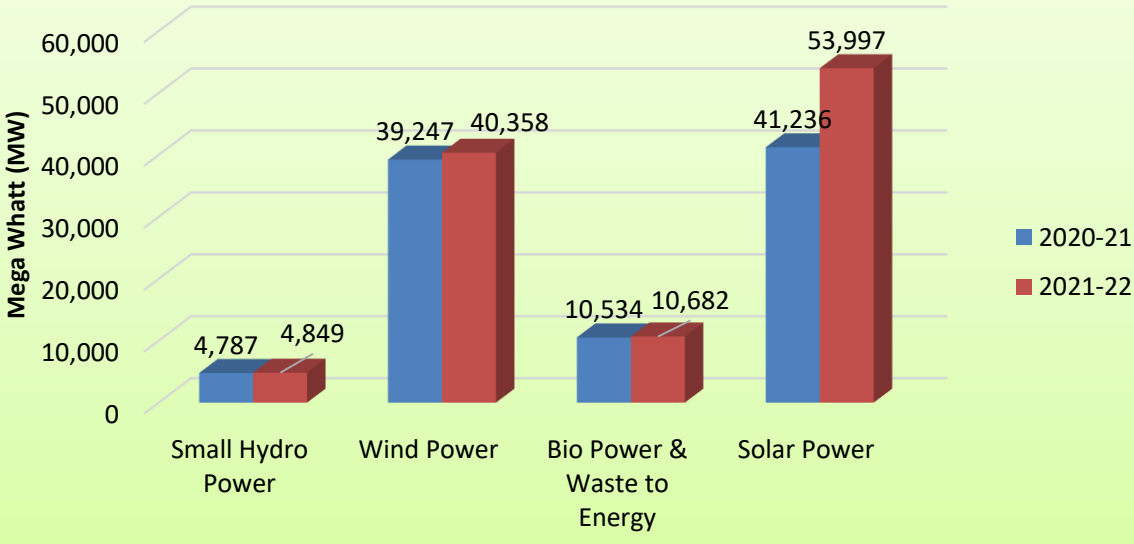


Fig 2.5 : Installed Capacity of Grid-Interactive Renewable Power During 2020-21 and 2021-22(P)



- Again, in case of Off-Grid/De-centralized Renewable Energy System, India has shown a steady growth over periods of time. Installation of solar Street Lightening System (SLS) has experienced a growth of 12.6% over last year. Also, the Solar Photovoltaic Plants (SPV) has registered a growth of 21.9% over last year (Figure 2.6).

Fig 2.6 : Installation of Off-grid / Decentralised Renewable Energy Systems/ Devices during last 3 years

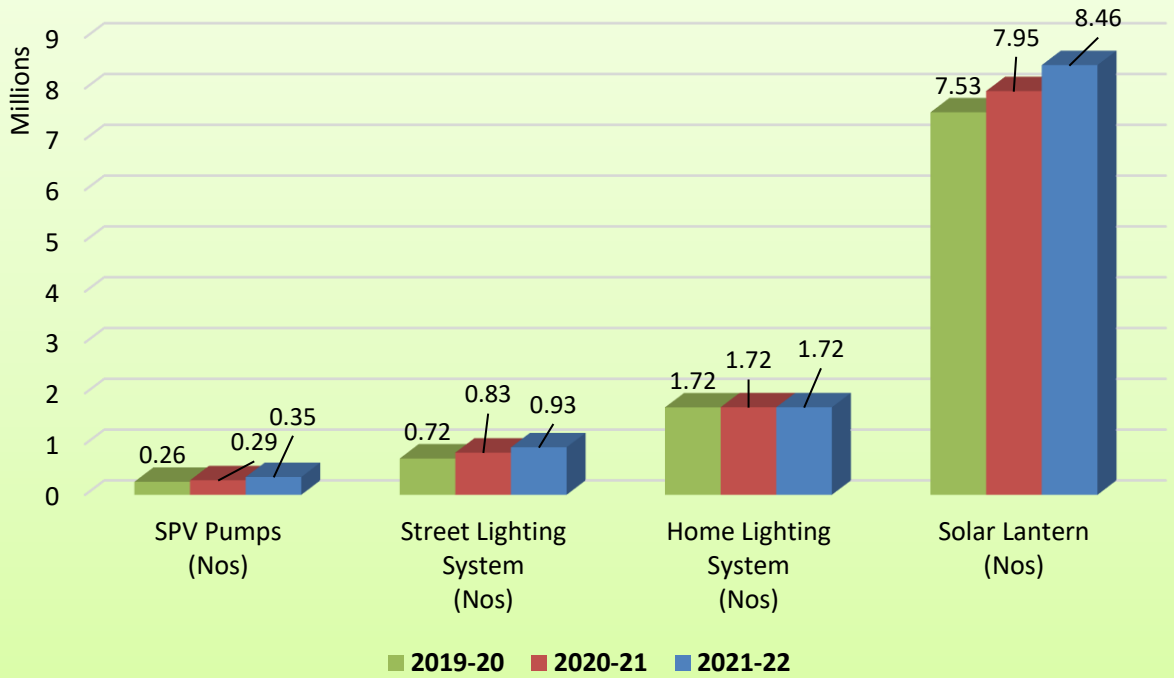


Table 2.1: Installed Capacity of Coal Washeries

Sl. No.	Washery & Operator	State of Location	Capacity (MTY) 31.03.2022*
	COKING COAL :		
1	Dudga-II, CIL	Jharkhand	2.00
2	Patherdih, CIL	Jharkhand	5.00
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
12	Bhojudih, CIL	West Bengal	1.70
	(A) CIL		**25.58**
13	Chasnala, IISCO	Jharkhand	1.40
14	Jamadoba, TISCO	Jharkhand	2.00
15	West Bokaro-II, TISCO	Jharkhand	2.50
16	West Boakaro-III,TISCO	Jharkhand	4.50
17	Bhelatand, TISCO	Jharkhand	1.20
18	Durgapur, SAIL	West Bengal	Closed
19	DCOP, DPL	West Bengal	Closed
	(B) PSU & Private		**11.60**
	TOTAL COKING (A + B)		**37.18**
	NON-COKING COAL		
1	Dugda-I,CIL	Jharkhand	2.00
2	Gidi,CIL	Jharkhand	2.50
3	Piparwar,CIL	Jharkhand	6.50
4	Kargali,CIL	Jharkhand	Closed
5	Bina (De-Shaling Plant) CIL	Uttar Pradesh	Closed
	(A) CIL		**11.00**
6	Indaram, Aryan Coal Benefication Pvt.Ltd.	Andhra Pradesh	14.00
7	Ramagundam, Gupta coalfield & washeries ltd.	Andhra Pradesh	6.25
8	Dipka, Aryan coal beneficiation pvt. Ltd.	Chattisgarh	2.62
9	Gevra, Aryan coal beneficiation pvt. Ltd.	Chattisgarh	7.50
10	Chakabuwa, Aryan Energy private ltd.	Chattisgarh	5.00
11	Binjhari, Aryan Energy private ltd.	Chattisgarh	4.80
12	Korba, ST-CLI Coal washeries ltd.	Chattisgarh	Closed
13	Bilaspur, Gupta coalfield & washeries ltd.	Chattisgarh	7.00

* 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) 31.03.2022*
14	Tamnar, Jindal Steel & Power Ltd.	Chattisgarh	2.50
15	Ratija, Spectrum Coal & Power Ltd.	Chattisgarh	closed
25	Maruti Clean Coal	Chattisgarh	4.00
26	AEL,Adani Enterprises Limited	Chattisgarh	4.00
16	Jindal Power Limited(JPL)	Chattisgarh	1.00
17	Dharamsthal, BLA Industries	Madhya Pradesh	closed
18	Panderpauni, Aryan coal beneficiation pvt. Ltd.	Maharashtra	closed
19	Wani, Kartikay Coal washeries pvt. ltd.(Aryan)	Maharashtra	closed
20	Sasti, Gupta coalfield & washeries ltd.	Maharashtra	closed
21	Wani, Gupta coalfield & washeries ltd.	Maharashtra	closed
22	Umrer, Gupta coalfield & washeries ltd.	Maharashtra	closed
23	Bhandara, Gupta coalfield & washeries ltd.	Maharashtra	closed
24	Gondegaon, Gupta coalfield & washeries ltd.	Maharashtra	closed
27	Majri, Gupta coalfield & washeries ltd.	Maharashtra	closed
28	Ghugus, Gupta coalfield & washeries ltd.	Maharashtra	0.96
29	Wani, Bhatia International Ltd.	Maharashtra	closed
30	Ghugus, Bhatia International Ltd.	Maharashtra	closed
31	Wani, Indo Unique Flame Ltd.	Maharashtra	closed
32	Nagpur, Indo Unique Flame Ltd.	Maharashtra	4.75
33	Punwat, Indo Unique Flame Ltd.	Maharashtra	closed
34	Himgir, Aryan Energy private ltd.	Odisha	closed
35	Talcher, Aryan Energy Pvt. Ltd.	Odisha	2.40
36	Talcher, Global coal Mining (P) Ltd.	Odisha	closed
37	Ib Valley, Global coal Mining (P) Ltd.	Odisha	closed
38	Jharsuguda, Bhatia International Ltd.	Odisha	11.00
39	Talcher, Spectrum Coal & Power Ltd.	Odisha	6.60
40	Ramagundam, Global coal Mining (P) Ltd.	Telengana	15.00
41	Manuguru, Global coal Mining (P) Ltd.	Telengana	4.75
	(B) Private		**104.13**
	TOTAL NON-COKING (A+B)		**115.13**
	Gross Total (Coking + Non-Coking)		**152.31**

* 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 (%)		
		31.03.2020	31.03.2021	31.03.2022	2020-21	2021-22 (P)	2020-21	2021-22 (P)	Change in Utilisation
1	2	3	4	5	6	7	8	9	10
(a)	**PUBLIC SECTOR**	**1,50,366**	**1,49,716**	**1,51,716**	**1,33,693**	**1,45,491**	**88.91**	**97.18**	**8.27**
	IOCL, Guwahati, Assam	1,000	1,000	1,000	849	730	**84.92**	**73.02**	**-11.90**
	IOCL, Barauni, Bihar	6,000	6,000	6,000	5,469	5,620	**91.15**	**93.66**	**2.51**
	IOCL, Koyali, Gujarat	13,700	13,700	13,700	11,603	13,474	**84.69**	**98.35**	**13.66**
	IOCL, Haldia, West Bengal	8,000	8,000	8,000	6,759	7,305	**84.48**	**91.32**	**6.84**
	IOCL, Mathura, Uttar Pradesh	8,000	8,000	8,000	8,926	9,123	**111.57**	**114.04**	**2.46**
	IOCL, Digboi, Assam	650	650	650	605	708	**93.09**	**108.90**	**15.80**
	IOCL, Panipat, Haryana	15,000	15,000	15,000	13,181	14,849	**87.88**	**98.99**	**11.12**
	IOCL, Bongaigaon, Assam	2,350	2,700	2,700	2,450	2,639	**104.27**	**97.72**	**-6.55**
	IOCL, Paradip, Odisha	15,000	15,000	15,000	12,508	13,217	**83.39**	**88.12**	**4.73**
	Total IOC	**69,700**	**70,050**	**70,050**	**62,351**	**67,665**	**89.46**	**96.60**	**7.14**
	BPCL, Mumbai, Maharashtra	12,000	12,000	12,000	12,941	14,437	**107.84**	**120.30**	**12.47**
	BPCL, Kochi, Kerala	15,500	15,500	15,500	13,282	15,402	**85.69**	**99.36**	**13.68**
	BPCL, Bina, Madhya Pradesh	7,800	7,800	7,800	6,190	7,410	**79.35**	**95.00**	**15.64**
	Total BPCL	**35,300**	**35,300**	**35,300**	**32,412**	**37,248**	**91.82**	**105.52**	**13.70**
	HPCL, Mumbai, Maharashtra	7,500	7,500	9,500	7,374	5,558	**98.32**	**74.10**	**-24.22**
	HPCL, Visakh, Andhra Pradesh	8,300	8,300	8,300	9,050	8,410	**109.04**	**101.32**	**-7.72**
	Total HPCL	**15,800**	**15,800**	**17,800**	**16,425**	**13,968**	**103.95**	**88.40**	**-15.55**
	CPCL, Manali, Tamil Nadu	10,500	10,500	10,500	8,243	9,040	**78.50**	**86.10**	**7.60**
	CPCL, Narimanam, Tamil Nadu	1,000	-	-	-	-	-	-	-
	Total CPCL	**11,500**	**10,500**	**10,500**	**8,243**	**9,040**	**71.68**	**86.10**	**14.42**
	NRL, Numaligarh, Assam	3,000	3,000	3,000	2,707	2,624	**90.25**	**87.48**	**-2.76**
	MRPL, Mangalore, Karnataka	15,000	15,000	15,000	11,475	14,871	**76.50**	**99.14**	**22.64**
	ONGC, Tatipaka, Andhra Pradesh	66	66	66	81	75	**122.71**	**113.84**	**-8.87**
(b)	**PRIVATE SECTOR & JVs SECTOR**	**99,500**	**99,500**	**99,500**	**88,080**	**96,212**	**88.52**	**96.70**	**8.17**
	RIL, Jamnagar, Gujarat	33,000	33,000	33,000	34,100	34,757	**103.33**	**105.32**	**1.99**
	RIL, SEZ-Jamnagar, Gujarat	35,200	35,200	35,200	26,841	28,264	**76.25**	**80.30**	**4.04**
	Nyara Energy Ltd. Vadinar	20,000	20,000	20,000	17,067	20,164	**85.34**	**100.82**	**15.49**
	HMEL, GGS, Bathinda, Punjab	11,300	11,300	11,300	10,072	13,027	**89.13**	**115.28**	**26.15**
	Total (a+b)	**2,49,866**	**2,49,216**	**2,51,216**	**2,21,773**	**2,41,703**	**88.76**	**96.99**	**8.23**

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
31.03.2012	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	2,05,135	510	24,955	2,30,600	45,699	6,780	87,028	3,70,106
31.03.2021	2,09,295	510	24,924	2,34,728	46,209	6,780	94,434	3,82,151
31.03.2022 (P)	2,10,700	510	24,900	2,36,109	46,723	6,780	1,09,885	3,99,497
Growth rate of 2021-22 over 2020-21(%)	**0.7%**	**0.0%**	**-0.1%**	**0.6%**	**1.1%**	**0.0%**	**16.4%**	**4.5%**
CAGR 2012-13 to 2021-22 (%)	**5.5%**	**-9.1%**	**2.4%**	**5.1%**	**1.9%**	**4.0%**	**16.6%**	**6.7%**

Note:

* 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
31.03.2012	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	51,543	12,775	7,316	71,633	131	4,475	76,239	4,46,346
31.03.2021	47,760	17,563	7,361	72,683	131	5,694	78,508	4,60,659
31.03.2022 (P)	51,000	17,700	7,400	76,100	135	6,500	82,735	4,82,232
Growth rate of 2021-22 over 2020-21(%)	**6.8%**	**0.8%**	**0.5%**	**4.7%**	**3.3%**	**14.2%**	**5.4%**	**4.7%**
CAGR 2012-13 to 2021-22(%)**	**8.8%**	**5.3%**	**5.7%**	**7.5%**	**8.1%**	**21.5%**	**8.2%**	**6.9%**

* 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 (2020-21 to 2021-22) (%)
	31.03.2021	31.03.2022	31.03.2021	31.03.2022	31.03.2021	31.03.2022	31.03.2021	31.03.2022	31.03.2021	31.03.2022	
Chandigarh	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.06	0.05	0.06	**22.17**
Delhi	0.00	0.00	2.36	2.36	0.00	0.00	0.24	0.27	2.60	2.63	**0.97**
Haryana	0.20	0.20	4.82	4.82	0.00	0.00	0.69	1.24	5.71	6.26	**9.61**
Himachal Pradesh	2.59	2.91	0.00	0.00	0.00	0.00	0.99	1.04	3.58	3.96	**10.55**
Jammu & Kashmir	1.23	1.23	0.18	0.18	0.00	0.00	0.21	0.24	1.61	1.64	**2.01**
Punjab	1.24	1.24	6.92	6.92	0.00	0.00	1.62	1.77	9.78	9.94	**1.54**
Rajasthan	0.43	0.43	10.97	11.63	0.00	0.00	9.86	16.70	21.26	28.76	**35.25**
Uttar Pradesh	0.72	0.72	12.77	13.43	0.00	0.00	3.85	4.45	17.35	18.61	**7.29**
Uttarakhand	2.08	2.08	0.55	0.55	0.00	0.00	0.71	0.93	3.34	3.56	**6.55**
Central Sector NR	11.52	11.53	15.54	15.54	1.62	1.62	0.38	0.38	29.06	29.08	**0.06**
Sub-Total (NR)	**20.02**	**20.36**	**54.12**	**55.44**	**1.62**	**1.62**	**18.59**	**27.07**	**94.34**	**104.49**	**10.75**
Chhattisgarh	0.12	0.12	16.01	16.01	0.00	0.00	0.57	0.87	16.70	17.00	**1.77**
Gujarat	0.77	0.77	20.23	20.23	0.00	0.00	12.91	16.34	33.91	37.35	**10.13**
Madhya Pradesh	1.70	1.70	11.80	11.80	0.00	0.00	4.91	5.17	18.40	18.67	**1.43**
Maharashtra	3.33	3.33	23.37	22.26	0.00	0.00	10.14	10.53	36.84	36.12	**-1.95**
Daman & Diu	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.04	0.04	**0.42**
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	0.01	0.02	0.06	0.07	**22.41**
Central Sector WR	1.52	1.52	22.28	22.28	1.84	1.84	0.67	0.67	26.31	26.31	**0.00**
Sub-Total (WR)	**7.45**	**7.45**	**93.73**	**92.62**	**1.84**	**1.84**	**29.25**	**33.65**	**132.27**	**135.55**	**2.49**
Andhra Pradesh	1.67	1.67	12.30	12.30	0.00	0.00	8.72	8.96	22.70	22.94	**1.07**
Telangana	2.48	2.48	7.19	7.46	0.00	0.00	4.37	4.95	14.04	14.89	**6.06**
Karnataka	3.59	3.63	7.11	7.11	0.00	0.00	15.46	15.90	26.15	26.64	**1.86**
Kerala	1.86	1.86	0.33	0.33	0.00	0.00	0.50	0.62	2.69	2.81	**4.42**
Tamil Nadu	2.18	2.18	8.51	9.03	0.00	0.00	15.00	15.92	25.68	27.13	**5.62**
Puducherry	0.00	0.00	0.03	0.03	0.00	0.00	0.01	0.01	0.04	0.05	**10.42**
Lakshadweep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**336.00**
Central Sector SR #	0.00	0.00	13.25	13.25	3.32	3.32	0.54	0.54	17.11	17.11	**0.00**
Sub-Total (SR)	**11.77**	**11.82**	**48.73**	**49.52**	**3.32**	**3.32**	**44.60**	**46.91**	**108.42**	**111.57**	**2.91**
Bihar	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.39	0.35	0.39	**9.14**
Jharkhand	0.13	0.13	2.25	2.25	0.00	0.00	0.06	0.10	2.44	2.48	**1.51**
Odisha	2.06	2.07	5.54	4.94	0.00	0.00	0.54	0.61	8.14	7.62	**-6.39**
West Bengal	0.99	0.99	7.43	6.95	0.00	0.00	0.57	0.59	8.98	8.52	**-5.14**
Sikkim	0.76	0.87	0.00	0.00	0.00	0.00	0.05	0.06	0.81	0.93	**14.50**
A. & N. Islands	0.00	0.00	0.04	0.04	0.00	0.00	0.03	0.03	0.07	0.07	**0.39**
Central Sector ER $	1.01	1.01	20.37	21.85	0.00	0.00	0.02	0.02	21.39	22.87	**6.92**
Sub-Total (ER)	**4.94**	**5.07**	**35.63**	**36.03**	**0.00**	**0.00**	**1.62**	**1.78**	**42.19**	**42.87**	**1.62**
Arunachal Pradesh	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.14	0.14	0.14	**4.11**
Assam	0.10	0.10	0.35	0.33	0.00	0.00	0.05	0.13	0.51	0.56	**9.93**
Manipur	0.00	0.00	0.04	0.04	0.00	0.00	0.01	0.02	0.05	0.05	**12.32**
Meghalaya	0.32	0.32	0.00	0.00	0.00	0.00	0.05	0.05	0.37	0.37	**1.09**
Mizoram	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.04	0.04	**16.76**
Nagaland	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.03	**6.44**
Tripura	0.00	0.00	0.14	0.14	0.00	0.00	0.02	0.03	0.16	0.16	**3.48**
Central Sector NER	1.61	1.61	2.00	2.00	0.00	0.00	0.03	0.03	3.64	3.64	**0.00**
Sub-Total (NER)	**2.03**	**2.03**	**2.53**	**2.51**	**0.00**	**0.00**	**0.37**	**0.47**	**4.93**	**5.01**	**1.62**
Total States	**30.56**	**31.06**	**161.28**	**161.18**	**0.00**	**0.00**	**92.80**	**108.25**	**284.64**	**300.49**	**5.57**
Total Central	**15.65**	**15.66**	**73.45**	**74.93**	**6.78**	**6.78**	**1.63**	**1.63**	**97.51**	**99.00**	**1.54**
Total All India	**46.21**	**46.72**	**234.73**	**236.11**	**6.78**	**6.78**	**94.43**	**109.89**	**382.15**	**399.50**	**4.54**

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

* RES: Renewable Energy Sources excluding hydro

Includes NLC-Central capacity also

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

Source : Central Electricity Authority.

Table 2.5: State-wise cumulative Installed Capacity of Grid Interactive Renewable Power as on 31.03.2022

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(2020-21 to 2021-22)
		2020-21	2021-22	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22	
1	Andhra Pradesh	162.11	162.11	4096.65	4096.65	483.67	483.67	52.37	82.37	4291.34	4386.76	**9086.14**	**9211.56**	**1.38%**
2	Arunachal Pradesh	131.11	131.11			0.00	0.00	0.00	0.00	10.16	11.23	**141.27**	**142.34**	**0.76%**
3	Assam	34.11	34.11			2.00	2.00	0.00	0.00	51.56	117.94	**87.67**	**154.05**	**75.72%**
4	Bihar	70.70	70.70			124.70	124.70	1.00	1.32	180.23	190.63	**376.63**	**387.35**	**2.85%**
5	Chhatisgarh	76.00	76.00			244.90	274.59	0.41	0.41	445.21	518.08	**766.52**	**869.08**	**13.38%**
6	Goa	0.05	0.05			0.00	0.00	0.34	0.34	7.56	19.95	**7.95**	**20.34**	**155.85%**
7	Gujarat	82.69	89.39	8561.82	9209.22	77.30	77.30	22.57	31.96	4469.87	7180.03	**13214.25**	**16587.90**	**25.53%**
8	Haryana	73.50	73.50			210.66	240.66	6.09	17.34	472.26	910.63	**762.51**	**1242.13**	**62.90%**
9	Himachal Pradesh	936.11	954.11			9.20	9.20	1.00	1.00	50.28	76.16	**996.59**	**1040.47**	**4.40%**
10	Jammu & Kashmir	185.98	184.32			0.00	0.00	0.00	0.00	42.13	54.73	**228.11**	**239.05**	**4.80%**
11	Jharkhand	4.05	4.05			4.30	4.30	0.00	0.00	69.86	88.79	**78.21**	**97.14**	**24.20%**
12	Karnataka	1280.73	1280.73	4938.60	5130.90	1887.30	1887.30	14.62	14.85	7383.88	7590.81	**15505.13**	**15904.59**	**2.58%**
13	Kerala	230.02	242.52	62.50	62.50	2.27	2.27	0.23	0.23	277.40	363.18	**572.42**	**670.70**	**17.17%**
14	Madhya Pradesh	99.71	99.71	2519.89	2519.89	107.35	107.35	20.31	23.98	2544.71	2717.95	**5291.97**	**5468.88**	**3.34%**
15	Maharashtra	379.58	381.08	5000.33	5012.83	2584.40	2584.40	47.75	47.75	2323.79	2631.02	**10335.85**	**10657.08**	**3.11%**
16	Manipur	5.45	5.45			0.00	0.00	0.00	0.00	11.39	12.25	**16.84**	**17.70**	**5.11%**
17	Meghalaya	32.53	32.53			13.80	13.80	0.00	0.00	3.85	4.15	**50.18**	**50.48**	**0.60%**
18	Mizoram	36.47	36.47			0.00	0.00	0.00	0.00	6.98	7.90	**43.45**	**44.37**	**2.12%**
19	Nagaland	30.67	30.67			0.00	0.00	0.00	0.00	2.91	3.04	**33.58**	**33.71**	**0.39%**
20	Odisha	88.63	106.63			59.22	59.22	0.00	0.00	425.53	451.24	**573.38**	**617.09**	**7.62%**
21	Punjab	173.55	176.10			473.45	473.45	18.20	18.20	982.30	1100.07	**1647.50**	**1767.82**	**7.30%**
22	Rajasthan	23.85	23.85	4326.82	4326.82	121.25	121.25	3.83	3.83	5925.60	12564.87	**10401.35**	**17040.62**	**63.83%**
23	Sikkim	52.11	52.11			0.00	0.00	0.00	0.00	1.94	4.68	**54.05**	**56.79**	**5.07%**
24	Tamil Nadu	123.05	123.05	9608.04	9866.37	1012.65	1012.65	27.26	30.05	4527.47	5067.18	**15298.47**	**16099.30**	**5.23%**
25	Telangana	90.87	90.87	128.10	128.10	160.10	160.10	50.38	59.64	3961.54	4520.48	**4390.99**	**4959.19**	**12.94%**
26	Tripura	16.01	16.01			0.00	0.00	0.00	0.00	13.56	14.89	**29.57**	**30.90**	**4.50%**
27	Uttar Pradesh	49.10	49.10			2117.26	2117.26	58.84	72.73	1836.27	2244.43	**4061.47**	**4483.52**	**10.39%**
28	Uttarakhand	214.32	218.82			130.22	130.22	9.22	9.22	380.13	573.54	**733.89**	**931.80**	**26.97%**
29	West Bengal	98.50	98.50			319.92	319.92	1.17	2.53	162.65	166.00	**582.24**	**586.95**	**0.81%**
30	Andaman & Nicobar	5.25	5.25				0.00	0.00	0.00	29.46	29.49	**34.71**	**34.74**	**0.09%**
31	Chandigarh						0.00	0.00	0.00	45.97	55.17	**45.97**	**55.17**	**20.01%**
32	Dadar & Nagar Haveli						0.00	0.00	0.00	5.46	5.46	**5.46**	**5.46**	**0.00%**
33	Daman & Diu						0.00	0.00	0.00	40.55	40.72	**40.55**	**40.72**	**0.42%**
34	Delhi						0.00	52.00	59.00	194.43	211.12	**246.43**	**270.12**	**9.61%**
35	Lakshwadeep						0.00	0.00	0.00	3.27	3.27	**3.27**	**3.27**	**0.00%**
36	Puducherry						0.00	0.00	0.00	9.51	13.69	**9.51**	**13.69**	**43.95%**
37	Others			4.30	4.30		0.00	0.00	0.00	45.01	45.01	**49.31**	**49.31**	**0.00%**
Total (MW)		**4786.81**	**4848.90**	**39247.05**	**40357.58**	**10145.92**	**10205.61**	**387.59**	**476.75**	**41236.02**	**53996.54**	**95803.39**	**109885.38**	**14.70%**
% Distribution		**5.0%**	**4.4%**	**41.0%**	**36.7%**	**10.6%**	**9.3%**	**0.4%**	**0.4%**	**43.0%**	**49.1%**	**100.0%**	**100.0%**	

Source: Ministry of New and Renewable Eneergy

Table 2.6 : Installation of Off-grid / Decentralised Renewable Energy Systems/ Devices as on 31.03.2022

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	10
1	Andhra Pradesh	2,68,598	34,045	16,460	22,972	77,803	3,816	29.20
2	Arunachal Pradesh	3,621	22	25,008	35,065	2,18,551	963	-
3	Assam	1,39,414	45	29,330	46,879	6,47,761	1,605	-
4	Bihar	1,30,072	2,813	52,431	12,303	17,35,227	6,905	1.00
5	Chhattisgarh	60,250	61,970	4,449	42,232	3,311	31,373	0.41
6	Goa	4,234	45	707	393	1,093	33	-
7	Gujarat	4,35,638	11,981	5,004	9,253	31,603	13,577	22.58
8	Haryana	64,013	33,901	34,625	56,727	93,853	2,321	4.89
9	Himachal Pradesh	47,718	231	98,500	22,592	33,909	1,906	1.00
10	Jammu & Kashmir	3,201	142	38,826	1,44,316	51,224	8,130	-
11	Jharkhand	7,890	11,387	14,344	9,450	7,90,515	3,770	-
12	Karnataka	5,12,755	7,734	5,694	52,638	7,781	7,854	13.62
13	Kerala	1,53,666	818	1,735	41,912	54,367	16,268	0.23
14	Madhya Pradesh	3,79,154	25,047	16,673	7,920	5,29,101	3,654	4.90
15	Maharashtra	9,31,313	13,741	10,420	3,497	2,39,297	3,858	35.16
16	Manipur	2,128	68	32,347	24,583	69,722	1,581	-
17	Meghalaya	11,156	54	5,800	14,874	97,360	2,004	-
18	Mizoram	5,857	37	20,325	12,060	1,55,217	3,895	-
19	Nagaland	7,953	3	16,045	1,045	30,766	1,506	-
20	Odisha	2,71,752	10,308	18,479	5,274	99,843	2,322	-
21	Punjab	1,87,145	11,079	43,508	8,626	17,495	2,066	7.45
22	Rajasthan	72,886	75,748	8,669	1,87,968	2,25,851	30,449	3.83
23	Sikkim	9,044	-	504	15,059	45,200	850	-
24	Tamil Nadu	2,24,037	6,646	41,121	2,98,641	16,818	13,053	20.86
25	Telangana	3,16,727	424	2,458	-	1,42,000.0	7,450	4.59
26	Tripura	3,744	572	15,177	32,723	3,64,012	867	-
27	Uttar Pradesh	4,41,180	35,492	2,97,961	2,35,909	23,51,205	10,638	58.84
28	Uttarakhand	3,65,188	26	43,723	91,595	1,65,071	4,060	9.22
29	West Bengal	1,216	653	17,894	1,45,332	17,662	1,730	1.17
30	Andaman & Nicobar	97	5	1,490	468	6,296	167	-
31	Chandigarh	169	12	901	275	1,675	730	-
32	Dadar & Nagar Haveli	681	-	-	-	-	0	-
33	Daman & Diu	-	-	-	-	-	0	-
34	Delhi	578	90	301	-	4,807	1,269	-
35	Lakshadweep	-	-	4,465	600	5,289	2,190	-
36	Puducherry	17,541	21	417	25	1,637	121	-
37	Others*	-	4,621	9,150	1,40,273	1,25,797	23,885	-
	Total	**50,80,616**	**3,49,781**	**9,34,941**	**17,23,479**	**84,59,119**	**2,16,863**	**219**

* Others includes installations through NGOs/IREDA in different states

** Updated upto 31.03.2021

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.

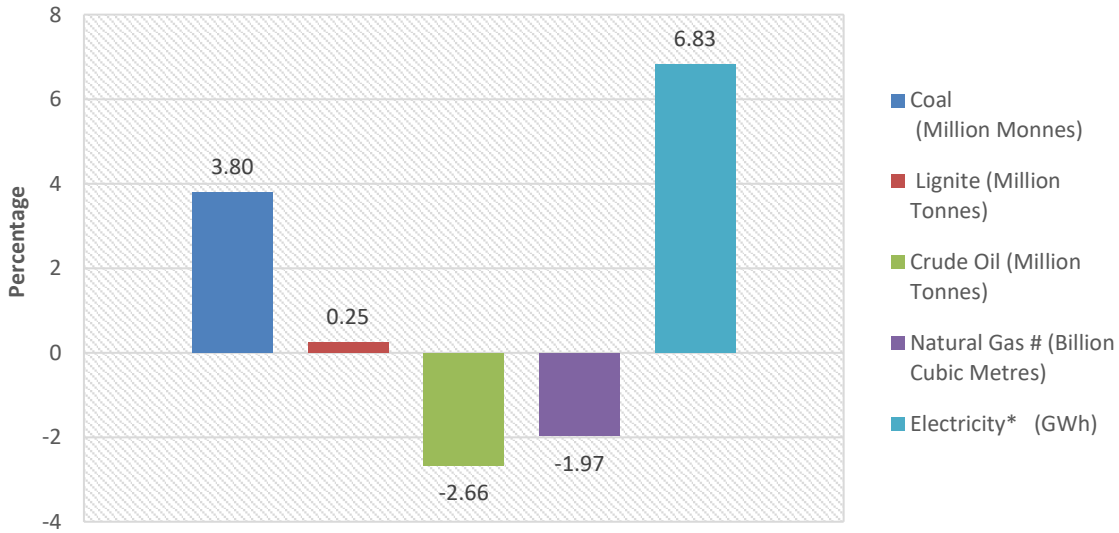
Secondary production is the manufacture of energy products through the process of transformation of other fuels or energy, whether primary or secondary. The quantities of secondary fuels reported as production include quantities lost through venting and flaring during and after production.

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

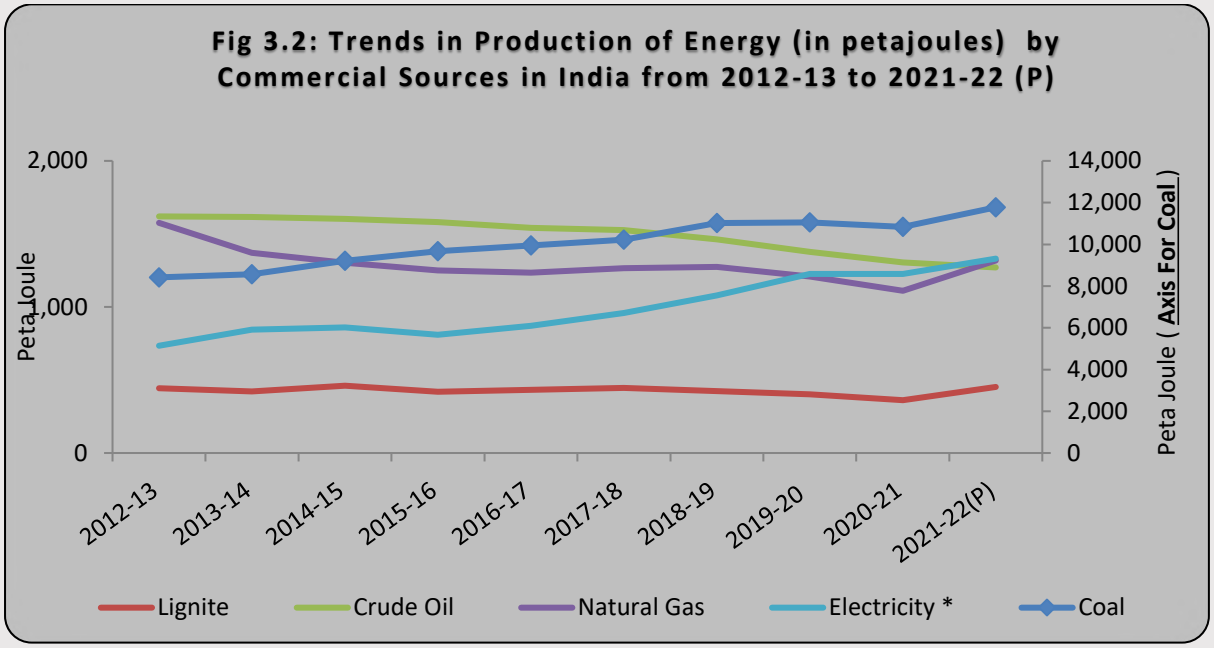
Highlights

- Coal production in the country during the year 2021-22(P) was 778.19 million tonnes as compared to 716.08 million tonnes during 2020-21. There is an increase of 8.67%. The overall trend of production in the last ten years i.e. 2012-13 to 2021-22(P) has shown a steady increase, except 2020-21, with a CAGR of 3.80% (Table 3.1).
- The Lignite production during 2021-22(P) has been increased to 47.49 million tonnes from the figure of 37.90 million tonnes in 2020-21; an increase of 25.32% over 2020-21(Table 3.1).
- However, the production of crude oil for 2021-22 (P) came out to be 29.69 MT as compared to 30.49 MT during FY: 2020-21 which is a decline of 2.63% (Table 3.1).
- The CAGRs for Crude Oil and Natural Gas, w.r.t FY: 2012-13, are having negative CAGR of -2.66% and -1.97% respectively. Electricity (generated from Hydro, Nuclear and other Renewable energy sources) is having the highest CAGR of 6.83%, showing the remarkable growth of Renewable Energy in India (Table 3.1).

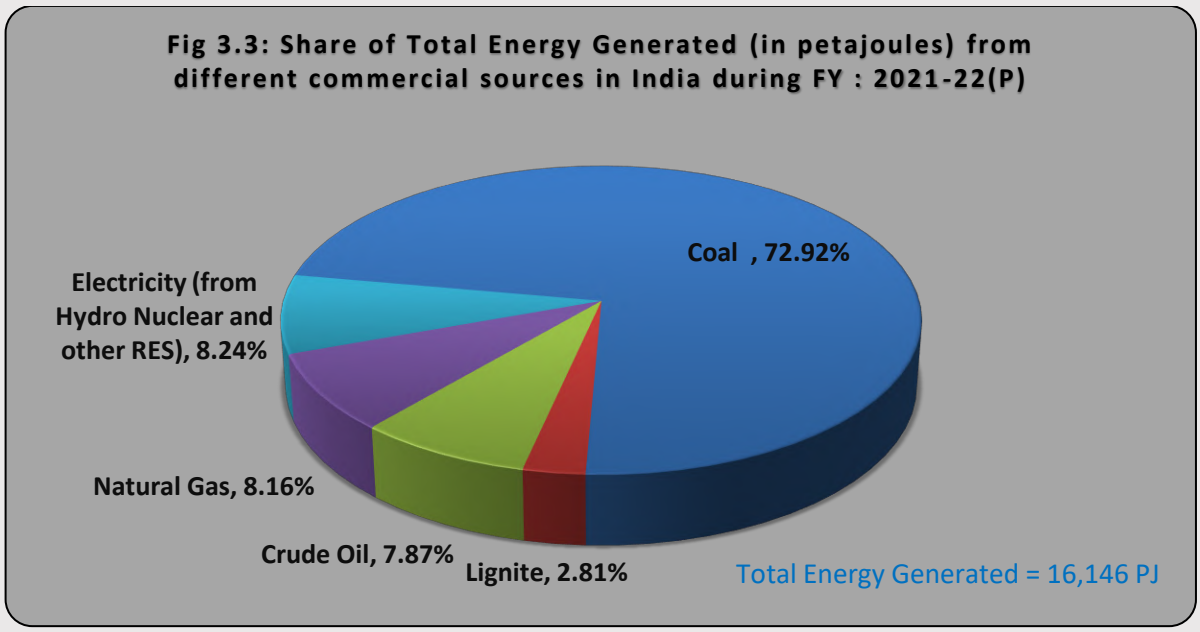
Fig 3.1 : Compound Annual Growth Rate of Production of Energy Resources from 2012-13 to 2021-22(P)



- 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 has increased from 14,837.60 petajoules during 2020-21 to 16,146.44 petajoules during 2021-22(P), an increase of 8.82% (Table 3.2).

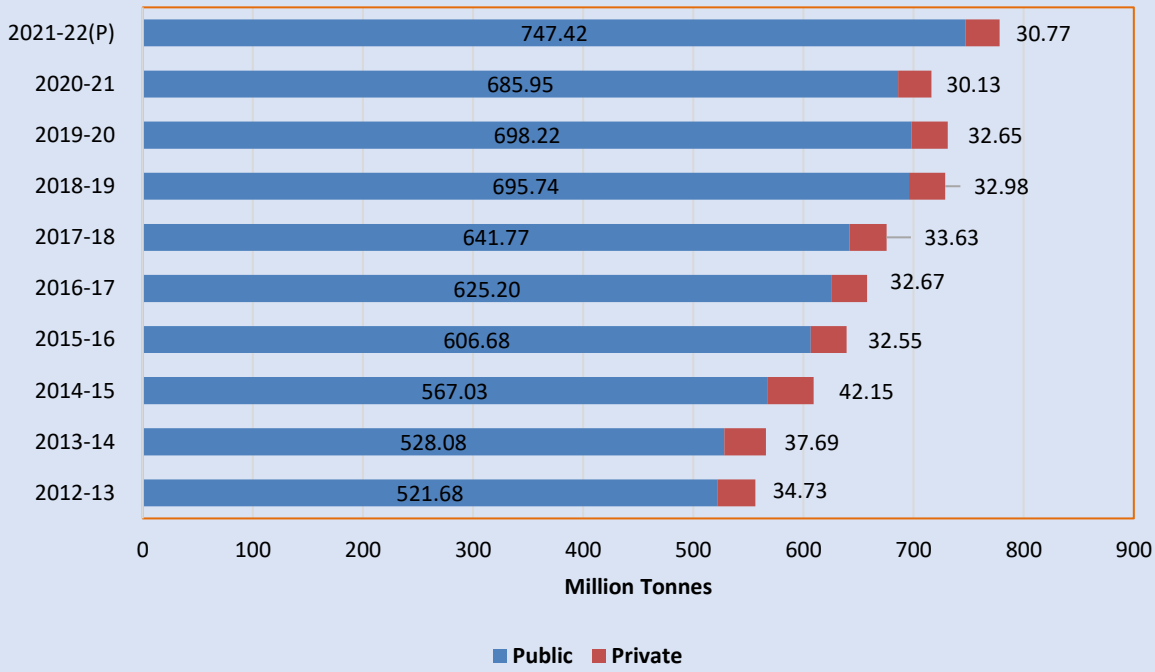


- India still depends heavily on Coal as the major source of energy. During the FY:2021-22(P) energy generated from Coal accounted for about 72.92% of the total generation of energy followed by Electricity (from Hydro, Nuclear and other Renewable energy sources) (8.24%) and Natural Gas (8.16%).



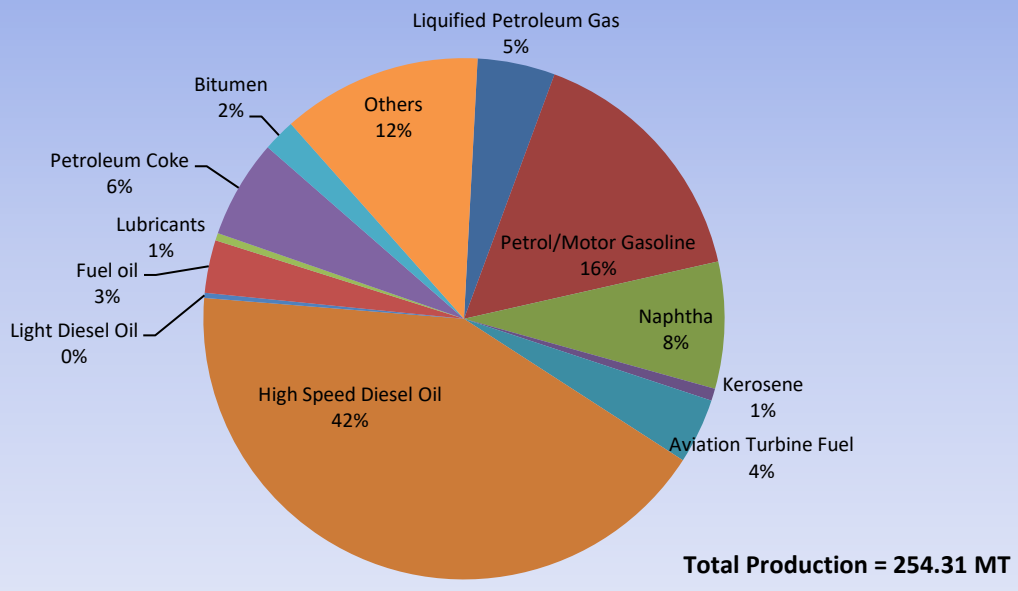
- Within Coal, Public sector has the dominating share in production. During FY: 2021-22 (P) almost 96% of total production has come from public sector. A scenario of performance made by Public and Private sector during past 10 years has been given below,

Fig 3.4: Share of Private and Public sector in Production of Coal in India during FY : 2012-13 to FY : 2021-22(P)



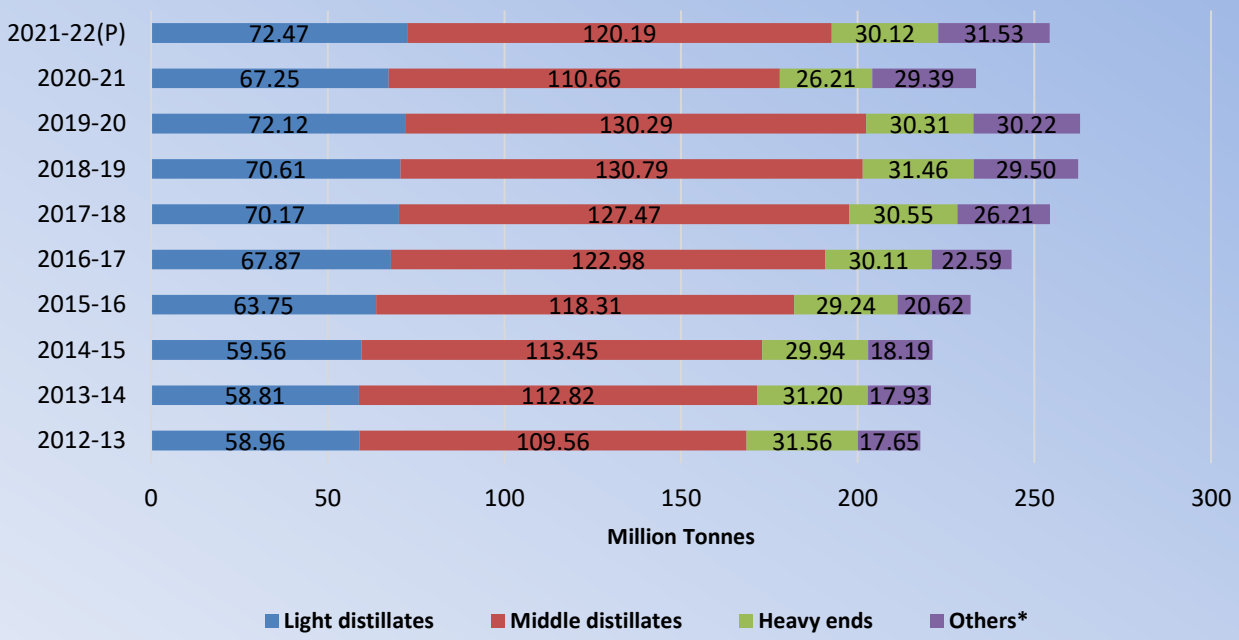
- In the year 2020-21, the production of Petroleum Products in the country was 233.51 MT as against 254.31 MT during 2021-22(P), an increase of 8.90%. In the total production of Petroleum Products during 2021-22 (P), High Speed Diesel Oil accounted for the maximum share (42%), followed by Motor Gasoline (16%). (Table 3.4).

Fig 3.5 : Production of Petroleum Products by type during 2021-22(P)

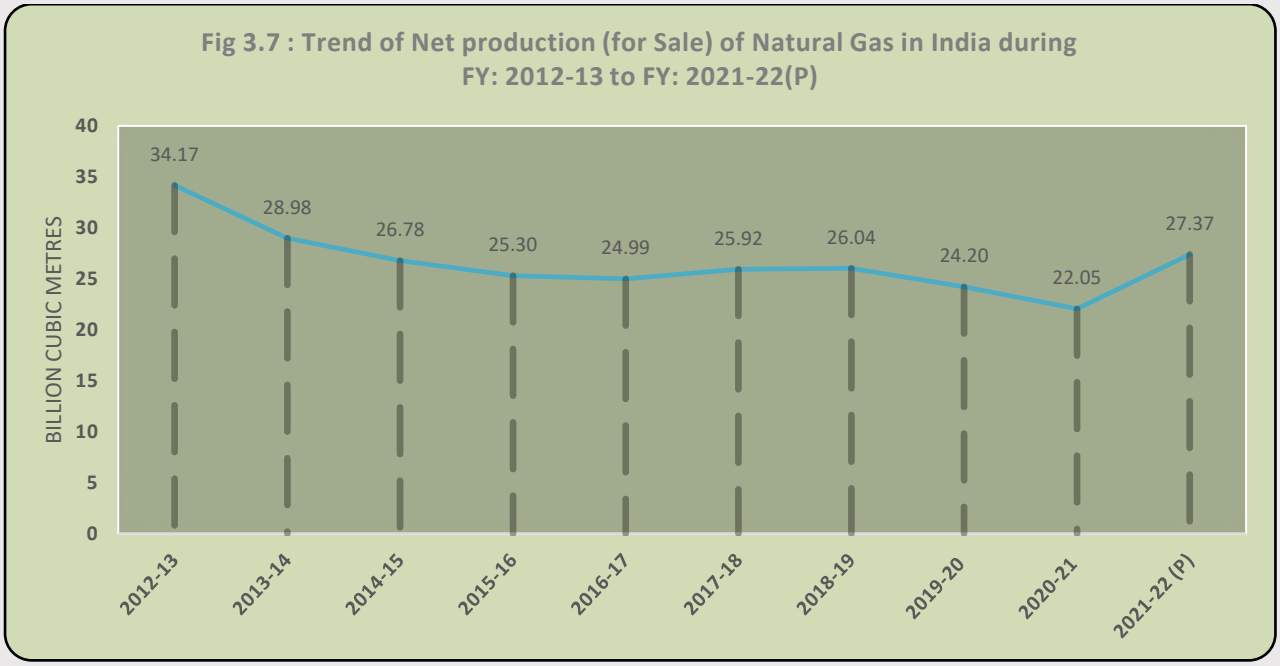


- Again, within the three (3) major categories of Petroleum Products, the *Middle Distillates* (which is having the dominant share of 47.3%, contains items like ATF, Diesel, Kerosene etc.) has experienced a growth of 8.6% during 2021-22, over past year. The Heavy Ends sector also has witnessed the highest growth of 15% over last year. A sectorial-overview during last 10 years is given below,

Fig 3.6 : Yearwise domestic production of Petroleum products during FY : 2012-13 to FY : 2021-22(P)



- Net production of Natural Gas for consumption increased from to 27.78 Billion Cubic Meters (BCM) in 2020-21 to 33.13 BCM in 2021-22(P) registering an increase of 19.25%. The Net-Production for sale has also experienced a growth of over 24% in comparison to the last FY. After having a steady decline from the FY: 2012-13, the Net-Production for sale of Natural Gas has increased to 27.37 BCM during FY: 2021-22(P) as compared to 22.05 BCM during FY: 2020-21.



- India has experienced a steady growth in terms of gross electricity generation (from Utility) over time except 2020-21. The CAGR grew at a rate of 4.41% in the last ten years from 2012-13 to 2021-22 (P).

- The generation of electricity in India still depends heavily on Coal. During FY:2021-22(P) close to 73% of the electricity has been generated from Steam. However, the RES (Renewable Energy Resources other than Hydro) has shown some good signs as it has registered a growth of 16.07% during FY: 2021-22(P), as compared to 2020-21.

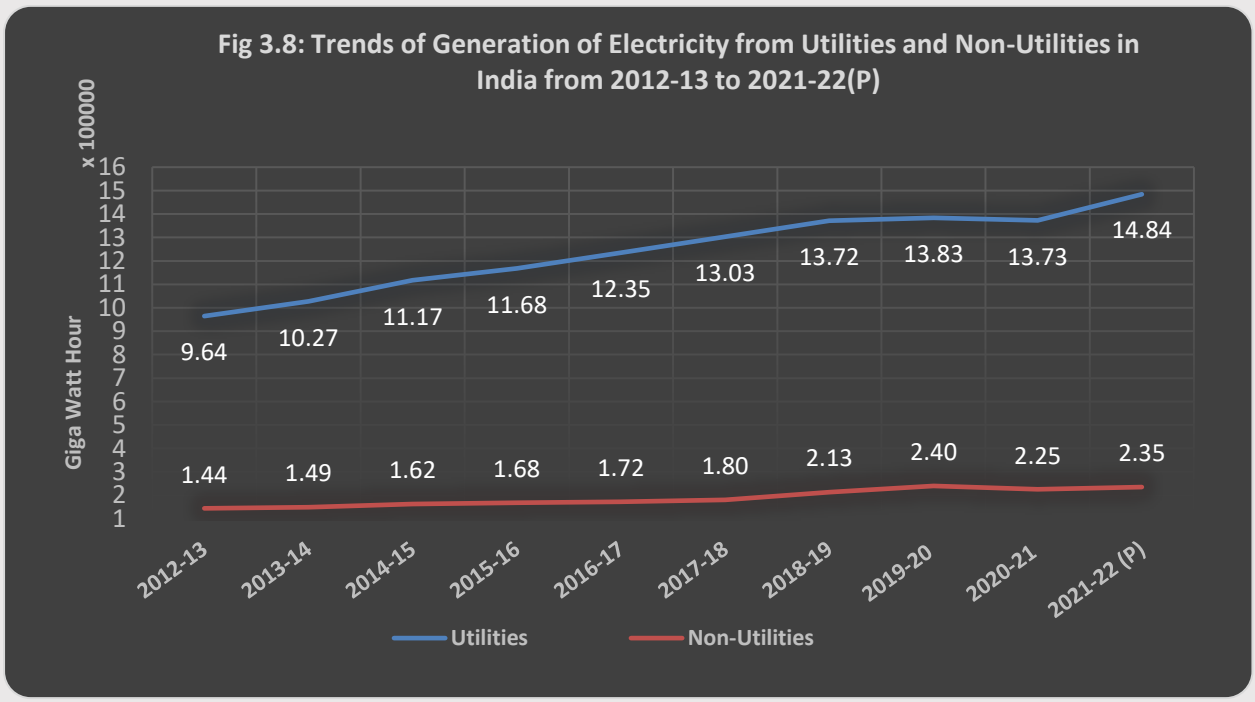


Table 3.1 : Yearwise Production of Energy Resources in Physical Units

Year	Coal (Million Monnes)	Lignite (Million Tonnes)	Crude Oil (Million Tonnes)	Natural Gas # (Billion Cubic Metres)	Electricity* (GWh)
1	2	3	4	5	6
2012-13	556.40	46.45	37.86	40.68	204,035
2013-14	565.77	44.27	37.79	35.41	234,595
2014-15	609.18	48.27	37.46	33.66	238,908
2015-16	639.23	43.84	36.94	32.25	224,571
2016-17	657.87	45.23	36.01	31.90	241,842
2017-18	675.40	46.64	35.68	32.65	266,308
2018-19	728.72	44.28	34.20	32.87	299,465
2019-20	730.87	42.10	32.17	31.18	340,579
2020-21	716.08	37.90	30.49	28.67	340,576
2021-22(P)	778.19	47.49	29.69	34.02	369,652
Growth rate of 2021-22 over 2020-21 (%)	**8.67**	**25.32**	**-2.63**	**18.66**	**8.54**
CAGR 2012-13 to 2021-22(%)	**3.80**	**0.25**	**-2.66**	**-1.97**	**6.83**

(P): provisional

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

#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 *	Total
1	2	3	4	5	6	7= 2 to 6
2012-13	8,418.36	443.44	1,619.99	1,575.74	734.53	12,792.06
2013-14	8,560.02	422.61	1,616.93	1,371.49	844.54	12,815.59
2014-15	9,216.88	460.79	1,602.92	1,303.72	860.07	13,444.37
2015-16	9,671.55	418.52	1,580.70	1,249.17	808.46	13,728.40
2016-17	9,953.54	431.77	1,540.78	1,235.52	870.63	14,032.24
2017-18	10,218.80	445.26	1,526.90	1,264.67	958.71	14,414.34
2018-19	11,025.50	422.73	1,463.52	1,273.35	1,078.07	14,090.50
2019-20	11,058.12	401.85	1,376.51	1,207.92	1,226.08	15,270.49
2020-21	10,834.34	361.75	1,304.81	1,110.63	1,226.07	14,837.60
2021-22(P)	11,774.01	453.34	1,270.44	1,317.90	1,330.75	16,146.44
Growth rate of 2021-22 over 2020-21 (%)	**8.67**	**25.32**	**-2.63**	**18.66**	**8.54**	**8.82**
CAGR 2012-13 to 2021-22(%)	**3.80**	**0.25**	**-2.66**	**-1.97**	**6.83**	**2.62**

(P): provisional

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

@ 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	Coal			Public	Private	Total
	Coking	Non-coking	Total			
1	2	3	4=(2)+(3)	5	6	7=(5)+(6)
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	695.74	32.98	728.72
2019-20	52.94	677.94	730.87	698.22	32.65	730.87
2020-21	44.79	671.30	716.08	685.95	30.13	716.08
2021-22(P)	51.70	726.49	778.19	747.42	30.77	778.19
Growth rate of 2021-22 over 2020-21 (%)	**15.44**	**8.22**	**8.67**	**8.96**	**2.12**	**8.67**
CAGR 2012-13 to 2021-22(%)	**0.03**	**4.13**	**3.80**	**4.08**	**-1.33**	**3.80**

(P): Provisional

Source : Office of Coal Controller of India

Table 3.3 A: Grade Wise Production of Coking Coal by Companies in 2020-21 & 2021-22 (P)

(Million Tonnes)

Grade of Coaking Coal	Public		Private		All India		Percentage Change
	2020-21	2021-22(P)	2020-21	2021-22(P)	2020-21	2021-22(P)	
Steel-I	0.00	0.00	0.00	0.00	0.001	0.00	-100.00
Steel-II	0.01	0.00	0.00	0.00	0.008	0.00	-100.00
SC-1	0.22	0.23	0.00	0.00	0.219	0.23	2.74
Wash-I	0.20	0.23	0.00	0.00	0.202	0.23	15.84
Wash-II	1.72	1.90	0.65	0.60	2.365	2.50	5.71
Wash-III	1.43	1.27	0.39	0.27	1.820	1.54	-15.44
Wash-IV	22.13	21.93	4.82	3.81	26.943	25.74	-4.46
Wash-V	12.80	20.17	0.00	0.00	12.798	20.17	57.61
SLV1	0.43	1.29	0.00	0.00	0.431	1.29	199.77
All India Total	**38.93**	**47.02**	**5.85**	**4.68**	**44.79**	**51.70**	**15.44**
Met.Coal	**26.42**	**32.23**	**5.85**	**4.68**	**32.28**	**36.91**	**14.35**
Non Met	**12.51**	**14.80**	**0.00**	**0.00**	**12.51**	**14.80**	**18.26**
All India Total	**38.93**	**47.02**	**5.85**	**4.68**	**44.79**	**51.70**	**15.44**

Source: Office of Coal Controller of India

Table 3.3 B: Grade Wise Production of Non-Coking Coal by Companies in 2020-21 & 2021-22 (P)

(Million Tonnes)

Grade of Non-Coaking Coal	Public		Private		All India		Percentage Change
	2020-21	2021-22(P)	2020-21	2021-22(P)	2020-21	2021-22(P)	
G1	0.00	0.00	0.00	0.00	0.003	0.00	-100.00%
G2	0.03	0.01	0.00	0.00	0.027	0.01	-66.67%
G3	2.68	2.14	0.00	0.00	2.681	2.14	-20.18%
G4	14.22	12.95	0.00	0.00	14.221	12.95	-8.96%
G5	9.71	8.70	0.00	0.00	9.707	8.70	-10.40%
G6	4.21	5.15	0.05	0.37	4.252	5.51	29.61%
G7	37.45	40.24	0.00	0.33	37.446	40.57	8.33%
G8	47.26	46.26	0.44	0.37	47.702	46.64	-2.24%
G9	36.72	44.78	0.00	0.00	36.723	44.78	21.94%
G10	59.56	52.36	10.33	9.27	69.883	61.63	-11.81%
G11	181.52	208.43	13.18	12.20	194.693	220.63	13.32%
G12	73.17	76.94	0.18	2.45	73.346	79.39	8.24%
G13	80.82	99.70	0.11	0.24	80.935	99.94	23.48%
G14	66.30	81.05	0.00	0.50	66.297	81.55	23.01%
G15	26.20	14.10	0.00	0.00	26.201	14.10	-46.20%
G16	6.79	7.59	0.00	0.00	6.790	7.59	11.81%
G17	0.24	0.01	0.00	0.36	0.236	0.38	58.90%
UNG	0.15		0.00		0.153	0.00	-100.00%
Total Non-Coaking Coal	**647.02**	**700.40**	**24.28**	**26.09**	**671.30**	**726.49**	**8.22%**

Source: Office of Coal Controller of India

Table 3.4 : Yearwise Domestic Production of Petroleum Products

(Million Tonnes)

Year	Light distillates			Middle distillates				Heavy ends				Others*	Total
	LPG	Petrol/MG	Naphtha	Kerosene	ATF	HSD	LDO	Fuel oil	Lubes	Pet. Coke	Bitumen		
1	2	3	4	5	6	7	8	9	10	11	12	13	14 (sum of 2 to 13)
2011-12	9.55	27.19	18.83	7.86	10.06	82.88	0.50	18.43	1.03	7.84	4.61	14.43	203.21
2012-13	9.82	30.12	19.02	7.97	10.09	91.10	0.40	15.05	0.90	10.94	4.67	17.65	217.73
2013-14	10.03	30.28	18.51	7.42	11.22	93.76	0.42	13.41	0.94	12.07	4.79	17.93	220.76
2014-15	9.84	32.33	17.39	7.56	11.10	94.43	0.36	11.92	0.95	12.45	4.63	18.19	221.14
2015-16	10.57	35.32	17.86	7.50	11.79	98.59	0.43	9.73	1.04	13.32	5.16	20.62	231.92
2016-17	11.33	36.59	19.95	6.04	13.83	102.48	0.63	9.96	1.03	13.94	5.19	22.59	243.55
2017-18	12.38	37.78	20.01	4.41	14.59	107.90	0.56	9.49	1.04	14.75	5.28	26.21	254.40
2018-19	12.79	38.04	19.79	4.07	15.48	110.53	0.70	10.03	0.95	14.68	5.80	29.50	262.36
2019-20	12.82	38.62	20.68	3.21	15.24	111.22	0.62	8.61	0.93	15.53	5.24	30.22	262.94
2020-21	12.07	35.78	19.40	2.39	7.09	100.44	0.73	7.24	1.07	12.66	5.25	29.39	233.51
2021-22(P)	12.24	40.24	19.99	1.92	10.29	107.17	0.81	8.33	1.17	15.51	5.11	31.53	254.31
Growth rate of 2021-22 over 2020-21(%)	**1.38**	**12.46**	**3.05**	**-19.93**	**45.14**	**6.70**	**10.49**	**14.99**	**9.73**	**22.54**	**-2.56**	**7.26**	**8.90**
CAGR 2012-13 to 2021-22 (%)	**2.48**	**3.27**	**0.56**	**-14.65**	**0.22**	**1.82**	**8.08**	**-6.37**	**3.04**	**3.95**	**1.01**	**6.66**	**1.74**

(P): Provisional LPG=Liquified Petroleum Gas, MG= Motor Gasoline, ATF= Aviation Turbine Fuel 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 Consumption)	Net Production (For Sales)
1	2	3	4	5	6=2-4-5	7 = 6 - 3
2012-13	40.68	5.40	1.08	0.03	39.57	34.17
2013-14	35.41	5.59	0.77	0.07	34.57	28.98
2014-15	33.66	5.91	0.87	0.10	32.69	26.78
2015-16	32.25	5.83	1.01	0.12	31.12	25.30
2016-17	31.90	5.86	0.98	0.07	30.85	24.99
2017-18	32.65	5.81	0.82	0.09	31.73	25.92
2018-19	32.87	6.02	0.73	0.09	32.05	26.04
2019-20	31.18	6.05	0.86	0.07	30.26	24.20
2020-21	28.67	5.73	0.82	0.07	27.78	22.05
2021-22 (P)	34.02	5.76	0.81	0.08	33.13	27.37
Growth rate of 2021-22 over 2020-21(%)	**18.66**	**0.48**	**-1.09**	**18.93**	**19.25**	**24.12**
CAGR 2012-13 to 2021-22 (%)	**-1.97**	**0.72**	**-3.08**	**11.46**	**-1.95**	**-2.44**

Note:

P : Provisional

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
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	9,94,197	199	48,443	10,42,838	1,55,769	46,472	1,38,337	13,83,417
2020-21	9,81,443	224	50,944	10,32,611	1,50,300	43,029	1,47,248	13,73,187
2021-22 (P)	10,78,581	193	36,016	11,14,790	1,51,627	47,112	1,70,912	14,84,442
Growth rate of 2021-22 over 2020-21(%)	**9.90**	**-13.59**	**-29.30**	**7.96**	**0.88**	**9.49**	**16.07**	**8.10**
CAGR 2012-13 to 2021-22(%)	**4.55**	**-22.43**	**-5.97**	**3.90**	**2.92**	**3.67**	**11.52**	**4.41**

(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	
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	2,05,546	1,919	25,443	2,32,908	348	6,310	2,39,567	16,22,983
2020-21	1,93,143	2,504	21,684	2,17,330	339	7,158	2,24,827	15,98,014
2021-22 (P)	2,04,000	2,100	20,050	2,26,150	350	8,500	2,35,000	17,19,442
Growth rate of 2021-22 over 2020-21(%)	**5.62**	**-16.14**	**-7.53**	**4.06**	**3.21**	**18.75**	**4.52**	**7.60**
CAGR 2012-13 to 2021-22(%)	**6.77**	**-14.05**	**-0.39**	**5.30**	**12.82**	**19.19**	**5.59**	**5.00**

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

Source : Central Electricity Authority.

|| CHAPTER – 4 ||

FOREIGN TRADE AND PRICES OF ENERGY RESOURCES

CHAPTER 4
Foreign Trade and Prices of Energy Resources

Trade and Prices

Many challenges are faced by the developing countries and the international community including 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.

These challenges coupled with the imperative to mitigate climate change, i.e. "decarbonization" of energy generation and use by households and industries, further intensifies high volatility present in the international energy market, 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, being an 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 for an enabling environment in this sector to thrive.

Highlights

- There has been an increasing trend in the net import of coal in the recent years. Over the last ten years, the Net Import of coal steadily increased from 143.34 MTs in 2012-13 to 216.54 MTs in 2014-15. This was followed by a marginal decline in the succeeding 2 years but again have started increasing again and reached to 247.51 MTs in 2019-20. However, during 2021-22(P), there is a sharp decline of 2.14% in the Net Import of Coal w.r.t the FY: 2020-21. During FY:2021-22(P), the net-Import of Coal came out to be 207.77 MTs as compared to 212.31 MTs during FY:2020-21.
- India is also highly dependent on imports of crude oil to meet domestic consumption. Imports of crude oil have increased from 184.80 MTs during 2012-13 to 226.95 MTs during 2019-20. But during FY: 2020-21 the same has been reduced to 196.46 MTs, a reduction of 13% over the FY: 2019-20. The same may be due to COVID-19 pandemic. However, during FY:2021-22(P) the fuel import has again experienced a growth of 7.9% and reached at 211.98 MTs.
- India is an exporter of Petroleum Products. The export of petroleum products has increased rather slowly from 63.41 MT during 2012-13 to 65.69 MT during 2019-20. But during FY:2020-21 the same has been reduced to 56.76 MTs which has again rose to 62.71 MT during FY:2021-22(P), registering a growth of close to 10.5%.
- The import of Natural Gas has experienced a steady increase over time. From a figure of 17.61 BCM (Billion Cubic Meter) during 2012-13 to 33.89 BCM during 2019-20 i.e. an increase of over 92% in a span of 7 years. However, the same stood at 30.78 BCM for the year 2021-22(P) as compared to 33.03 BCM in the 2020-21 recording a decline of (-)6.83%. The CAGR of import of natural gas between 2012-13 and 2021-22(P) is having a positive growth rate of 6.40%.
- India's exports of electricity started rising as compared to gross imports since 2016-17. The export of electricity has increased from 153.53 GWh in 2012-13 to 9231.63 GWh in 2021-22(P) with a CAGR of 57.64%.
- India, however also imports a decent amount of electricity to meet its' domestic demand. The Import figure during FY:2012-13 was 4,795 GWh which, after having a decline during FY:2018-19 (4,396 GWh), the Import has displayed a steady growth upto FY:2020-21 having a figure of 9547.70 GWh. However, during FY:2021-22(P) the same has been found to be reduced to 7596.71 GWh, a decline of over 20% in comparison to FY:2020-21. (Table 4.1(Contd.))

Fig 4.1: Trends of Import of Coal, Crude oil,Petroleum products in India during FY : 2012-13 to 2021-22(P)

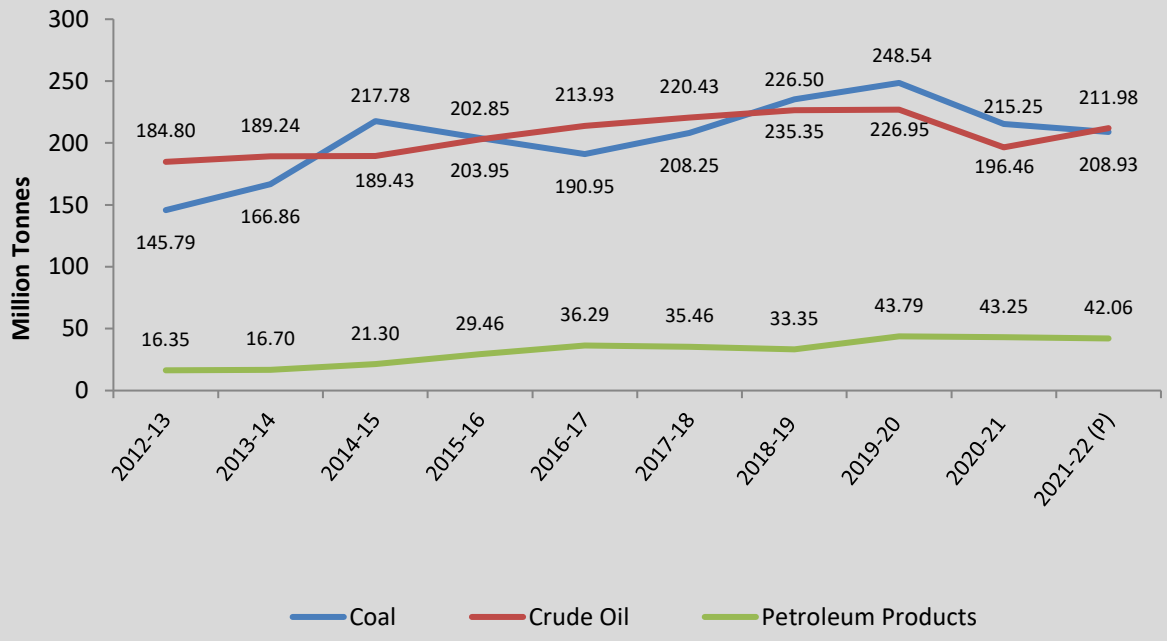


Fig 4.2: Trends of Import of Natural Gas and Electricity in India during FY : 2012-13 to 2021-22(P)

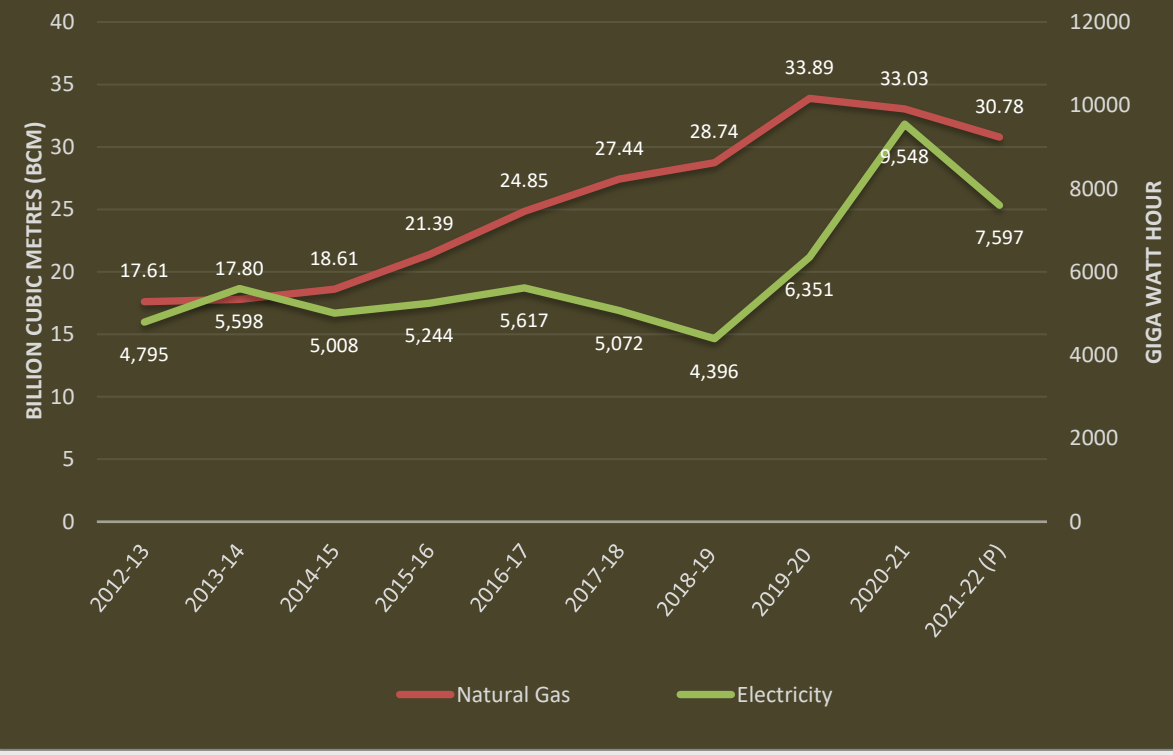


Fig 4.3: Yearwise Wholesale Price Indices (base: 2011-12) of Energy Commodities

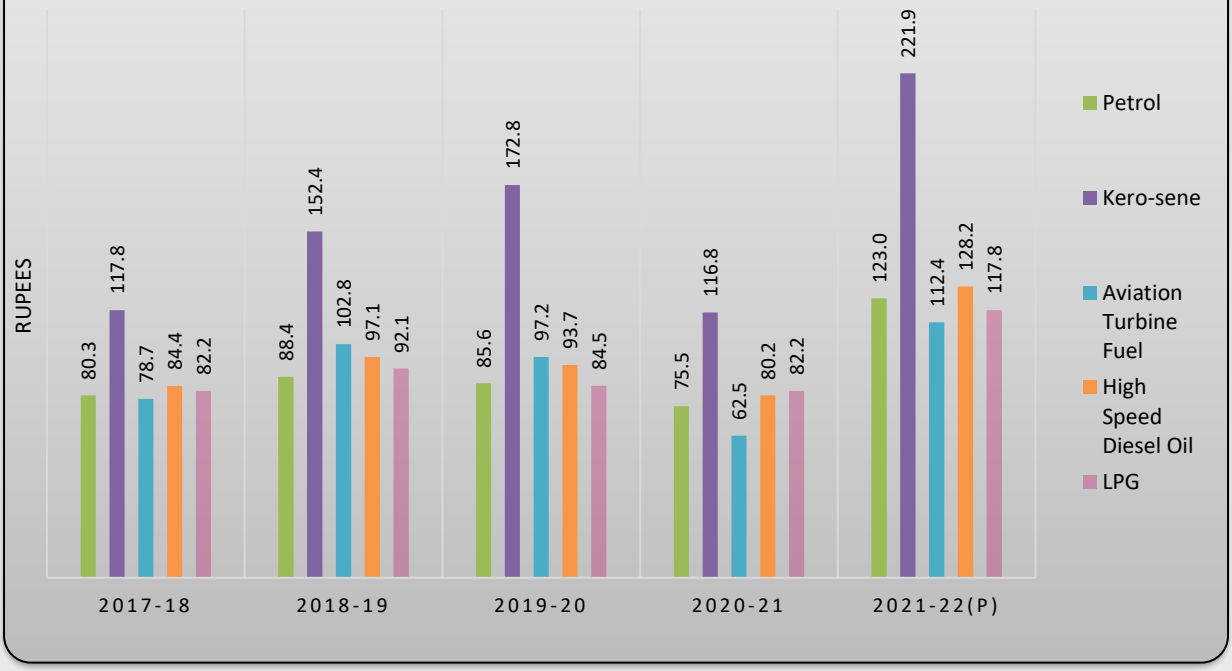


Fig 4.4: Yearwise Wholesale Price Indices(base: 2011-12) of Energy Commodities

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

(Million Tonnes)

Year	Coal			Lignite			Crude Oil			Petroleum Products		
	Gross Imports	Exports	Net Imports	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)	11	12	13=(11)-(12)
2012-13	145.79	2.44	143.34	0.00	0.07	-0.07	184.80	0.00	184.80	16.35	63.41	-47.05
2013-14	166.86	2.19	164.67	0.00	0.00	0.00	189.24	0.00	189.24	16.70	67.86	-51.17
2014-15	217.78	1.24	216.54	0.00	0.00	0.00	189.43	0.00	189.43	21.30	63.93	-42.63
2015-16	203.95	1.58	202.37	0.00	0.00	0.00	202.85	0.00	202.85	29.46	60.54	-31.08
2016-17	190.95	1.77	189.18	0.02	0.01	0.01	213.93	0.00	213.93	36.29	65.51	-29.23
2017-18	208.25	1.50	206.75	0.01	0.00	0.01	220.43	0.00	220.43	35.46	66.83	-31.37
2018-19	235.35	1.31	234.04	0.02	0.08	-0.06	226.50	0.00	226.50	33.35	61.10	-27.75
2019-20	248.54	1.03	247.51	0.05	0.09	-0.04	226.95	0.00	226.95	43.79	65.69	-21.90
2020-21	215.25	2.95	212.31	0.02	0.19	-0.17	196.46	0.00	196.46	43.25	56.77	-13.52
2021-22 (P)	208.93	1.17	207.77	0.07	0.02	0.05	211.98	0.00	211.98	42.06	62.71	-20.65
Growth rate of 2021-22 over 2020-21(%)	-2.93	-	-2.14	-	-	-	7.90	-	7.90	-2.74	10.47	-
CAGR 2012-13 to 2021-22 (%)	4.08	-7.86	4.21	-	-14.09	-	1.54	-	1.54	11.07	-0.12	-8.74

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	14	15	16
2012-13	17.61	0.00	17.61	4794.50	153.53	4640.97
2013-14	17.80	0.00	17.80	5597.90	1651.00	3946.90
2014-15	18.61	0.00	18.61	5007.74	4432.76	574.98
2015-16	21.39	0.00	21.39	5244.21	5150.30	93.91
2016-17	24.85	0.00	24.85	5617.30	6710.19	-1092.89
2017-18	27.44	0.00	27.44	5072.08	7202.86	-2130.78
2018-19	28.74	0.00	28.74	4395.86	8468.94	-4073.08
2019-20	33.89	0.00	33.89	6350.60	9490.91	-3140.31
2020-21	33.03	0.00	33.03	9547.70	9573.55	-25.85
2021-22 (P)	30.78	0.00	30.78	7596.71	9231.63	-1634.92
Growth rate of 2021-22 over 2020-21(%)	-6.83	-	-6.83	-20.43	-3.57	-
CAGR 2012-13 to 2021-22 (%)	6.40	-	6.40	5.25	57.64	-

(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	85.6	172.8	97.2	93.7	82.8	81.0	131.7	84.5	138.1	128.6	129.1	111.8
2020-21	75.5	116.8	62.5	80.2	77.9	67.9	137.2	82.2	141.8	132.4	130.9	109.6
2021-22(P)	123.0	221.9	112.4	128.2	113.2	108.2	162.0	117.8	143.0	220.1	170.5	117.4
Increase in 2021-22 over 2020-21 (%)	**62.91**	**89.98**	**79.84**	**59.85**	**45.31**	**59.35**	**18.08**	**43.31**	**0.85**	**66.24**	**30.25**	**7.12**

* 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.

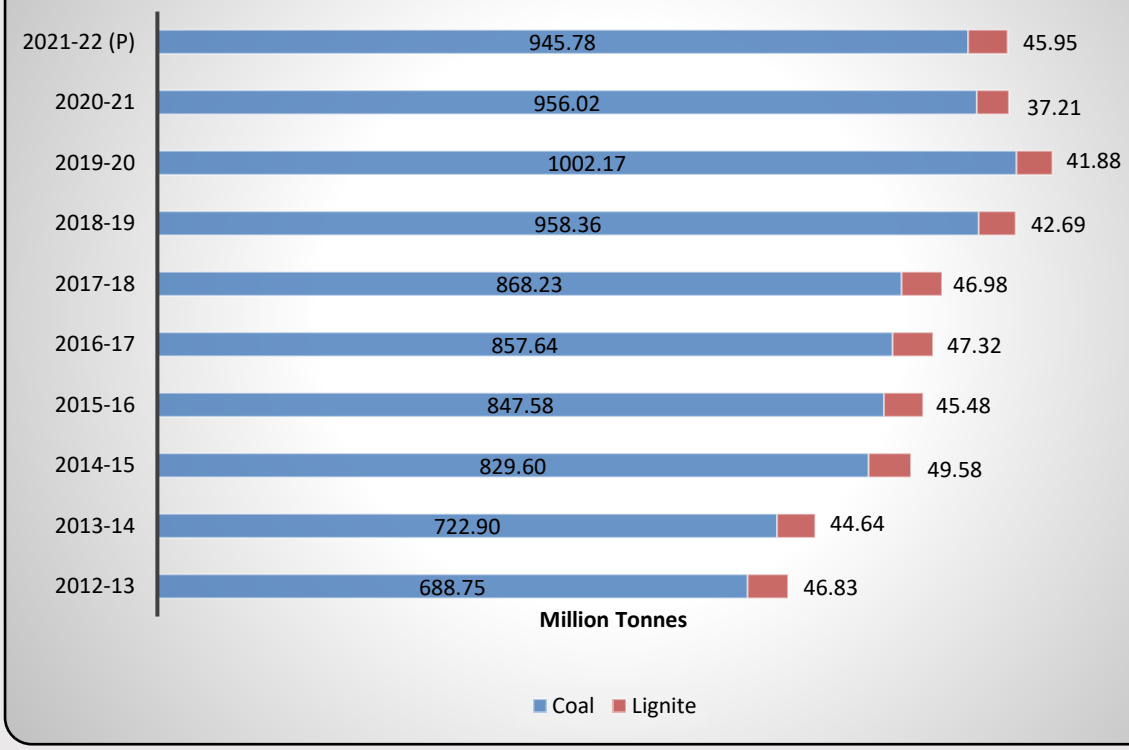
The necessity of Energy security in the current world and availability of energy being an enabler of life improvement, access and availability of Clean Energy for all has been recognized as an agenda point of the Sustainable Development Goals which are to be achieved by countries till 2030.

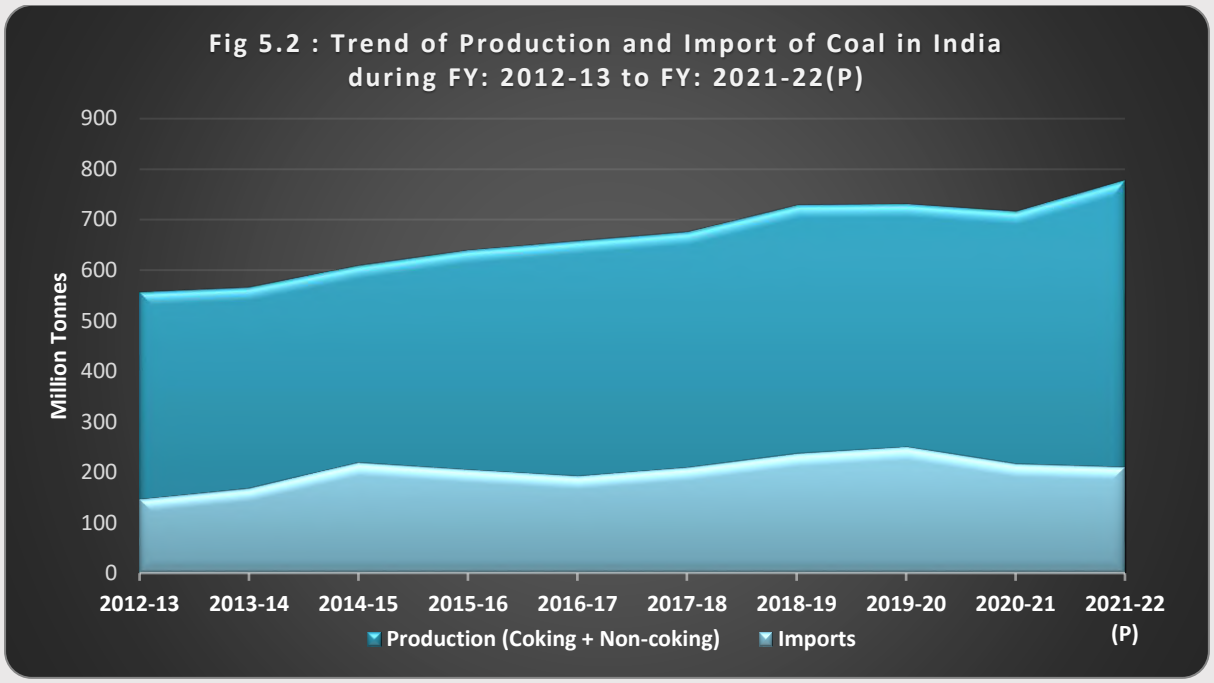
This chapter presents the availability of primary energy resources, petroleum products and electricity in the economy.

Highlights

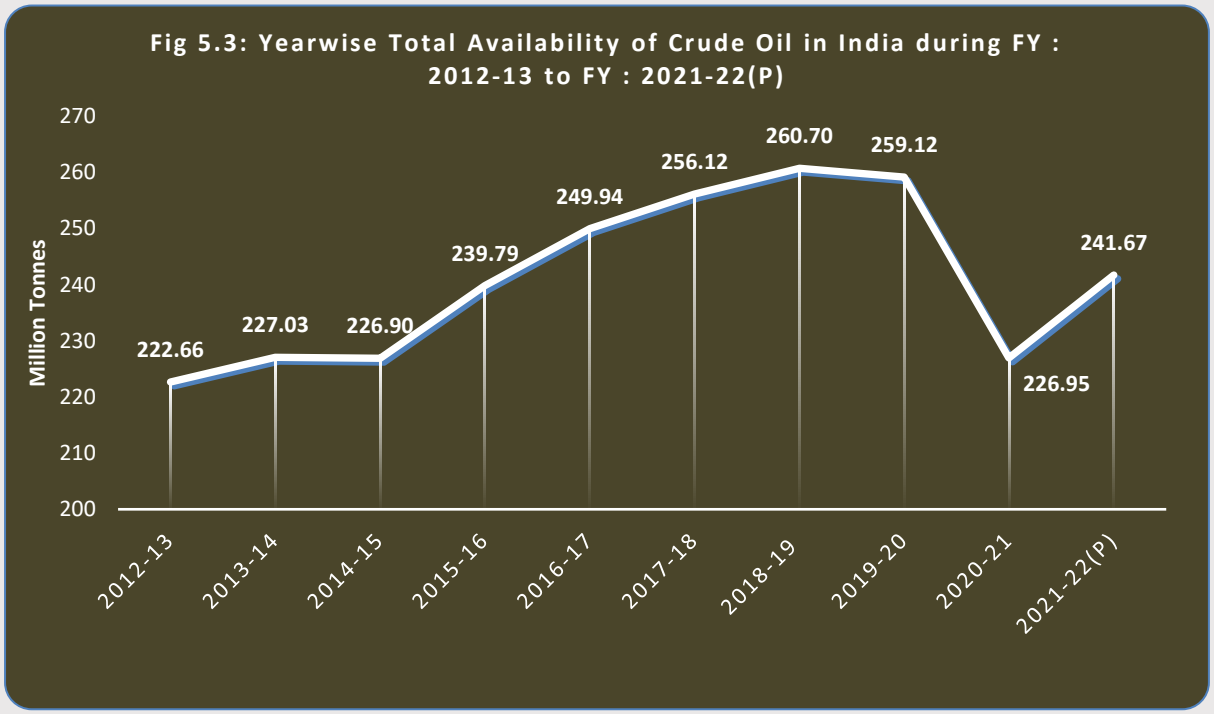
- Over the year 2021-22 (P), in comparison to the year 2020-21, the availability of energy resources has experienced an increase in all the energy resources except coal. Coal has declined by 1.07% during FY:2021-22(P), in comparison with previous Financial year; the availability of Lignite, Crude Oil and Natural Gas oil has increased by 23.48%, 6.48% and 5.08%respectively during FY:2021-22 (P), w.r.t FY:2020-21. (Table 5.1).
- India, being one of the largest reservoirs of Coal, has displayed a steady increase in availability of Coal during the period from 2012-13 to 2021-22(P) with a CAGR of about 3.59%, except for small decline of 4.61% from 2019-20 and 1.07% from 2020-21. The total availability of Coal in 2021-22(P) stood at 945.78 MT as compared to 956.02 MT in 2020-21 indicating a total decrease of 10.23 MT in a year. Out of the 945.78 MT available for consumption in 2021-22(P), a major portion (82.28%) is produced domestically and 208.93 MT is imported (Table 5.1 & 5.2). An overview of availability of Coal and Lignite in India is given below,

Fig 5.1: Yearwise Total Availability of Coal and Lignite in India during FY : 2012-13 to FY : 2021-22(P)



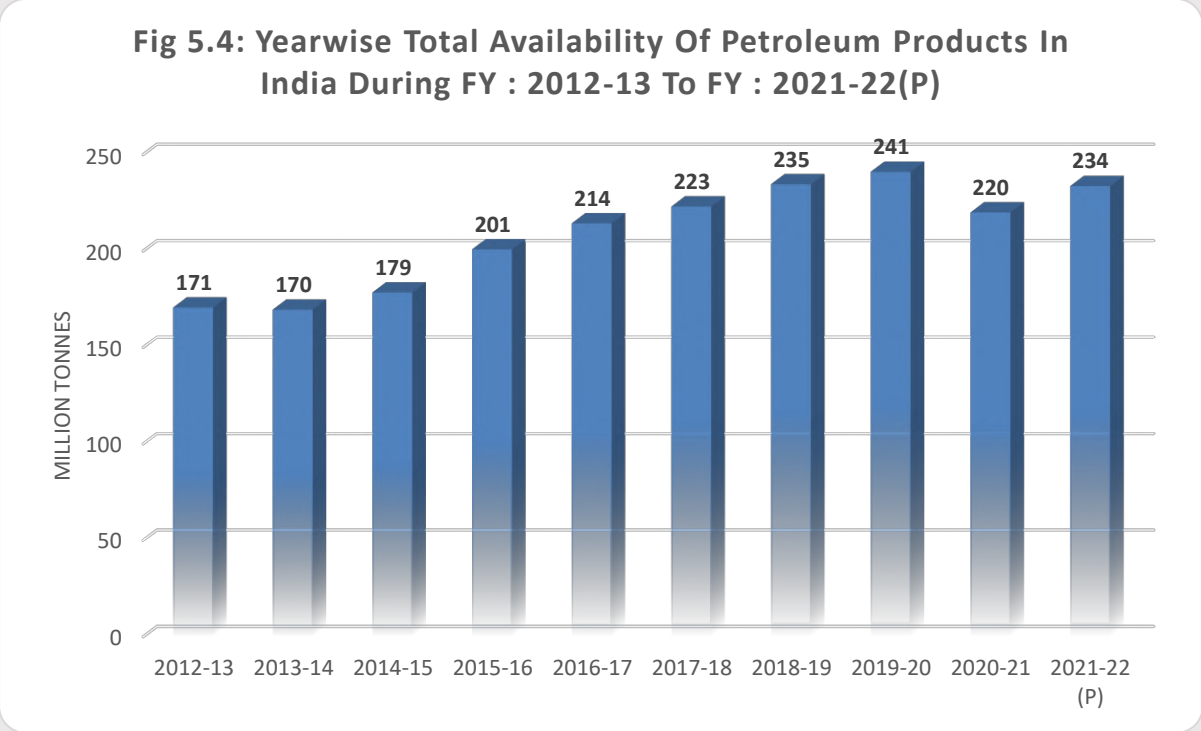


- The total availability of crude oil experienced a downfall of 32.17 MT during FY:2020-21 a decline of close to 12%, primarily because of COVID-19 pandemic. The same, however has bounced back and registered a growth of 6.48% during FY:2021-22(P) over last year (from 226.95 MT in 2020-21 to 241.67 MT during 2021-22(P)). The overall CAGR between 2012-13 to 2021-22(P) has also remained positive (0.91%).



- Like in all developing countries, India has also experienced a steady growth rate of Petroleum Products over time. A production of 203.20 MTs in 2011-12 to 262.94 MTs in 2019-20 i.e. an increase of over 29% has been registered. But during 2020-21,

over 2019-20. The Petroleum Products, however, has experience a healthy growth of close to 9% during FY:2021-22(P) and has reached to 254.31 in 2021-22(P). The CAGR of total availability of Petroleum products between 2012-13 to 2021-22(P) has shown a growth of 1.74% (Table 5.3).



- Electricity available for supply has increased from 9,21,229 GWh in 2012-13 to 14,25,036 GWh in 2021-22(P), thus recording a CAGR of 4.97% during this period. There is also an increase of 8.45% in the availability of electricity (from 13,14,025 GWh during 2020-21 to 14,25,036 GWh) during 2020-21.

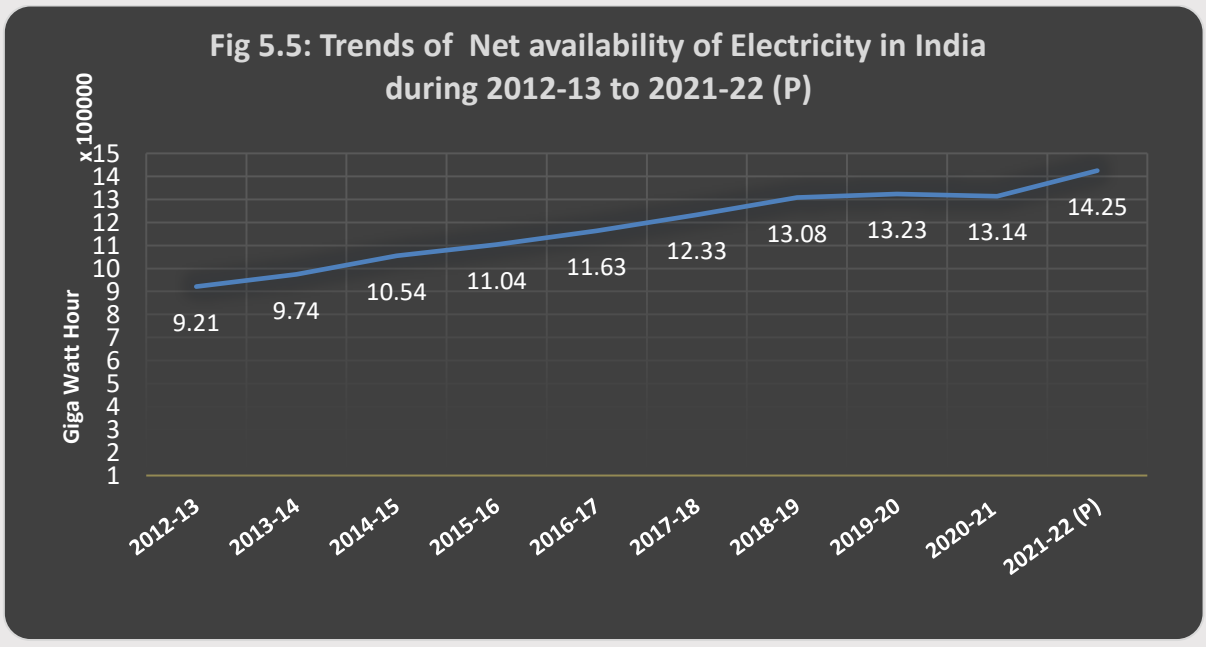


Table 5.1 : Yearwise Availability of Energy Resources

Year	Coal (Million Tonnes)	Lignite (Million Tonnes)	Crude Oil (Million Tonnes)	Natural Gas (Billion Cubic Metres)
2012-13	688.75	46.83	222.66	57.19
2013-14	722.90	44.64	227.03	52.37
2014-15	829.60	49.58	226.90	51.30
2015-16	847.58	45.48	239.79	52.51
2016-17	857.64	47.32	249.94	55.70
2017-18	868.23	46.98	256.12	59.17
2018-19	958.36	42.69	260.70	60.79
2019-20	1002.17	41.88	259.12	64.14
2020-21	956.02	37.21	226.95	60.82
2021-22(P)	945.78	45.95	241.67	63.91
Growth rate of 2021-22 over 2020-21(%)	**-1.07**	**23.48**	**6.48**	**5.08**
CAGR 2012-13 to 2021-22 (%)	**3.59**	**-0.21**	**0.91**	**1.24**

(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
2012-13	556.40	145.79	2.44	-10.99	688.75	46.45	0.00	0.07	0.44	46.83
2013-14	565.77	166.86	2.19	-7.54	722.90	44.27	0.00	0.00	0.37	44.64
2014-15	609.18	217.78	1.24	3.88	829.60	48.27	0.00	0.00	1.32	49.58
2015-16	639.23	203.95	1.58	5.97	847.58	43.84	0.00	0.00	1.63	45.48
2016-17	657.87	190.95	1.77	10.59	857.64	45.23	0.02	0.01	2.07	47.32
2017-18	675.40	208.25	1.50	-13.92	868.23	46.64	0.01	0.00	0.33	46.98
2018-19	728.72	235.35	1.31	-4.40	958.36	44.28	0.02	0.08	-1.54	42.69
2019-20	730.87	248.54	1.03	23.79	1002.17	42.10	0.05	0.09	-0.18	41.88
2020-21	716.08	215.25	2.95	27.63	956.02	37.90	0.02	0.19	-0.51	37.21
2021-22 (P)	778.19	208.93	1.17	-40.17	945.78	47.49	0.07	0.02	-1.59	45.95
Growth rate of 2021-22 over 2020-21(%)	**8.67**	**-2.93**	**-60.31**	**-245.40**	**-1.07**	**25.32**	**258.96**	**-90.61**	**209.73**	**23.48**

(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 Crude Oil, Petroleum Products and Natural Gas.

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
2011-12	38.09	171.73	209.82	203.21	-44.99	158.22	46.56	18.00	64.56
2012-13	37.86	184.80	222.66	217.73	-47.05	170.68	39.57	17.61	57.19
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	32.17	226.95	259.12	262.94	-21.90	241.04	30.26	33.89	64.14
2020-21	30.49	196.46	226.95	233.51	-13.52	219.99	27.78	33.03	60.82
2021-22 (P)	29.69	211.98	241.67	254.31	-20.65	233.65	33.13	30.78	63.91
Growth rate of 2021-22 over 2020-21(%)	**-2.63**	**7.90**	**6.48**	**8.90**	**52.73**	**6.21**	**19.25**	**-6.83**	**5.08**
CAGR 2012-13 to 2021-22 (%)	**-2.66**	**1.54**	**0.91**	**1.74**	**-8.74**	**3.55**	**-1.95**	**6.40**	**1.24**

* : Availability of natural gas is equal to indigenous net production (Gross production-Flared/Losses) + net imports

(P): Provisional; Total may not tally due to rounding off.

Source : Ministry of Petroleum & Natural Gas.

Table 5.4 : Yearwise Availability of Electricity

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

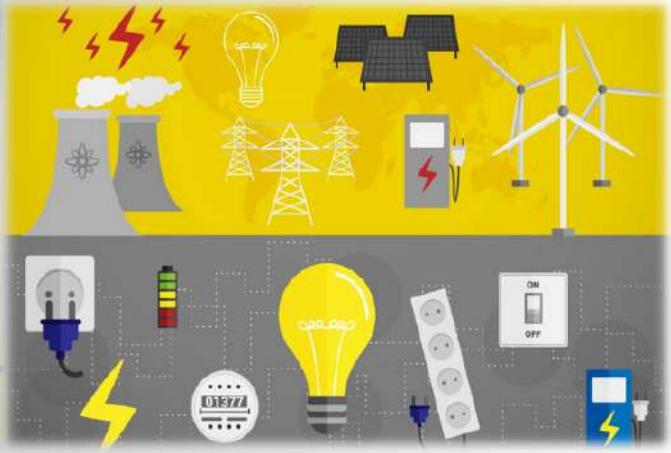
Year	Gross Electricity Generated from Utilities	Consumption in Power Station Auxiliaries	Net Electricity Generated from Utilities	Purchases from Non-Utilities + Net Import from Other Countries	Net Electricity Available for Supply
1	2	3	4=2-3	5	6=4+5
2012-13	9,64,489	64,109	9,00,380	20,849	9,21,229
2013-14	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	13,83,417	83,301	13,00,116	22,932	13,23,048
2020-21	13,73,187	80,472	12,92,715	21,310	13,14,025
2021-22 (P)	14,84,442	83,856	14,00,586	24,450	14,25,036
Growth rate of 2021-22 over 2020-21(%)	**8.10**	**4.20**	**8.34**	**14.73**	**8.45**
CAGR 2012-13 to 2021-22 (%)	**4.91**	**3.03**	**5.03**	**1.79**	**4.97**

(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.

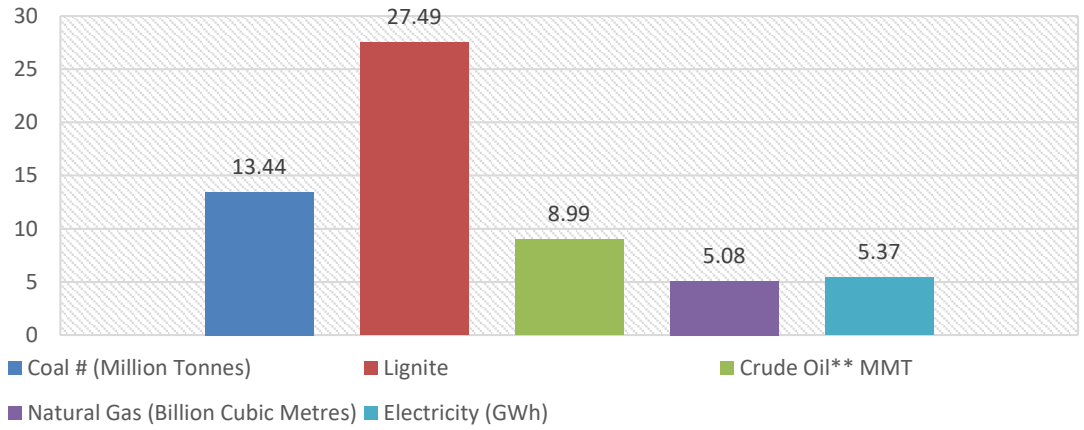
According to the International Energy Agency, where India is an Association country since March 2017, Total Energy Consumption (TEC) in an economy is a good indicator of efficient or non-efficient end-use in economic activities and may indicate course-correction measures to sustainability. It is defined 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

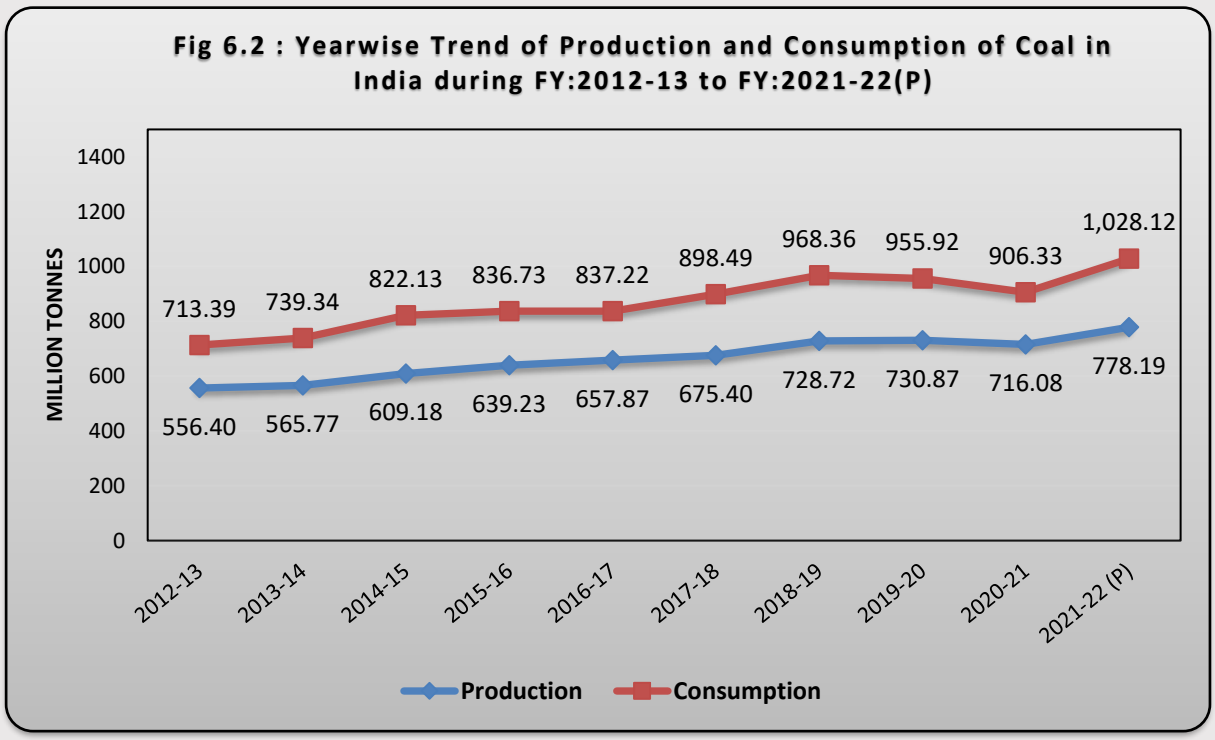
- During the FY: 2021-22, India has experienced a rather slow rate of consumption, mainly because of COVID-19 pandemic, where all the sectors experienced a negative growth rate. But during FY:2021-22, all the sectors have come-up with a healthy growth rates displaying a steady recovery of the Indian economy.

Fig 6.1 : Growth rate of consumption of Energy Resources during FY:2021-22(P) w.r.t 2020-21



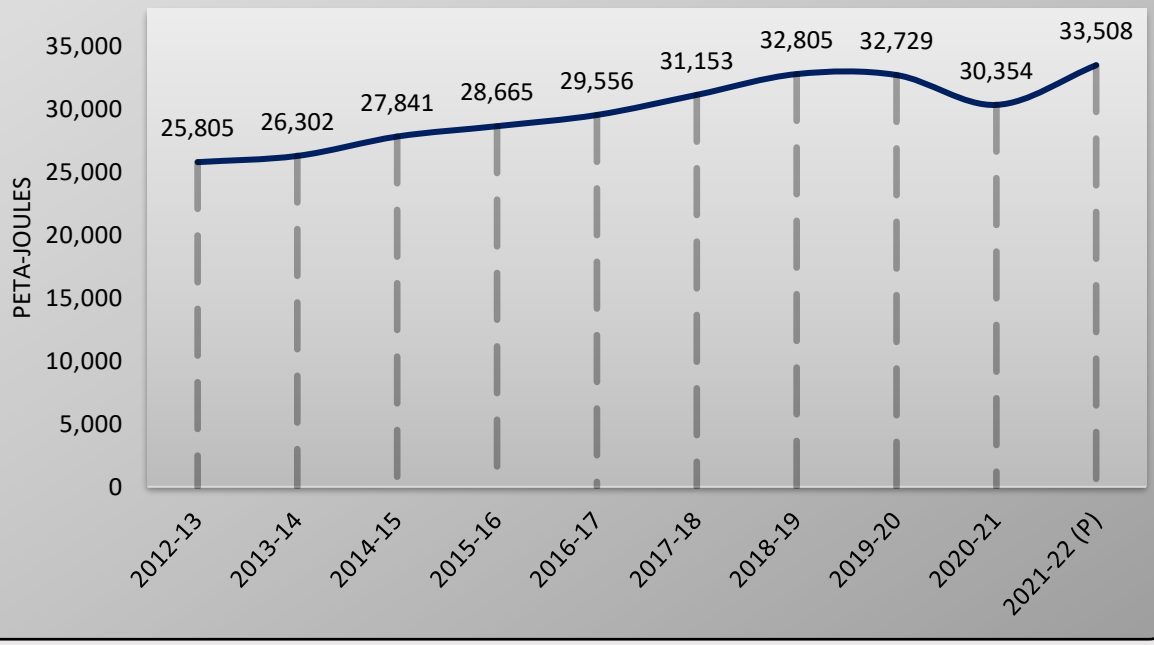
- India is one of the largest producers and consumer of coal in the world. Though there is a small decline of (-)5.19% in 2020-21 over 2019-20; the consumption has increased by close to 13.5% during FY:2021-22 (Table 6.1).

Fig 6.2 : Yearwise Trend of Production and Consumption of Coal in India during FY:2012-13 to FY:2021-22(P)



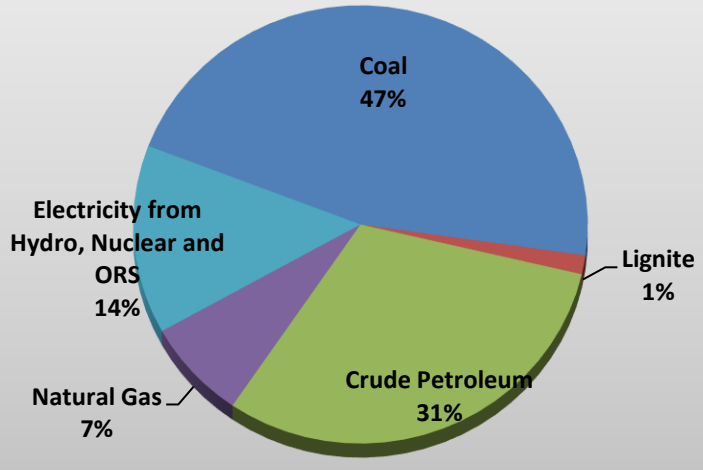
- India has experienced a healthy growth in consumption of Energy. A growth from a figure of 25,805 Petajoule (PJ) during 2012-13 to 33,508 Petajoule (PJ) in 2021-22 (P). The total consumption of energy has increased from 30,354 PJ in 2020-21 to 33,508 PJ in 2021-22(P), an increase of 10.39%. Coal and Lignite together has registered the highest growth of close to 14% during FY:2021-22(P) over last year.

Fig 6.3 : Trend of total consumption of Energy in India during FY: 2012-13 to FY: 2021-22 (P)



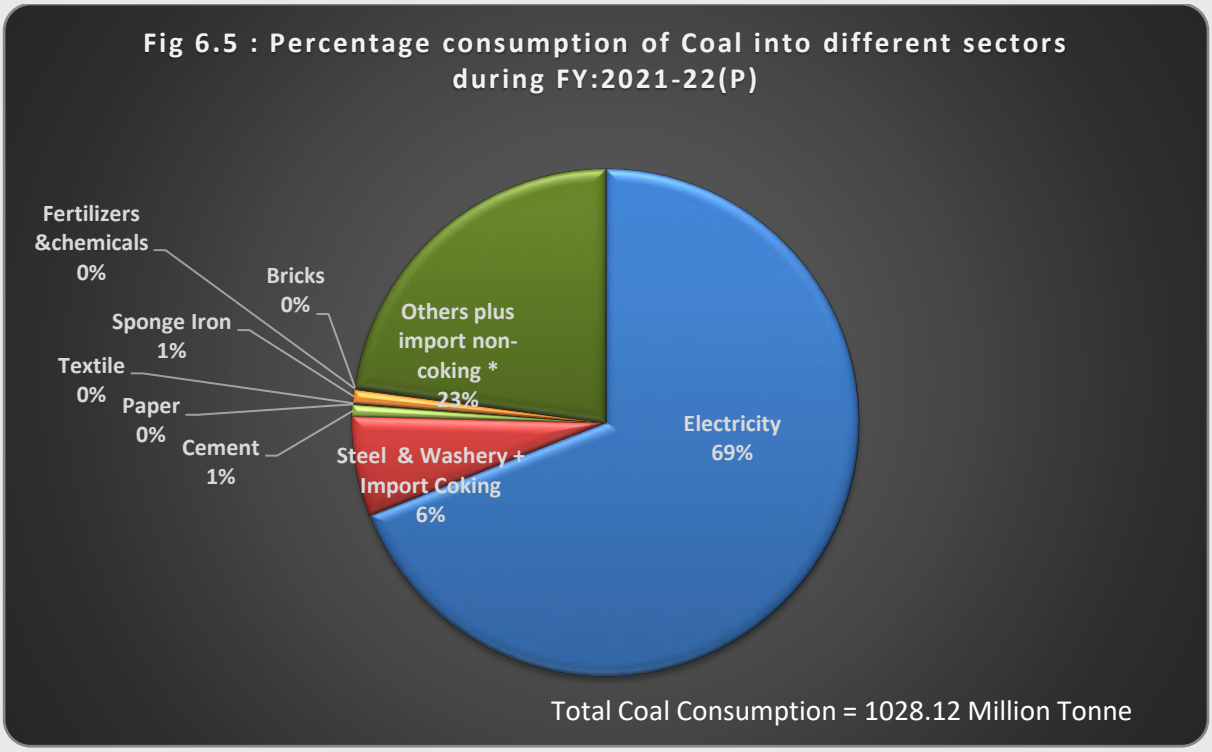
- The consumption of energy in petajoules from Coal and Lignite was highest which accounted for about 48% of the total consumption during 2021-22(P) followed by Crude Oil (31%) and Electricity (14%) (Table 6.2).

Fig 6.4: Sourcewise Consumption of Energy during 2021-22 (P)



Total Energy Consumption = 33,508 PJ

- Electricity Sector remains the biggest consumer of Raw Coal and Lignite in India with this sector consuming as much as 69.04% of the total consumption of coal and 78.98% of total consumption of lignite in India in 2021-22(P). (Table 6.3 & Table 6.4)



- Consumption of Lignite has increased from 38.49 MT in 2020-21 to 49.07 MT in 2021-22(P) which is almost 27.49%. The sharp increase can be attributed to the higher demand in Electricity/Power sector during FY: 2021-22(P), which has experienced an increase of 5.82MT over last year (Table 6.4).

- Petroleum products have experienced a steady growth over time. From a figure of 157.06 MTs during 2012-13 to 214.13 MTs during 2019-20 i.e. a growth of 36% over a span of 7 years. However, during FY:2020-21 the same has been decreased by 9.26% and stood at 194.30 MTS primarily because of COVID-19 pandemic. During FY:2021-22(P) the same has shown a positive growth rate of 5.77% and stood at 204.23 MTs. Among all the products the High-Speed Diesel Oil (HSDO) accounted for 37.55% of total consumption. This was followed by Petrol (15.10%), LPG (13.87%), Pet Coke (7.72%) (Table 6.5).

Fig 6.6 : Trend of total consumption of Petroleum Products in India during FY: 2012-13 to FY: 2021-22 (P)

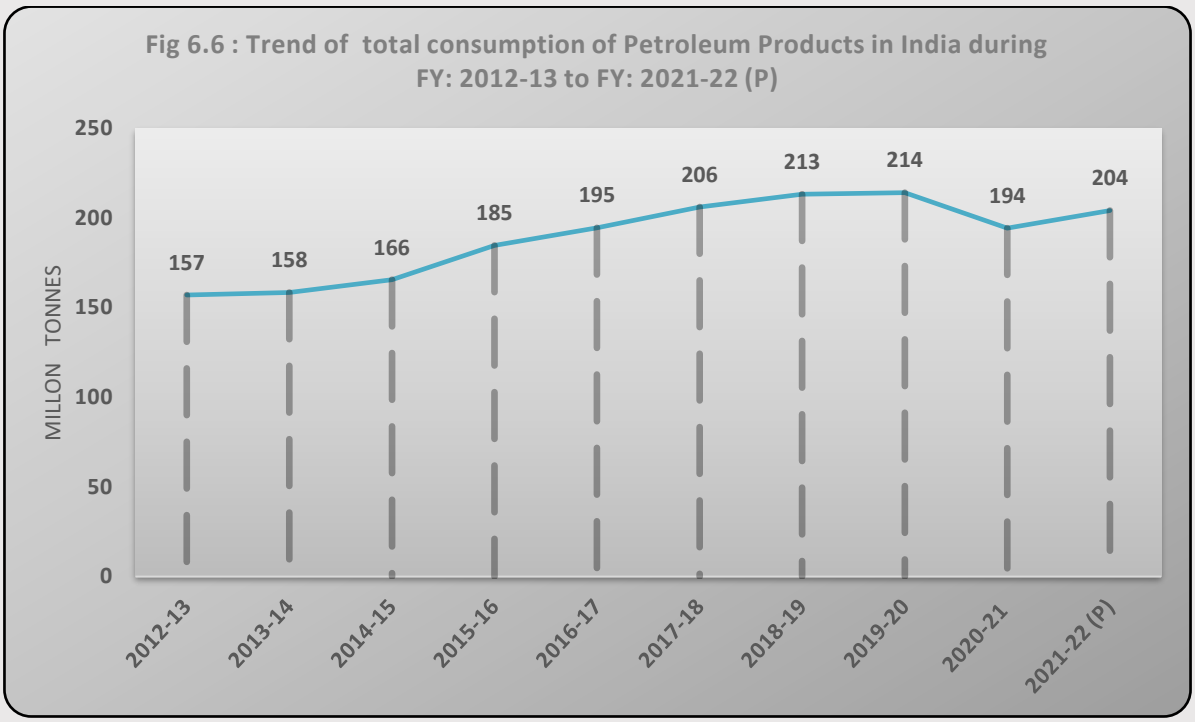
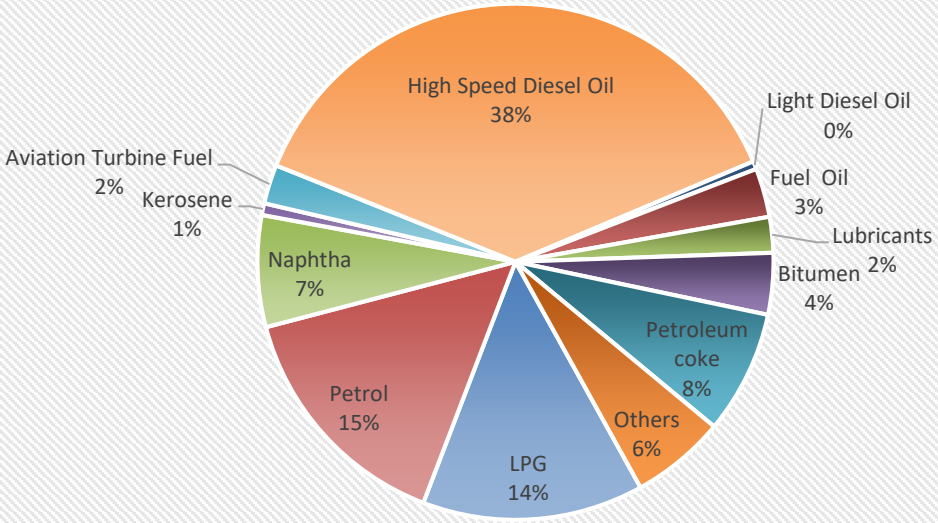
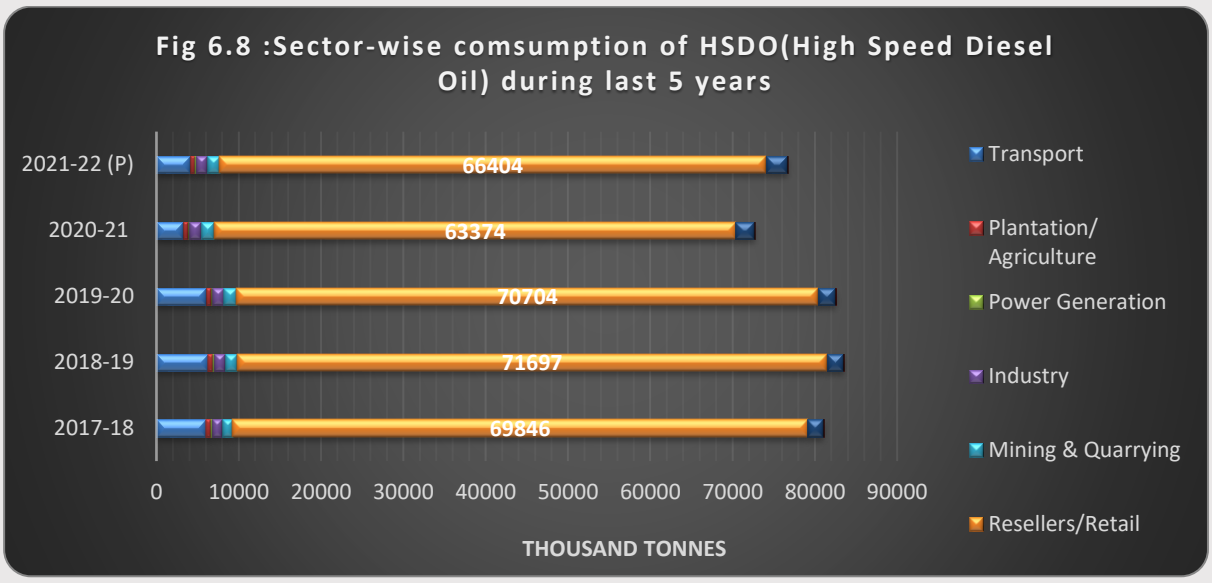


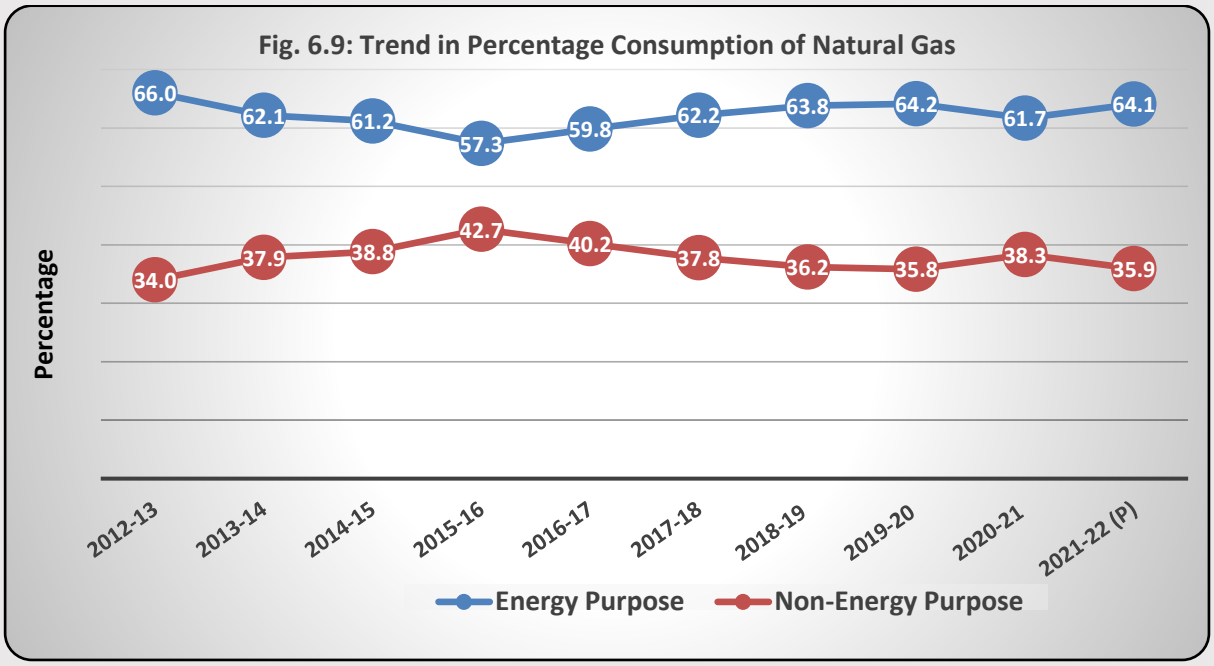
Fig 6.7 : Consumption of Petroleum Products- By type during FY:2021-22(P)



- Among all the Petroleum Products the HSDO, which has the highest share of consumption (37.55%) during FY: 2021-22(P), experienced a positive growth of 5.47% over last year. The Petrol and Pet-Coke are also having a growth of 10.30% and 1.07% respectively over last year. The LPG has registered a positive growth during FY:2021-22 (p); with a growth of 2.80% over last year it has stood at a figure of 28.33 MTs in 2021-22(P), as compared to 27.56 MTs during 2020-21(Table 6.5).



- The impact of energy policies of recent time is evident 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 (-) 16.42% from 2012-13 to 2021-22(P) (Table 6.5).
- The consumption of Natural Gas, both for energy and non-energy purpose have experienced a fluctuation over time. During FY: 2021-22 the consumption against the Energy purpose has experienced a growth of 14% (from 34,617 BCM during 2020-21 to 39,414 BCM during 2021-22); the Non-Energy purpose has also experienced a meagre growth of 2.7% (from 21,500 BCM during 2020-21 to 22,077 BCM during 2021-22).

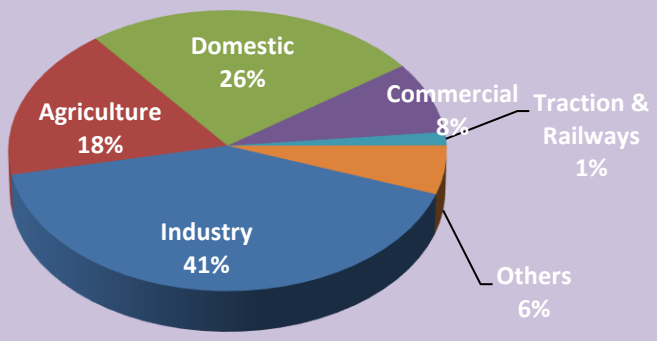


- The maximum use of Natural Gas is in fertilizers industry (28.29%) followed by power generation (15.89%). Industry wise off-take of natural gas shows that, out of the Total Consumption (*Availability Basis (Net Production + LNG Imports)*), while 62% of natural

gas has been used for Energy purposes, 35% is used for Non-energy purposes (Table 6.7).

- The estimated electricity consumption increased from 8,24,301 GWh during 2012-13 to 12,96,300 GWh during 2021-22(P), showing a CAGR of 5.16%. Out of the total consumption of electricity in 2021-22(P), industry sector accounted for the largest share (41.16%), followed by domestic (25.77%), agriculture (17.67%) and commercial sectors (8.29%). The Domestic sector has experienced the highest CAGR of 6.87 between FY:2012-13 to FY:2021-22(P) (Table 6.8).

Fig 6.10: Consumption of Electricity by Sectors in India during 2021-22(P)



Total Electricity Consumption = 12,96,300

Fig 6.11: Sector-wise comsumption of Electricity during last 5 years

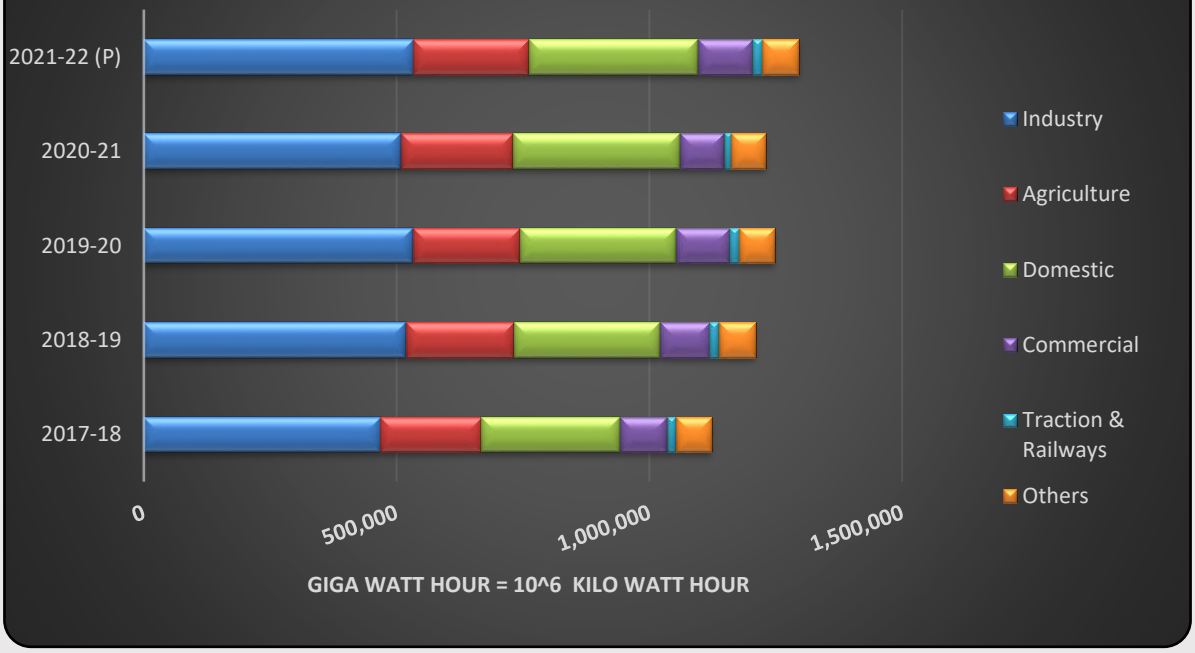


Table 6.1: Yearwise Consumption of Energy Resources in Physical Units

Year	Coal # (Million Tonnes)	Lignite (Million Tonnes)	Crude Oil** MMT	Natural Gas (Billion Cubic Metres)	Electricity (GWh)
1	2	3	4	5	6
2012-13	713.39	46.31	219.21	57.37	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	9,48,521.67
2015-16	836.73	42.21	232.86	52.52	10,01,190.68
2016-17	837.22	43.16	245.36	55.70	10,61,182.64
2017-18	898.49	46.32	251.93	59.17	11,23,426.86
2018-19	968.36	45.81	257.20	60.80	12,09,971.63
2019-20	955.92	42.27	254.39	64.14	12,48,085.82
2020-21	906.33	38.49	221.77	60.82	12,30,207.98
2021-22 (P)	1,028.12	49.07	241.70	63.91	12,96,300.00
Growth rate of 2021-22 over 2020-21(%)	**13.44**	**27.49**	**8.99**	**5.08**	**5.37**
CAGR 2012-13 to 2021-22 (P) (%)	**4.14**	**0.65**	**1.09**	**1.21**	**5.16**

(P): Provisional

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
2012-13	10,794	442	9,380	2,222	2,967	25,805
2013-14	11,186	419	9,520	2,029	3,147	26,302
2014-15	12,439	448	9,552	1,987	3,415	27,841
2015-16	12,660	403	9,964	2,034	3,604	28,665
2016-17	12,667	412	10,499	2,157	3,820	29,556
2017-18	13,594	442	10,780	2,292	4,044	31,153
2018-19	14,651	437	11,006	2,355	4,356	32,805
2019-20	14,463	403	10,885	2,485	4,493	32,729
2020-21	13,713	367	9,489	2,356	4,429	30,354
2021-22 (P)	15,556	468	10,342	2,475	4,667	33,508
% Share in total consumption for 2021-22 (P)	**46.4**	**1.4**	**30.9**	**7.4**	**13.9**	**100.0**
CAGR 2012-13 to 2021-22 (%)	**4.14**	**0.65**	**1.09**	**1.21**	**5.16**	**2.94**

*: 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 + Import Coking	Cement	Paper	Textile	Sponge Iron	Fertilizers &chemicals	Bricks	Others plus import non-coking *	Total
1	2	3	4	5	6	7	8	9	10	11 = 2 to 10
2012-13	446.76	51.70	13.11	2.12	0.30	20.90	2.86	2.01	173.62	713.39
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	626.15	63.74	8.57	1.33	0.10	10.53	1.76	0.03	243.72	955.92
2020-21	581.23	60.17	6.75	1.05	0.08	9.57	1.53	0.03	245.93	906.33
2021-22 (P)	709.86	65.38	7.29	1.25	0.08	8.67	1.46	0.02	234.10	1,028.12
Percentage Distribution (in 2021-22)	**69.04**	**6.36**	**0.71**	**0.12**	**0.01**	**0.84**	**0.14**	**0.00**	**22.77**	**100.00**
Growth rate of 2021-22 over 2020-21(%)	**22.13**	**8.66**	**7.94**	**19.62**	**2.50**	**-9.34**	**-4.19**	**-12.00**	**-4.81**	**13.44**
CAGR 2012-13 to 2021-22(%)	**5.28**	**2.64**	**-6.32**	**-5.69**	**-13.55**	**-9.31**	**-7.18**	**-39.43**	**3.38**	**4.14**

(P): Provisional

* 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	Brick	Others *	Total
1	2	3	4	5	6	7	8	9=2 to 8
2012-13	37.20	0.05	1.10	0.69	3.47	0.87	2.94	46.31
2013-14	36.34	0.03	1.49	1.29	0.73	1.00	3.02	43.90
2014-15	39.47	0.02	1.27	0.65	2.89	0.67	1.98	46.95
2015-16	37.56	0.01	0.23	0.43	1.73	0.39	1.87	42.21
2016-17	38.82	0.04	0.29	0.53	1.29	0.42	1.77	43.16
2017-18	38.84	0.12	1.09	0.76	2.46	0.38	2.67	46.32
2018-19	37.73	0.09	1.80	0.60	2.61	0.63	2.34	45.81
2019-20	36.33	0.02	1.00	0.55	0.16	0.47	3.75	42.27
2020-21	32.94	0.02	0.81	0.57	0.29	0.43	3.44	38.49
2021-22 (P)	38.76	0.27	1.55	0.78	3.40	0.54	3.78	49.07
Distribution (%) in 2021-22	**78.98**	**0.55**	**3.15**	**1.59**	**6.92**	**1.11**	**7.70**	**100.00**
Growth rate of 2021-22 over 2020-21(%)	**17.67**	-	-	-	-	-	**9.98**	**27.49**
CAGR 2012-13 to 2021-22(%)	**0.46**	**20.78**	**3.89**	**1.34**	**-0.23**	**-5.05**	**2.83**	**0.65**

(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
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	26.33	29.98	14.27	2.40	8.00	82.60	0.63
2020-21	27.56	27.97	14.10	1.80	3.70	72.71	0.86
2021-22 (P)	28.33	30.85	14.28	1.49	5.01	76.69	1.02
% Distribution in 2021-22(P)	**13.87**	**15.10**	**6.99**	**0.73**	**2.45**	**37.55**	**0.50**
Growth rate of 2021-22 over 2012-13 (%)	**2.80**	**10.30**	**1.25**	**-16.92**	**35.43**	**5.47**	**19.35**
CAGR 2012-13 to 2021-22 (%)	**6.85**	**7.76**	**1.68**	**-16.42**	**-0.57**	**1.17**	**11.01**

(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
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	6.30	3.83	6.72	21.71	11.36	214.13	23.61	237.74
2020-21	5.59	4.10	7.52	15.61	12.79	194.30	22.81	217.10
2021-22 (P)	6.25	4.57	7.87	15.77	12.10	204.23	24.34	228.57
% Distribution in 2021-22 (P)	**3.06**	**2.24**	**3.86**	**7.72**	**5.92**	**100.00**	-	-
Growth rate of 2021-22 over 2020-21 (%)	**11.96**	**11.54**	**4.65**	**1.07**	**-5.41**	**5.11**	**6.73**	**5.28**
CAGR 2012-13 to 2021-22 (%)	**-2.22**	**4.05**	**5.96**	**5.04**	**9.13**	**2.96**	**3.19**	**2.99**

(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 to10
High Speed Diesel Oil	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	60383	1768	83	69416
	2015-16	5765	630	224	1096	1184	63754	1940	55	74647
	2016-17	5658	607	208	1033	1224	65072	2179	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	6011	616	214	1334	1542	70704	2064	117	82602
	2020-21	3257	571	204	1355	1642	63374	2232	79	72713
	2021-22 (P)	4089	530	213	1290	1540	66404	2552	67	76687
Growth rate of 2021-22 over 2020-21(%)		25.55	-7.05	4.83	-4.77	-6.20	4.78	14.32	-14.28	5.47
CAGR 2012-13 to 2021-22 (%)		-2.55	-1.67	-0.05	-2.55	4.10	1.51	1.07	4.16	1.17

Source : PPAC, MoPNG

Table 6.6(A-1) : Distribution of High Speed Diesel(HSD) under Retail/Reseller into different End-Use sectors

('000 Tonnes)

FY	Road Transport	Shipping	Railways	Agriculture	Power Generation	Other Consumer/ Industrial Goods	Miscellaneous	Total
2021-22(P)	51,662	531	1,394	3,187	1,062	4,183	4,383	66,404

Note : The above end-use distribution of *High Speed Diesel* ***(HSD)*** (under ***Retail/Reseller*** segment) has been made based on the findings mentioned in *Figure 17 (End-use share(%) of diesel (retail and direct) across India) of Sectoral Study Report of PPAC (https://ppac.gov.in/uploads/rep_studies/1666932000_ExecutiveSummarySectoralConsumptionStudy.pdf) .*

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

('000 Tonnes)

Petroleum	Year	Transport	Plantation/	Power	Industry	Mining &	resellers/	Misc.	Pvt	Total
1	2	3	4	5	6	7	8	9	10	11 =3 to10
Light Diesel Oil	2011-12	3	1	127	102	2	**	180	0	415
	2012-13	3	1	142	74	2	1	175	0	399
	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	5	12	342	153	14	38	63	0	628
	2020-21	5	15	252	309	8	125	129	12	855
	2021-22 (P)	6	18	289	297	10	206	187	8	1020
Growth rate of 2021-22over 2020-21(%)		**19.88**	**15.97**	**14.39**	**-3.85**	**33.30**	**64.99**	**45.23**	**-35.91**	**19.35**
CAGR 2012-13 to 2021-22(%)		**7.76**	**33.51**	**8.17**	**16.69**	**17.38**	**86.43**	**0.77**	**-**	**11.01**

Source : PPAC, MoPNG

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	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	849	71	303	2143	84	290	1398	775	5912
	2020-21	1022	80	226	1874	92	268	1330	316	5208
	2021-22 (P)	1159	65	312	2092	127	211	1388	455	5808
Growth rate of 2021-22 over 2020-21(%)		**13.33**	**-19.01**	**37.82**	**11.59**	**38.93**	**-21.14**	**4.37**	**43.94**	**11.52**
CAGR 2012-13 to 2021-22 (%)		**17.25**	**-2.20**	**-6.79**	**0.39**	**29.48**	**-5.50**	**-5.71**	**-3.18**	**-0.88**

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	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	0.00	44.25	0.00	448.71
	2014-15	0.00	226.18	103.54	0.00	0.00	47.50	0.00	377.22
	2015-16	0.00	50.70	70.45	0.00	0.00	29.23	0.00	150.38
	2016-17	0.00	16.43	50.88	0.00	0.00	36.91	0.00	104.23
	2017-18	1.18	0.00	53.78	0.31	14.67	46.33	0.00	116.27
	2018-19	7.90	9.31	175.13	0.00	48.04	128.67	0.00	369.04
	2019-20	6.42	17.88	201.93	0.00	50.29	113.02	0.00	389.54
	2020-21	6.79	10.71	196.23	0.00	48.50	115.97	0.00	378.20
	2021-22 (P)	6.51	29.66	191.26	0.00	67.39	151.88	0.00	446.70
Growth rate of 2021-22 over 2020-21(%)		**-4.15**	**-**	**-2.53**	**-**	**38.94**	**30.97**	**-**	**18.11**
CAGR 2012-13 to 2021-22 (%)		**-**	**-25.87**	**-14.44**	**-**	**-**	**0.21**	**-**	**-11.68**

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

('000 Tonnes)

Petroleum Product	Year	Transport	Plantation/ Agriculture	Power Generation	Manufacturing/Non domestic	Mining	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	13=sum of (3) to (12)
Liquefied Petroleum Gas	2012-13	215	4	0	145	0	13568	1168	59	45	398	15,601
	2013-14	195	4	3	135	0	14412	1074	58	46	369	16,294
	2014-15	165	6	3	208	0	16040	1051	45	53	429	18,000
	2015-16	172	7	3	202	0	17182	1464	45	60	489	19,623
	2016-17	168	8	2	220	0	18871	1776	67	67	429	21,608
	2017-18	185	7	1	205	0	20352	2086	74	67	364	23,342
	2018-19	181	22	2	204	0	21728	2364	0	89	316	24,907
	2019-20	173	26	1	153	0	23076	2614	0	82	204	26,330
	2020-21	119	28	0	215	2	25128	1886	1	115	64	27,558
	2021-22 (P)	123	30	0	180	3	25502	2239	2	174	76	28,330
Growth rate of 2021-22 over 2020-21(%)		**3.34**	**5.19**	**15.82**	**-16.27**	**-**	**1.49**	**18.71**	**-**	**50.87**	**18.92**	**2.80**
CAGR 2012-13 to 2021-22 (%)		**-6.01**	**25.86**	**-**	**2.43**	**-**	**7.26**	**7.50**	**-29.69**	**16.29**	**-16.78**	**6.85**

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	Fertiliser Sector	Petro chemicals	Power Sector	Steel Plants	Others	Private import	Total
1	2	3	4	5	6	7	8	9 =3 to 8
Naptha	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	10209.80	60.20	0.00	198.68	2422.75	13240.78
	2017-18	367.74	10010.95	66.53	0.00	404.90	2038.49	12888.61
	2018-19	351.61	10601.63	5.26	0.00	461.66	2711.08	14131.23
	2019-20	149.65	10874.49	0.41	0.00	879.64	2363.58	14267.78
	2020-21	65.66	11339.35	70.22	0.00	885.20	1739.92	14100.36
	2021-22 (P)	0.00	11903.71	5.95	0.00	799.48	1567.44	14276.58
Growth rate of 2020-21 over 2019-20(%)		-	**4.98**	**-91.53**	-	**-9.68**	**-9.91**	**1.25**
CAGR 2011-12 to 2020-21 (%)		-	**2.64**	**-36.25**	-	**16.45**	**0.99**	**1.68**

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)	2012-13	7349.04	37.18	115.28	7502
	2013-14	7008.86	107.30	48.61	7165
	2014-15	6917.34	60.11	109.26	7087
	2015-16	6648.94	63.94	113.43	6826
	2016-17	5197.24	84.00	115.58	5397
	2017-18	3633.59	96.99	114.54	3845
	2018-19	3231.21	97.30	130.95	3459
	2019-20	2173.71	86.52	136.60	2397
	2020-21	1586.61	68.61	142.65	1798
	2021-22 (P)	1291.77	63.75	138.14	1494
Growth rate of 2021-22 over 2020-21(%)		**-18.58**	**-7.09**	**-3.16**	**-16.92**
CAGR 2012-13 to 2021-22 (%)		**-17.57**	**6.18**	**2.03**	**-16.42**

Table 6.7: Yearwise Consumption of Natural Gas - Sectorwise

(Figures in MMSCM)

Sector	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22 (P)	% Share of Total
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
(a) Energy Purpose											
Power	16,078	11,284	10,720	10,889	11,616	12,028	12,005	11,080	10,836	10,157	15.89
Industrial & Manufacturing	269	261	533	545	794	999	1,086	701	555	829	1.30
City or Local Natural Gas Distribution Network incl. Road Transport	5,780	5,904	5,416	5,464	7,350	8,585	9,206	10,883	9,230	12,175	19.05
Agriculture (Tea Plantation)	182	196	180	187	183	189	192	200	177	156	0.24
Internal Consumption for Pipeline System	387	372	351	410	471	496	541	525	439	486	0.76
Refinery	3,891	3,968	4,575	5,077	5,374	6,533	7,047	7,786	7,911	5,312	8.31
LPG Shrinkage	1,027	982	1,005	754	759	798	874	858	900	1,070	1.67
Miscellaneous	7,976	7,479	5,941	4,111	3,929	3,226	3,393	4,209	4,569	9,229	14.44
Total (a)	**35,590**	**30,446**	**28,721**	**27,437**	**30,478**	**32,854**	**34,343**	**36,241**	**34,617**	**39,414**	**62**
(b) Non-Energy Purpose											
Fertilizer Industry	14,733	15,869	15,190	16,135	15,429	14,676	14,987	16,115	17,781	18,079	28.29
Petrochemical	2,486	2,405	2,890	3,733	4,170	4,024	3,386	3,569	3,072	2,864	4.48
Sponge Iron	1,106	274	154	544	885	1,278	1,124	567	647	1,134	1.77
Total (b)	**18,325**	**18,548**	**18,234**	**20,412**	**20,484**	**19,978**	**19,497**	**20,251**	**21,500**	**22,077**	**35**
Total Sectorial Sales (a+b)	**53,915**	**48,994**	**46,955**	**47,849**	**50,961**	**52,832**	**53,840**	**56,492**	**56,117**	**61,491**	**96**
Total Consumption **	**57,367**	**52,375**	**51,300**	**52,517**	**55,697**	**59,170**	**60,796**	**64,144**	**60,815**	**63,907**	**100**
Total Consumption in MMSCMD	**157.17**	**143.49**	**140.55**	**143.49**	**152.59**	**162.11**	**166.57**	**175.26**	**166.62**	**175.09**	

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

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 being used as feedstock are classified

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

Source: PPAC

Note : *LPG shrinkage is being shifted from Non-Energy purpose to Energy Purpose. Since, LPG shrinkage is a transformation process and LPG produced is further* used for energy purposes to meet domestic / household energy requirements. Therefore, it has been shifted from 'non energy purpose' to 'energy purpose'

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 Electricity Consumed
1	2	3	4	5	6	7	8=2 to 7
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	5,32,820	2,11,295	3,08,745	1,06,047	19,148	70,031	12,48,086
2020-21	5,08,776	2,21,303	3,30,809	86,950	14,668	67,701	12,30,208
2021-22 (P)	5,33,500	2,29,000	3,34,000	1,07,500	19,800	72,500	12,96,300
% share in 2021-22(%)	**41.16**	**17.67**	**25.77**	**8.29**	**1.53**	**5.59**	**100.00**
Growth rate of 2021-22 over 2020-21(%)	**4.86**	**3.48**	**0.96**	**23.63**	**34.99**	**7.09**	**5.37**
CAGR 2012-13 to 2021-22 (%)	**4.28**	**5.01**	**6.87**	**4.43**	**3.84**	**6.76**	**5.16**

(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

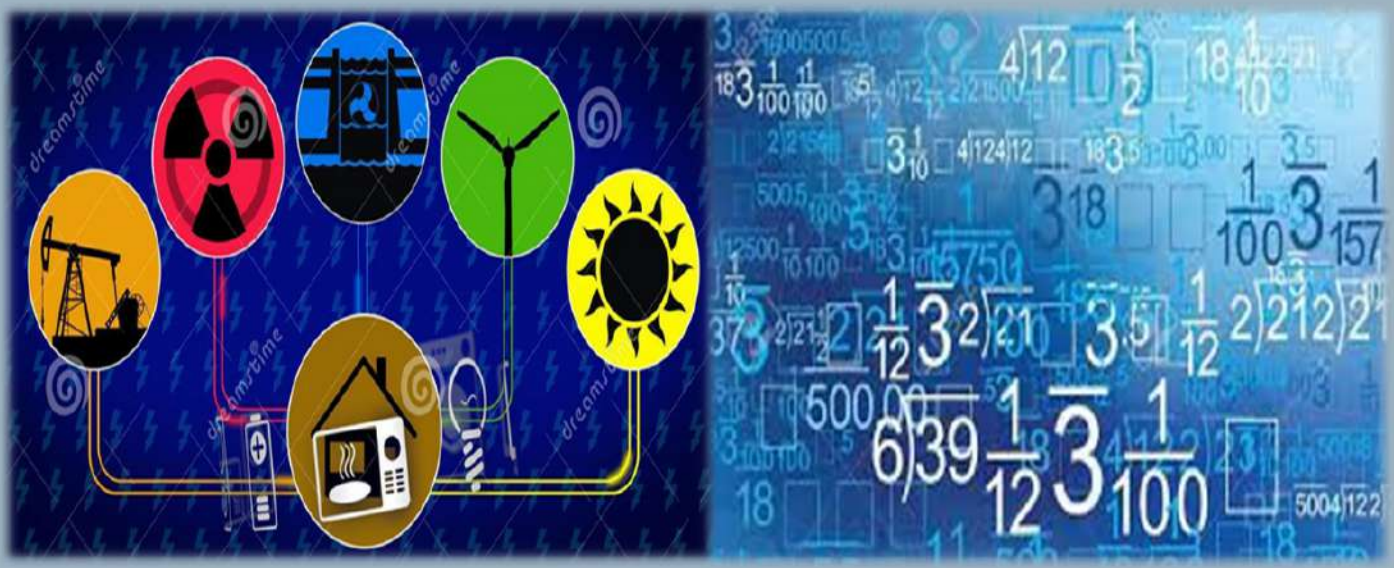
Year	Net Electricity Generated from Utilities	Purchases from Non-Utilities + Net Import from Other Countries	Net Electricity Available for Supply	Sold to Ultimate Consumers	Loss in transmission & distribution	Loss in transmission & distribution (%)
1	2	3	4=2+3	5	6=4-5	7
2012-13	9,00,380	20,849	9,21,229	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	13,00,116	22,932	13,23,048	10,52,346	2,70,701	20.46%
2020-21	12,92,715	21,310	13,14,025	10,41,656	2,72,369	20.73%
2021-22 (P)	14,00,586	24,450	14,25,036	11,26,030	2,91,410	20.45%
Growth rate of 2021-22 over 2020-21(%)	**8.34**	**14.73**	**8.45**	**8.10**	**6.99**	**-1.34**
CAGR 2012-13 to 2021-22 (%)	**5.03**	**1.79**	**4.97**	**5.27**	**3.59**	**-1.32**

(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 also used as a final product or intermediate for power generation. Similarly, natural gas is also used directly or as an intermediate in power generation. Many petroleum products, such as HSDO, Naphtha etc. are used as a final product by the non-energy producing sectors and also used for power generation. This indicates that the same energy source can be used in various forms at various stages of consumption. This creates a possibility of over-estimation or under-estimation of energy consumption in totality as well as for different sources.

Energy Balance

An energy balance is a framework to complete data on all energy products entering, existing and used within a given country during a reference 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)

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 this 30th edition of Energy Statistics, attempt has been made to generate the Energy Balance table of India using the domestic conversion factors (especially for Coal). Since Coal has always having the dominant share of Energy resources in India, thus a shift of conversion factors from IEA to Domestic, results in a significant reduction of Energy supplied and consumed in India. Attempt has also been made to generate the final version of Energy Balance table of India from 2012-13 onwards, based on the audited final database, received from all the source Ministries and using the domestic conversion factors.
- In 2021-22 (P), Primary Energy Supply added up to 7,39,386 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 56.13% of the total and Crude Oil which accounted for 33.40%.
- In 2021-22 (P), final Energy Consumption (End Use) was 5,25,708 ktoe. The industrial sector was the largest consumer of energy in the country with this sector itself using more than half, i.e., 50.59% of the total final energy consumption.
- Within the industry sector, the most energy intensive industries were iron and steel, which accounted for 15.29% of the industrial energy use followed by Chemicals and petrochemicals 5.36 % and construction 2.09%.
- The consumption of the residential, agriculture, commercial & public sectors, No-specified(others) and non-energy purpose represented 38.53% of the total final consumption in the country, whereas, transport sector accounted for 10.88% of Total Final Consumption.
- The Energy Balance table of India, based on the final audited figures as available from different Ministries and on Domestic conversion factors have been computed from the FY: 2012-13 to FY: 2019-20. The same can be found in *Annexure – V*.

Table 7.1 : Energy Commodity Balance for the year 2020-21(Final)

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	716083	37895	12072	19403	2393	101170	7242	1069	5245	35779	49140	28673	1373187
From Other Sources													224827
Imports	215251	19	16476	1199	3	648	6454	2693	2055	1351	12369	33031	9548
Exports	-2945	-187	-452	-6509	-15	-30576	-1177	-15	-7	-11606	-6412	0	-9574
Stock changes	27628	-514											
Domestic Supply	**956017**	**37212**	**28096**	**14093**	**2381**	**71242**	**12519**	**3747**	**7293**	**25524**	**55097**	**61704**	**1597988**
Transfer													
Statistical difference	-49685	1280	-538	8	-583	2325	-6932	350	231	2445	-23003	210	-14939
Transformation	**581233**	**32937**	**0**	**70**	**0**	**456**	**237**	**0**	**0**	**0**	**0**	**10836**	**0**
Electricity plants	581233	32937	0	70		456	237					10836	
Energy industry own use	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**18210**	**80472**
Oil and Gas extraction												5730	
Petroleum refineries												7911	
Own use in electricity, CHP and heat plants													80472
Other energy sector												4569	
Distribution losses												**67**	**272369**
Final Consumption	**325099**	**5555**	**27558**	**14030**	**1798**	**73112**	**5350**	**4097**	**7524**	**27969**	**32094**	**32801**	**1230208**
Industry Sector	**325099**	**5555**	**2102**	**14030**	**0**	**3314**	**2162**				**28396**	**555**	**508776**
Iron and steel	69738	24		0		204	826						
Chemical and petroleum	1527			11405		162	532						
Non-ferrous metals						21	349						
Machinery						125	21						
Mining & Quarrying			2			1650	92						
Paper, pulp and print	1045	566											
Construction	6779	1239				1080	148						
Textile and leather	80	290				20	39						
Non-specified	245930	3436	2101	2625		53	155				28396	555	508776
Transport Sector	**0**	**0**	**119**	**0**	**0**	**3262**	**1022**	**0**	**0**	**27969**	**3698**	**9669**	**14668**
Road			119			1375	132			27969		9230	
Domestic Aviation						2							
Rail						1223	0						14668
Pipeline transport												439	
Domestic navigation						662	890				3698		
Non-specified							0						
Other Sectors			**25337**	**0**	**1798**	**66536**	**2165**	**4097**	**7524**			**1077**	**706764**
Residential			25128		1587								330809
Comm. And public services					69								86950
Agriculture/forestry			28			586	87					177	221303
Non-specified			180		143	65950	2078	4097	7524			900	67701
Non-Energy Use												**21500**	

(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 2020-21 (Final)

All figures in KToE

	Coal	Crude Oil	Oil Products	Natural Gas	Nuclear	Hydro	Solar, Wind, Others	Electricity	Total
Production	2,97,775	31,165	0	26,522	11,214	12,955	13,279	0	3,92,909
Imports	1,15,541	2,00,783	42,915	30,554	0	0	0	821	3,90,614
Exports	-2,026	0	-59,090	0	0	0	0	-823	-61,939
Stock changes	11,521	0	0	0	0	0	0	0	11,521
Total primary energy supply	**4,22,811**	**2,31,947**	**-16,174**	**57,076**	**11,214**	**12,955**	**13,279**	**-2**	**7,33,105**
Statistical differences	-6,473	18,012	-23,136	194	0	0	0	-1,285	-12,687
Main activity producer electricity plants	-2,43,521	0	-769	-10,023	-11,214	-12,926	-12,663	1,18,094	-1,73,021
Autoproducer electricity plants	0	0	0	0	0	-29	-616	19,335	18,690
Oil refineries	0	-2,26,652	2,37,827	0	0	0	0	0	11,175
Energy industry own use	0	0	0	-16,844	0	0	0	-6,921	-23,765
Losses	0	-23,308	0	-62	0	0	0	-23,424	-46,794
Final consumption	**1,72,818**	**0**	**1,97,748**	**30,341**	**0**	**0**	**0**	**1,05,798**	**5,06,704**
Industry	**1,72,818**	**0**	**47,051**	**513**	**0**	**0**	**0**	**43,755**	**2,64,137**
Iron and steel	36,805	0	984	0	0	0	0	0	37,790
Chemical and petrochemical	806	0	12,923	0	0	0	0	0	13,729
Non-ferrous metals	0	0	348	0	0	0	0	0	348
Machinery	0	0	149	0	0	0	0	0	149
Mining and quarrying	0	0	1,792	0	0	0	0	0	1,792
Paper, pulp and print	680	0	0	0	0	0	0	0	680
Construction	3,860	0	1,256	0	0	0	0	0	5,116
Textile and leather	108	0	57	0	0	0	0	0	165
Non-specified (industry)	1,30,558	0	29,542	513	0	0	0	43,755	2,04,368
Transport	**0**	**0**	**38,331**	**8,944**	**0**	**0**	**0**	**1,261**	**48,537**
Road	0	0	31,608	8,538	0	0	0	0	40,146
Domestic aviation	0	0	3,941	0	0	0	0	0	3,941
Rail	0	0	1,264	0	0	0	0	1,261	2,526
Pipeline transport	0	0	0	406	0	0	0	0	406
Domestic navigation	0	0	1,517	0	0	0	0	0	1,517
Non-specified (transport)	0	0	0	0	0	0	0	0	0
Other	**0**	**0**	**1,12,365**	**996**	**0**	**0**	**0**	**60,782**	**1,74,143**
Residential	0	0	29,963	0	0	0	0	28,450	58,413
Commercial and public services	0	0	68	0	0	0	0	7,478	7,546
Agriculture/forestry	0	0	719	164	0	0	0	19,032	19,915
Non-specified (other)	0	0	81,615	832	0	0	0	5,822	88,269
Non-energy use	**0**	**0**	**0**	**19,887**	**0**	**0**	**0**	**0**	**19,887**
Non-energy use industry/transformation/energy	0	0	0	19,887	0	0	0	0	19,887
Non-energy use in transport	0	0	0	0	0	0	0	0	0
Non-energy use in other	0	0	0	0	0	0	0	0	0
Elect. output in GWh	**0**	**0**	**0**	**0**	**43,029**	**1,50,639**	**1,54,405**	**0**	**3,48,073**
Elec output-main activity producer ele plants	0	0	0	0	43,029	1,50,300	1,47,248	0	3,40,576
Elec output-autoproducer electricity plants	0	0	0	0	0	339	7,158	0	7,497

* Final consumption refers to End Use Consumption

P: Provisional

Table 7.3 : Energy Commodity Balance for the year 2021-22(Provisional)

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	778190	47490	12238	19994	1916	107980	8327	1173	5111	40238	57328	34024	1484442
From Other Sources													235000
Imports	208934	68	17120	1268	0	75	9024	3106	2638	671	8160	30776	7597
Exports	-1169	-18	-513	-6861	-14	-32407	-1716	-10	-6	-13482	-7703	0	-9232
Stock changes	-40171	-1592											
Domestic Supply	**945784**	**45948**	**28845**	**14401**	**1902**	**75648**	**15636**	**4269**	**7743**	**27426**	**57785**	**64800**	**1717807**
Transfer													
Statistical difference	82339	3125	-515	-124	-409	2060	-9381	301	131	3423	-24906	2529	-46241
Transformation	**709860**	**38756**	**0**	**6**	**0**	**502**	**341**	**0**	**0**	**0**	**0**	**10157**	**0**
Electricity plants	709860	38756	0	6		502	341					10157	
Energy industry own use	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**20298**	**83856**
Oil and Gas extraction												5758	
Petroleum refineries												5312	
Own use in electricity, CHP and heat plants													83856
Other energy sector												9229	
Distribution losses												**80**	**291410**
Final Consumption	**318263**	**10317**	**28329**	**14271**	**1494**	**77205**	**5914**	**4570**	**7874**	**30849**	**32879**	**36793**	**1296300**
Industry Sector	**318263**	**10317**	**2422**	**14271**	**0**	**3138**	**2410**				**27871**	**829**	**533500**
Iron and steel	74053	268		0		228	913						
Chemical and petroleum	1463			11904		136	581						
Non-ferrous metals						27	390						
Machinery						140	19						
Mining & Quarrying			3			1551	127						
Paper, pulp and print	1250	782											
Construction	7312	2090				977	184						
Textile and leather	82	3398				19	33						
Non-specified	234103	3779	2419	2367		60	162				27871	829	533500
Transport Sector	**0**	**0**	**123**	**0**	**0**	**4095**	**1159**	**0**	**0**	**30849**	**5008**	**12661**	**19800**
Road			123			1696	172			30849		12175	
Domestic Aviation						3							
Rail						1749	0						19800
Pipeline transport												486	
Domestic navigation						648	986				5008		
Non-specified							0						
Other Sectors			**25784**	**0**	**1494**	**69973**	**2345**	**4570**	**7874**			**1226**	**743000**
Residential			25502		1292								334000
Comm. And public services					64								107500
Agriculture/forestry			30			548	71					156	229000
Non-specified			253		138	69424	2273	4570	7874			1070	72500
Non-Energy Use												**22077**	

(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 7.4: Energy Balance of India for 2021-22 (Provisional)

All figures in KToE

	Coal	Crude Oil	Oil Products	Natural Gas	Nuclear	Hydro	Solar, Wind, Others	Electricity	Total
Production	3,23,501	30,344	0	31,471	12,278	13,070	15,429	0	4,26,093
Imports	1,15,985	2,16,643	42,216	28,468	0	0	0	653	4,03,964
Exports	-791	0	-65,425	0	0	0	0	-794	-67,010
Stock changes	-23,662	0	0	0	0	0	0	0	-23,662
Total primary energy supply	**4,15,032**	**2,46,987**	**-23,209**	**59,939**	**12,278**	**13,070**	**15,429**	**-141**	**7,39,386**
Statistical differences	51,533	24,910	-26,483	2,339	0	0	0	-3,977	48,322
Main activity producer electricity plants	-2,94,450	0	-845	-9,395	-12,278	-13,040	-14,698	1,27,662	-2,17,044
Autoproducer electricity plants	0	0	0	0	0	-30	-731	20,210	19,449
Oil refineries	0	-2,47,020	2,58,615	0	0	0	0	0	11,594
Energy industry own use	0	0	0	-18,776	0	0	0	-7,212	-25,988
Losses	0	-24,876	0	-74	0	0	0	-25,061	-50,011
Final consumption	**1,72,115**	**0**	**2,08,077**	**34,033**	**0**	**0**	**0**	**1,11,482**	**5,25,708**
Industry	**1,72,115**	**0**	**47,185**	**767**	**0**	**0**	**0**	**45,881**	**2,65,948**
Iron and steel	39,561	0	1,091	0	0	0	0	0	40,652
Chemical and petrochemical	780	0	13,478	0	0	0	0	0	14,259
Non-ferrous metals	0	0	393	0	0	0	0	0	393
Machinery	0	0	163	0	0	0	0	0	163
Mining and quarrying	0	0	1,723	0	0	0	0	0	1,723
Paper, pulp and print	845	0	0	0	0	0	0	0	845
Construction	4,377	0	1,183	0	0	0	0	0	5,559
Textile and leather	818	0	51	0	0	0	0	0	869
Non-specified (industry)	1,25,733	0	29,104	767	0	0	0	45,881	2,01,485
Transport	**0**	**0**	**43,802**	**11,712**	**0**	**0**	**0**	**1,703**	**57,216**
Road	0	0	35,063	11,262	0	0	0	0	46,325
Domestic aviation	0	0	5,338	0	0	0	0	0	5,338
Rail	0	0	1,808	0	0	0	0	1,703	3,511
Pipeline transport	0	0	0	450	0	0	0	0	450
Domestic navigation	0	0	1,593	0	0	0	0	0	1,593
Non-specified (transport)	0	0	0	0	0	0	0	0	0
Other	**0**	**0**	**1,17,091**	**1,134**	**0**	**0**	**0**	**63,898**	**1,82,123**
Residential	0	0	30,093	0	0	0	0	28,724	58,817
Commercial and public services	0	0	63	0	0	0	0	9,245	9,308
Agriculture/forestry	0	0	667	144	0	0	0	19,694	20,505
Non-specified (other)	0	0	86,268	990	0	0	0	6,235	93,492
Non-energy use	**0**	**0**	**0**	**20,421**	**0**	**0**	**0**	**0**	**20,421**
Non-energy use industry/transformation/energy	0	0	0	20,421	0	0	0	0	20,421
Non-energy use in transport	0	0	0	0	0	0	0	0	0
Non-energy use in other	0	0	0	0	0	0	0	0	0
Elect. output in GWh	**0**	**0**	**0**	**0**	**47,112**	**1,51,977**	**1,79,412**	**0**	**3,78,502**
Elec output-main activity producer ele plants	0	0	0	0	47,112	1,51,627	1,70,912	0	3,69,652
Elec output-autoproducer electricity plants	0	0	0	0	0	350	8,500	0	8,850

* Final consumption refers to End Use Consumption

P: Provisional

Figure 7.1 : Year-wise comparison of TPES and Energy Supplied from Coal_IEA Vs. Domestic Conversion Factors

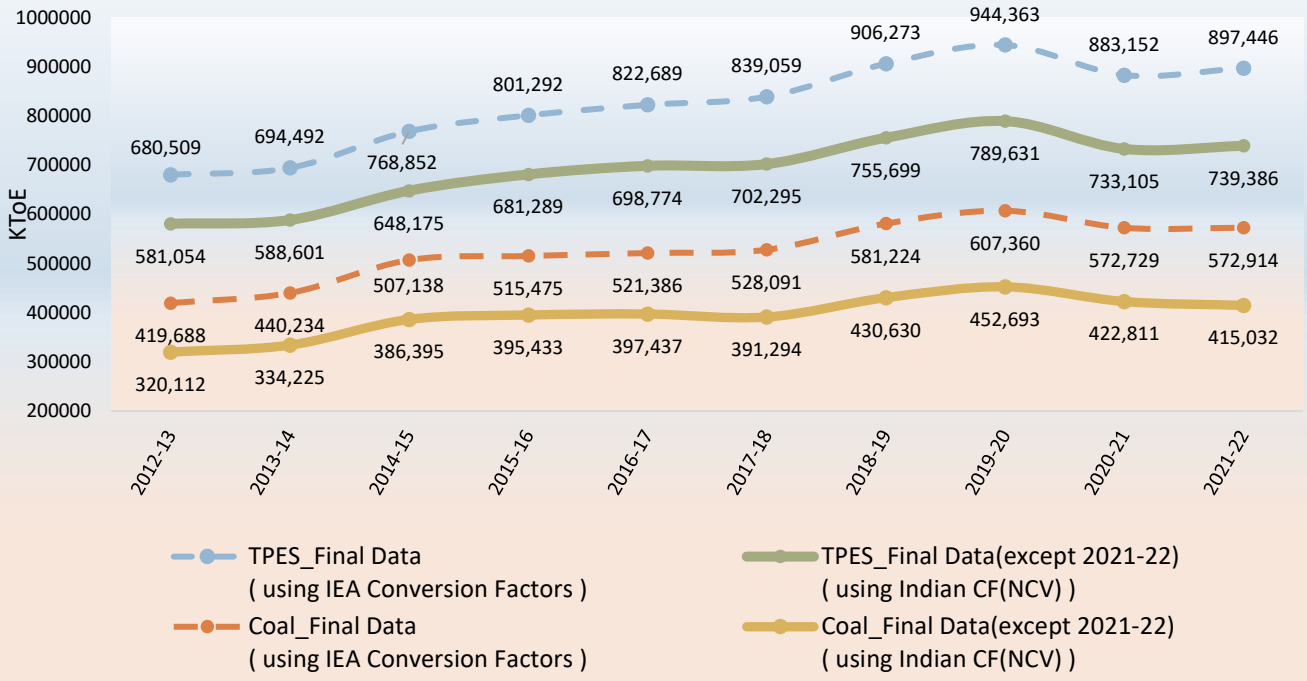


Figure 7.2 : Year-wise comparison of Energy Consumption using IEA Vs. Domestic Conversion Factors

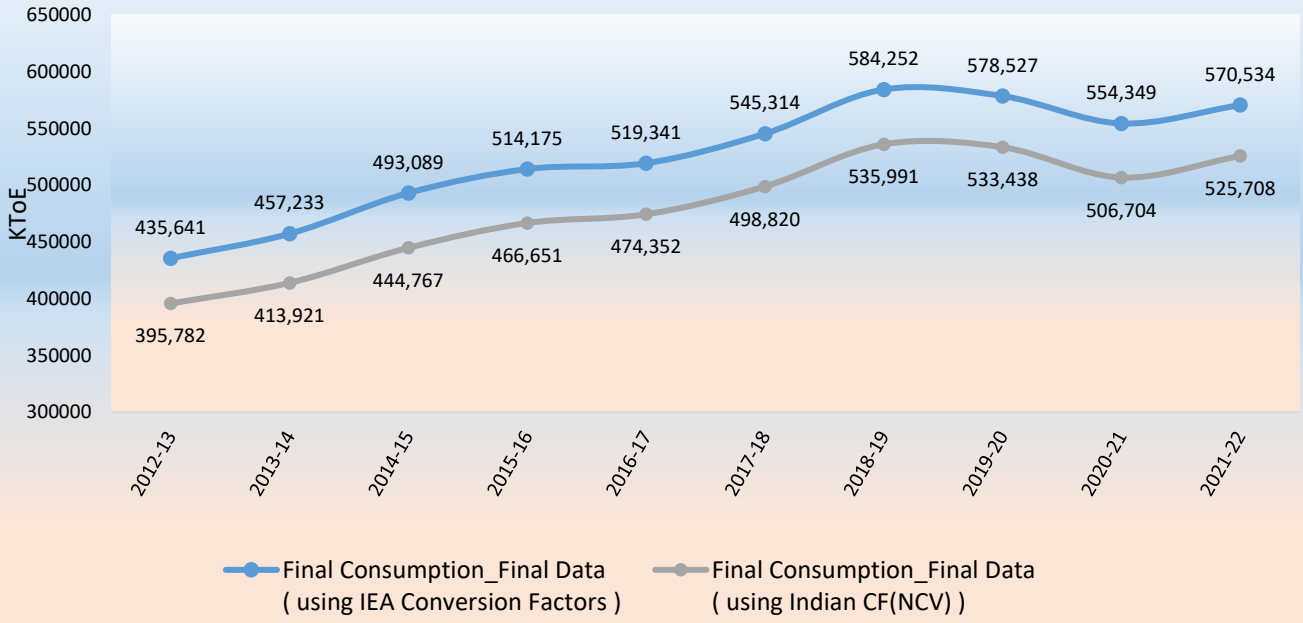


Fig. 7.3: Sankey Diagram on Overall Energy Flow in India during FY: 2020-21(Final) (in KToe)

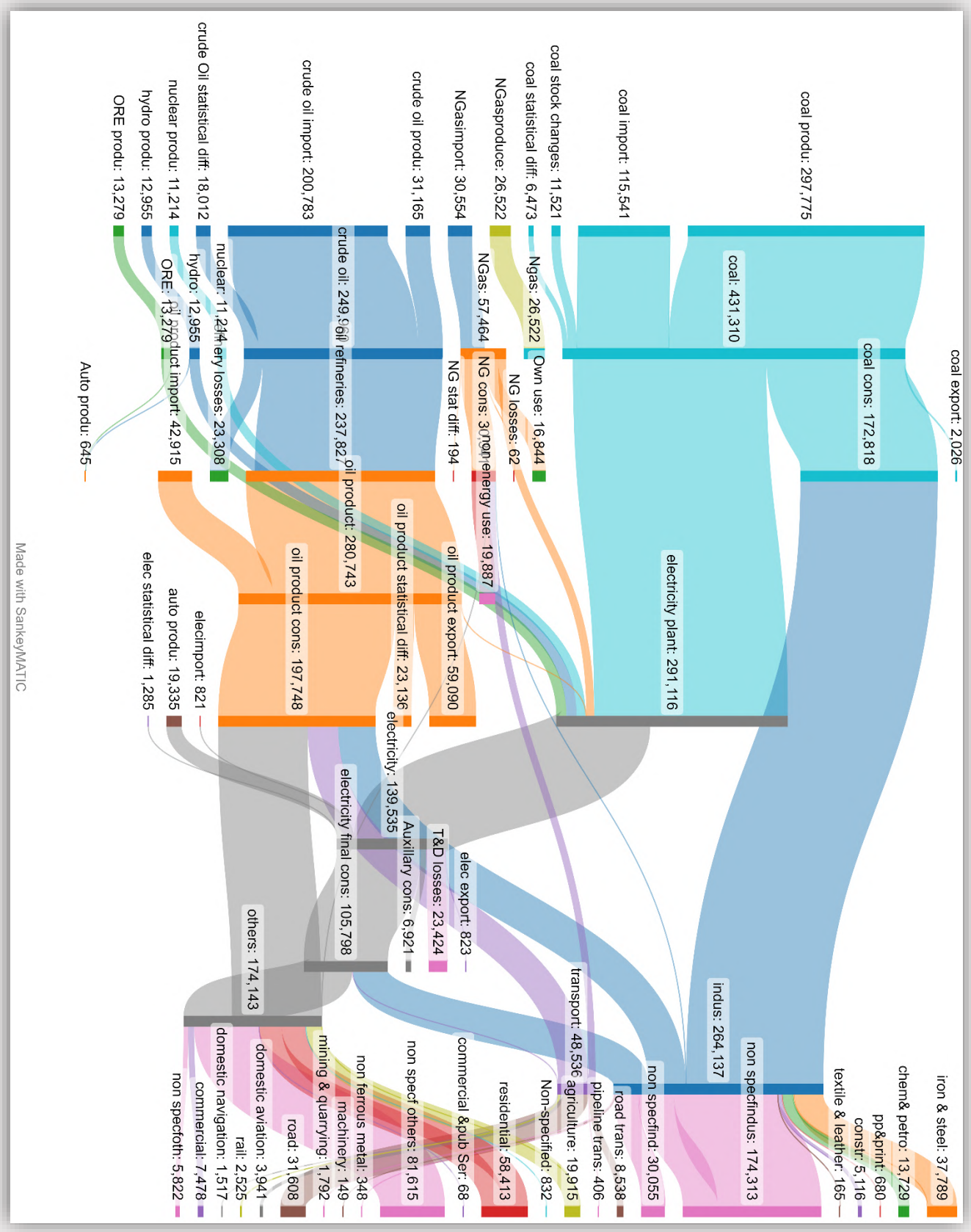


Fig. 7.4: Sankey Diagram on Final Consumption by sectors in India during FY: 2020-21(Final) (in KToe)

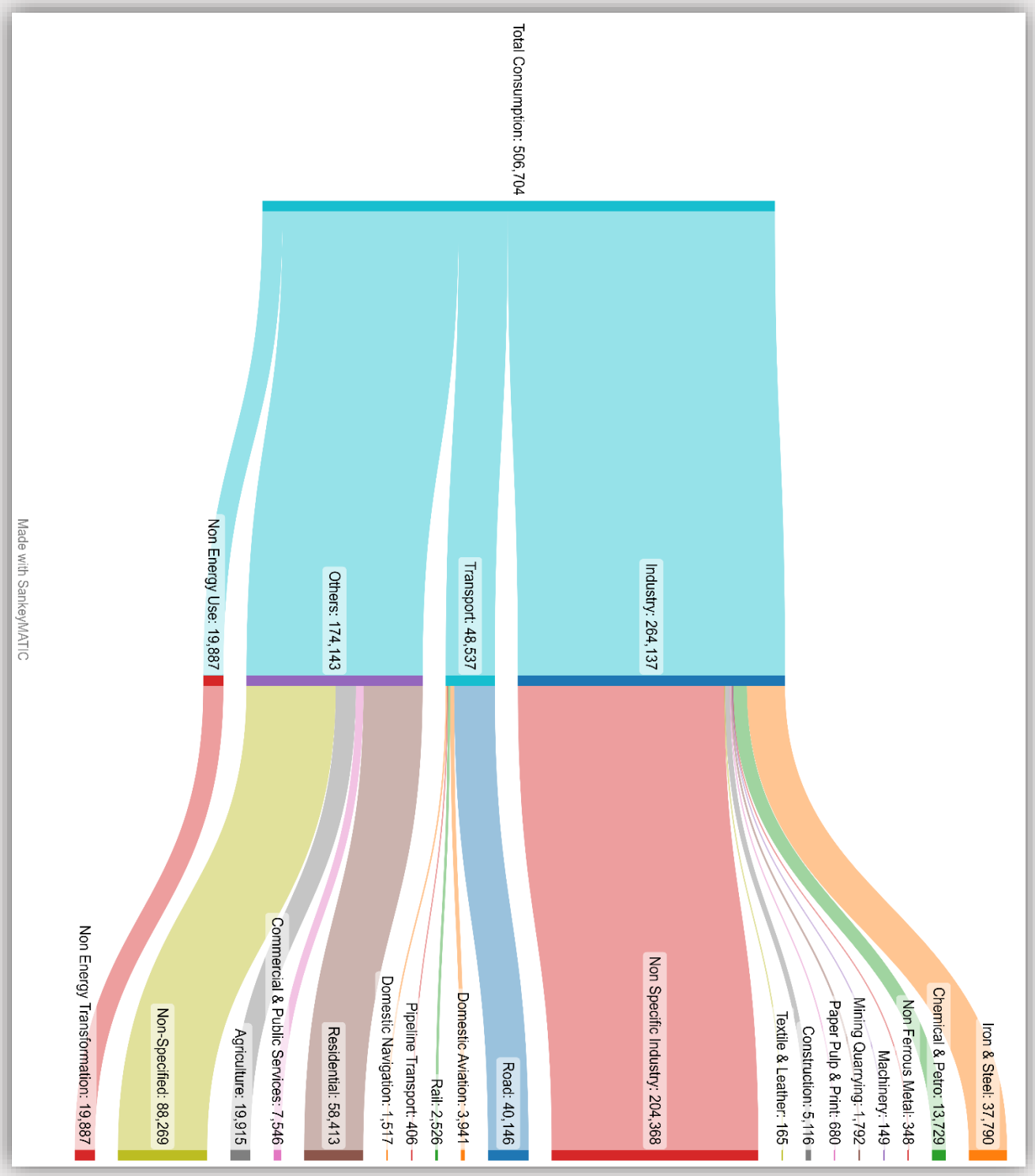


Fig. 7.5: Sankey Diagram on Overall Energy Flow in India during FY: 2021-22(P) (in KToe)

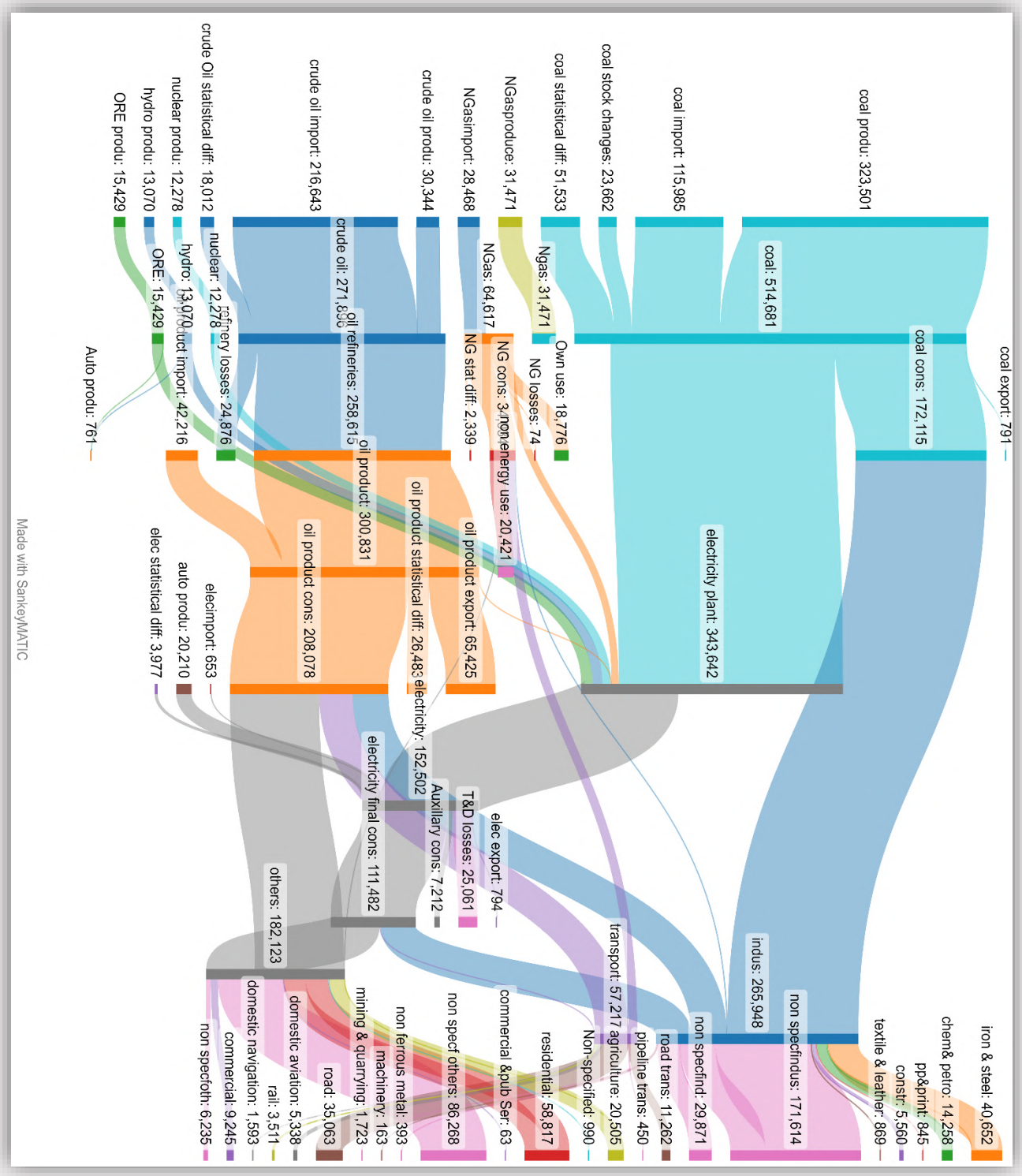
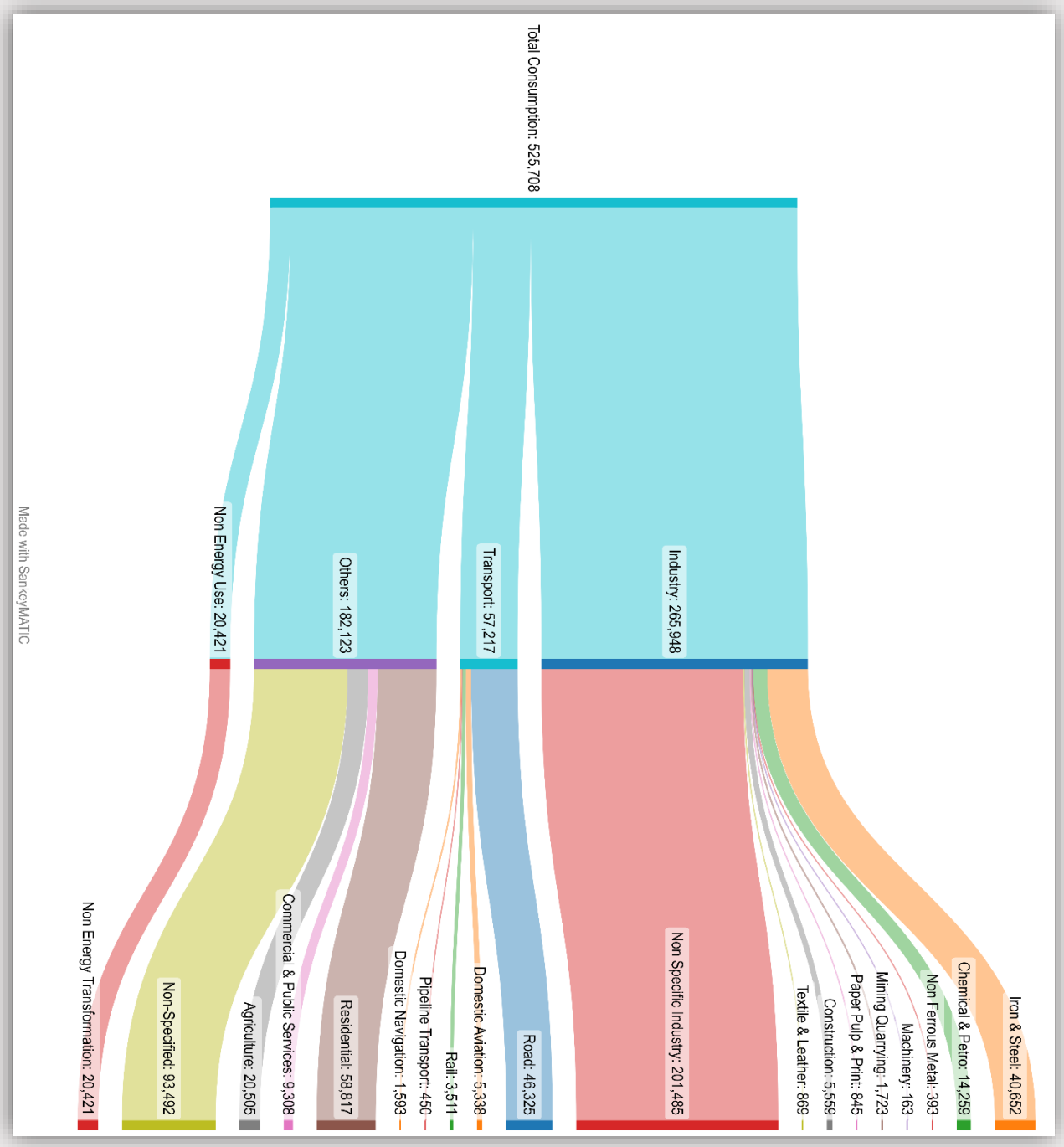


Fig. 7.6: Sankey Diagram on Final Consumption by sectors in India during FY: 2021-22 (P) (in KToe)



|| 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.

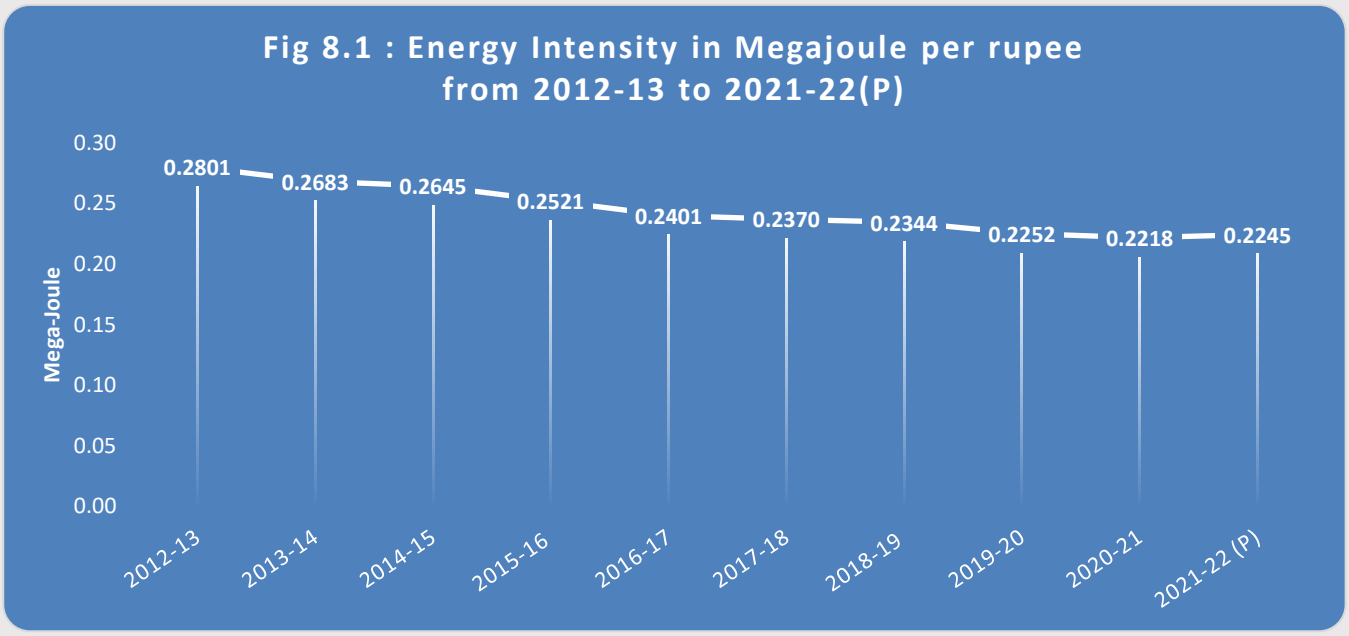
This Chapter presents some of the concepts related to sustainable energy systems in continuation of the data presented earlier on renewable energy resources in the earlier chapters.

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

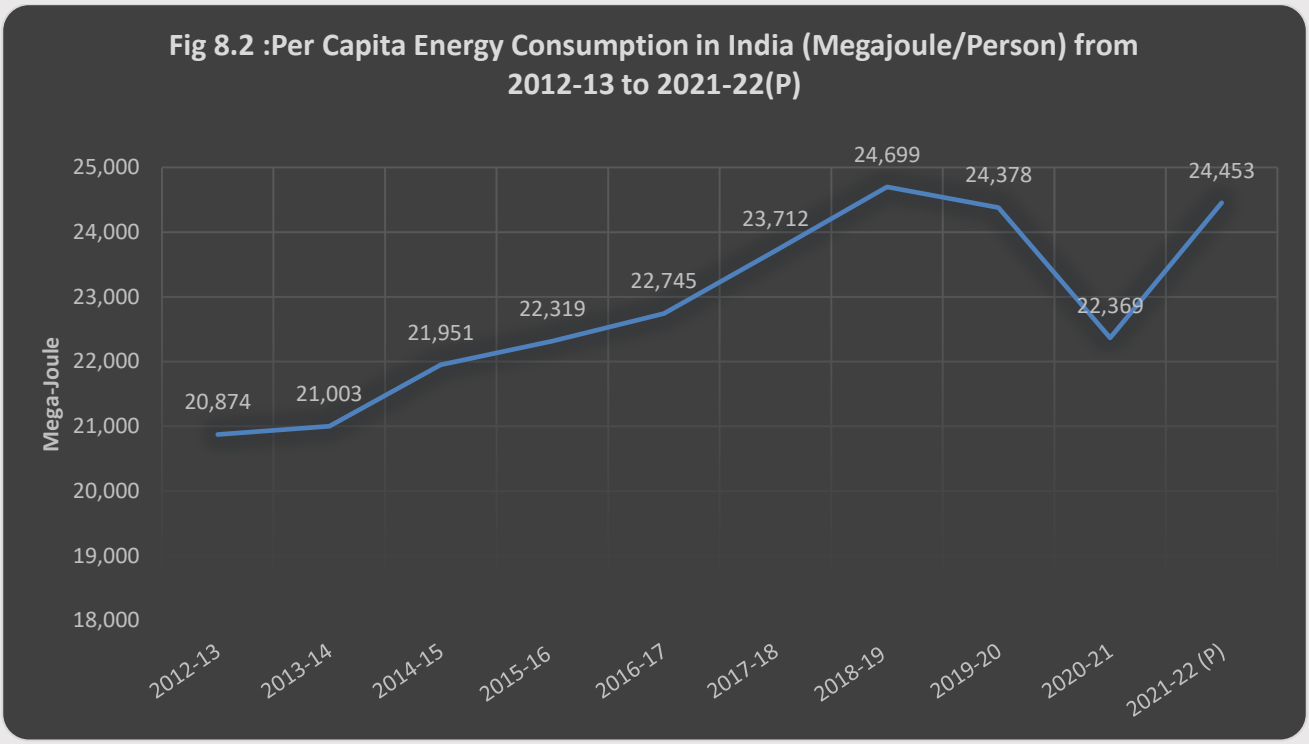
of detail than that are presented in Energy Statistics this report is restricted to the economic dimension only and presents some of these indicators in this chapter. The details of the indicators – theme, definition, purpose and measurement method etc. are provided in the Annexures.

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. As seen, state-wise number of villages electrified as on 31.03.2022 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 0.2801 Mega joules per rupee in 2012-13 to 0.2245 Mega Joules in 2021-22 (P).



- Similarly, Per-capita Energy Consumption increased from 20,874 Mega joules in 2012-13 to 24,453 Mega joules in 2021-22(P).



- India's Total Emissions from the Energy Sector have increased from 16,51,928 GgCO2 Equivalent in 2011 to 21,29,428 GgCO2 Equivalent in 2016 as per the latest estimates by MoEFCC in 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).
- The Energy Indicators for Sustainability have been re-calculated for the FY : 2012-13 to FY : 202-21, based on the domestic conversion factors and final, audited figures as available from different energy Ministries. The same has been attached under *Annexure- VI.*

Table 8.1 : State-wise Number of Villages Electrified

Sl. No.	States/ UTs	No. of villages as per 2011 Census	Villages Electrified as on 31.3.2020	Villages Electrified as on 31.03.2021
1	Andhra Pradesh	16158	All Villages have been 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 Thousands) *	GDP at 2011-12 prices (Rs. crore) **	Per Capita Energy Consumption (in Megajoules)	Energy Intensity (Megajoules per rupee)
2011-12	24,121	12,20,171	87,36,329	19,769	0.2761
2012-13	25,805	12,36,220	92,13,017	20,874	0.2801
2013-14	26,302	12,52,267	98,01,370	21,003	0.2683
2014-15	27,841	12,68,310	1,05,27,674	21,951	0.2645
2015-16	28,665	12,84,350	1,13,69,493	22,319	0.2521
2016-17	29,556	12,99,434	1,23,08,193	22,745	0.2401
2017-18	31,153	13,13,815	1,31,44,582	23,712	0.2370
2018-19	32,805	13,28,206	1,39,92,914	24,699	0.2344
2019-20	32,729	13,42,586	1,45,34,641	24,378	0.2252
2020-21	30,354	13,56,980	1,36,87,118	22,369	0.2218
2021-22 (P)	33,508	13,70,311	1,49,25,840	24,453	0.2245
Growth rate of 2021-22 (P) over 2020-21(%)	**10.39**	**0.98**	**9.05**	**9.32**	**1.23**
CAGR 2012-13 to 2021-22 (P) (%)	**2.94**	**1.15**	**5.51**	**1.77**	**-2.43**

(P): Provisional

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

** 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 , July, 2020*

** GDP estimates are at base 2011-12 price as per the National Accounts Divisions's, NSO, MoSPI.

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	2021-22 (P)
Use and Production Pattern	Overall Use	Energy use per capita	TPES	toe/person	0.5396
			TFC	toe/person	0.3836
			Electricity	Kwh/person	945.9896
	Overall Productivity	Energy use per unit of GDP	TPES	toe/000'rupees	0.0050
			TFC	toe/000'rupees	0.0036
			Electricity	Kwh/000'rupees	8.7971
	Supply Efficiency	Efficiency of energy conversion and distribution	All	%	19.63
	Production	Reserves-to-production ratio	All	years	202
			coal	years	240
			lignite	years	155
		Resources-to-production ratio	All	years	409
			Crude oil	years	22
			Natural Gas	years	33
			Coal	years	464
			Lignite	years	973
	End Use	Sectoral Energy Intensities	Industry	toe/000'rupees	0.00661
			Agriculture	toe/000'rupees	0.00095
			Transport	toe/000'rupees	0.00916
		Sectoral Electricity Intensities	Industry	Kwh/000'rupees	13.264
			Agriculture	Kwh/000'rupees	10.656
			Transport	Kwh/000'rupees	3.17
	Diversification (Fuel Mix)	Fuel shares in TPES	Crude Oil	%	33.40
			Natural Gas	%	8.11
			Coal	%	56.13
			RE &Others	%	5.52
		Fuel share in TFC	Oil Products	%	39.58
			Natural Gas	%	6.47
			Coal	%	32.74
			Electricity	%	21.21
		Fuel share in electricity	Thermal	%	77.99
			Nuclear	%	2.74
			Hydro	%	8.84
			RE (other than Hydro)	%	10.43
Security	Imports	Net energy import dependency	Overall	%	40.90
			Crude Oil	%	87.71
			Natural gas	%	47.49
			Coal	%	27.95
			Electricity	%	0.44
	Strategic Fuel Stocks	Stocks of critical fuels per corresponding fuel consumption	Coal	%	6.70

Note: 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.

Annexure - I

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° 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 vapor pressure components of natural gas liquids.

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

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

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

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

v. **Kerosene** Mixtures of hydrocarbons in the range C9 to C16 and distilling over the temperature interval 145°C to 300°C, but not usually above 250°C and with a flash point above 38°C.
Remark: The chemical compositions of kerosenes depend on the nature of the crude oils from which they are derived and the refinery processes that they have undergone. Kerosenes obtained from crude oil by atmospheric distillation are known as straight-run kerosenes. Such streams may be treated by a variety of processes to produce kerosenes that are acceptable for blending as jet fuels. Kerosenes are primarily used as jet fuels. They are also used as domestic heating and cooking fuels, and as solvents. Kerosenes may include components or additives derived from biomass.

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

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

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

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

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

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

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

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

x. **Petroleum coke** Petroleum coke is a black solid obtained mainly by cracking and carbonizing heavy hydrocarbon oils, tars and pitches. It consists mainly of carbon (90 to 95 per cent) and has 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) or with back-pressure turbines, and plants using internal combustion engines or gas turbines whether or not these are equipped for heat recovery.

vi. **Nuclear Electricity** is defined as the heat released by the reactors during the accounting period and is obtained by dividing the generation of nuclear electricity by average efficiency of all nuclear power stations.

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.

Annexure- I

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%
WasheryGr.V	35%<=Ash content<42%
WasheryGr.VI	42%<=Ash content<49%

Grades of Semi Coking Coal based on Ash and Moisture content

Grade	Ash + Moisture content
Semi coking Gr. I	less than 19%
Semi coking Gr. II	Between 19% and 24%

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.

Annexure - II

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 Lignite	=	9.546 petajoules of energy
One million tonnes of oil equivalent (MTOE)	=	42.789 petajoules of energy
One billion cubic meter of natural gas	=	38.735 petajoules of energy
One million cubic meter of natural gas	=	38.735 terajoules of energy
One billion-kilowatt hour of electricity	=	3.60 petajoules of energy

	Gross Calorific Value of Indian Coal (in Kilo Joule/kg)									
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Coal-Production	19,262	19,228	19,048	19,001	18,757	18,227	18,182	18,033	17,795	17,708
Coal – Import	22,454	21,988	22,298	23,134	23,351	23,349	23,163	23,227	23,656	24,462
Coal dispatch-Power Sector	18,327	18,327	18,327	18,327	18,327	18,327	18,341	18,254	17,895	17,732
Coal Dispatch - Non - Power sector	23,189	23,189	23,189	23,189	23,189	23,189	23,592	23,695	23,256	23,508

Conversion factors of Petroleum Products		
Type of Fuel	**Toe / Metric Tonnes**	**KJ/Kg**
Crude Oil	1.022	42,789
Liquefied Petroleum Gases	1.130	47,311
Motor Gasoline	1.070	44,799
Aviation Gasoline	1.070	44,799
Gasoline Type Jet Fuel	1.070	44,799
Kerosene Type Jet Fuel	1.065	44,589
Kerosene	1.045	43,752
Gas/Diesel Oil	1.034	43,292
Fuel Oil	0.985	41,240
Naphtha	1.075	45,008
Non-specified Oil Products	0.96	40,193

Annexure - III

Metadata: Energy Statistics

1. Contact	
1.1. Contact organization	National Statistical Office (NSO), Ministry of Statistics & Programme Implementation (MOSPI)
1.2. Contact organization unit	Economic Statistics Division
1.3. Contact mail address	K. L Bhawan, Janpath, New Delhi – 110001
1.4. Contact emails	adg-esd-mospi@nic.in energyunit-esd@mospi.gov.in
1.5. Homepage	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 the reserves, installed capacity, potential for generation, production, consumption, import, export and wholesale price of different energy commodities and Energy Indicators on Economic Dimension.
2.3. Sector coverage
Coal & Lignite, Petroleum & Natural Gas, Renewable Energy Resources and Electricity. (Data Collection Mechanism is given in Annex: V of this publication). 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", 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 source. The publication includes analytical indicators viz. Growth Rates, Compound Annual Growth Rates (CAGR), Percentage Distributions and Economic Energy Indicators.
2.5. Statistical unit
Data are aggregated appropriately at national and state level.
2.6. Statistical population
Data covers all the energy commodity sources.

2.7. Reference area
The energy industries of the entire country are covered.
2.8. Time coverage
In the current publication the data given is for the period 2009-10 to 2018-19 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 2018-19. Energy Indicators on Economic Dimensions have been compiled for the year 2018-19.
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 Annex: I & Annex: II respectively. Annex III gives categorization of coal in India. Annex IV gives details of Energy Data Collection Mechanism.

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 in 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
Publication on Energy Statistics is released annually.
8.2. Publications
Annual publication in pdf format is available on the website of MOSPI.
9. Accessibility of documentation
9.1. Documentation on methodology
Information on the relevant Energy indicators methodology can be found in the publication in Chapter 10.

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

Preliminary data on energy production and consumption statistics for the year 2018-19is 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. It is published in the ministry's web-site.
13.2. Frequency of data collection
Annual.
13.3. Data collection
Data is collected through e-mail or by publications brought out by the source agencies.
13.4. Data validation
Checks are carried out to the data before publishing it.
13.5. Data compilation
National figures are compiled by aggregating the data received from the source agencies.
13.6. Adjustment
No seasonal adjustment or temperature correction of the energy consumption is applied.

Annexure - IV

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 considered only the import value of different energy sources to calculate the indicator.

Annexure - V

Energy Balance Table of India from 2012-13 to 2019-20
(Based on Domestic Conversion Factors and Final, Audited data)

Table - I - Energy Balance of India for 2012-13 (Final)

All figures in KToE

	Coal	Crude Oil	Oil Products	Natural Gas	Nuclear	Hydro	Solar, Wind, Others	Electricity	Total
Production	2,53,773	38,693	0	37,420	8,565	9,790	5,091	0	3,53,332
Imports	74,275	1,88,860	16,426	16,203	0	0	0	412	2,96,176
Exports	-1,661	0	-60,505	0	0	0	0	-13	-62,180
Stock changes	-6,274	0	0	0	0	0	0	0	-6,274
Total primary energy supply	**3,20,112**	**2,27,553**	**-44,080**	**53,623**	**8,565**	**9,790**	**5,091**	**399**	**5,81,054**
Statistical differences	16,521	15,231	-17,207	966	0	0	0	-1,075	14,437
Main activity producer electricity plants	-1,94,267	0	-1,696	-14,789	-8,565	-9,780	-4,941	82,946	-1,51,092
Autoproducer electricity plants	0	0	0	0	0	-10	-151	12,385	12,224
Oil refineries	0	-2,24,034	2,21,619	0	0	0	0	0	-2,415
Energy industry own use	0	0	0	-15,883	0	0	0	-5,513	-21,396
Losses	0	-18,751	0	-28	0	0	0	-18,252	-37,030
Final consumption	**1,42,366**	**0**	**1,58,636**	**23,889**	**0**	**0**	**0**	**70,890**	**3,95,782**
Industry	**1,42,366**	**0**	**32,835**	**248**	**0**	**0**	**0**	**31,475**	**2,06,924**
Iron and steel	38,213	0	943	0	0	0	0	0	39,156
Chemical and petrochemical	1,505	0	12,581	0	0	0	0	0	14,086
Non-ferrous metals	0	0	249	0	0	0	0	0	249
Machinery	0	0	275	0	0	0	0	0	275
Mining and quarrying	0	0	1,124	0	0	0	0	0	1,124
Paper, pulp and print	1,273	0	0	0	0	0	0	0	1,273
Construction	8,403	0	834	0	0	0	0	0	9,237
Textile and leather	951	0	287	0	0	0	0	0	1,237
Non-specified (industry)	92,022	0	16,543	248	0	0	0	31,475	1,40,288
Transport	**0**	**0**	**28,302**	**5,672**	**0**	**0**	**0**	**1,213**	**35,187**
Road	0	0	19,373	5,317	0	0	0	0	24,690
Domestic aviation	0	0	5,616	0	0	0	0	0	5,616
Rail	0	0	2,628	0	0	0	0	1,213	3,841
Pipeline transport	0	0	0	356	0	0	0	0	356
Domestic navigation	0	0	685	0	0	0	0	0	685
Non-specified (transport)	0	0	0	0	0	0	0	0	0
Other	**0**	**0**	**97,499**	**1,112**	**0**	**0**	**0**	**38,202**	**1,36,814**
Residential	0	0	22,624	0	0	0	0	15,798	38,422
Commercial and public services	0	0	37	0	0	0	0	6,260	6,297
Agriculture/forestry	0	0	718	168	0	0	0	12,682	13,567
Non-specified (other)	0	0	74,120	945	0	0	0	3,462	78,527
Non-energy use	**0**	**0**	**0**	**16,856**	**0**	**0**	**0**	**0**	**16,856**
Non-energy use industry/transformation/energy	0	0	0	16,856	0	0	0	0	16,856
Non-energy use in transport	0	0	0	0	0	0	0	0	0
Non-energy use in other	0	0	0	0	0	0	0	0	0
Elect. output in GWh	**0**	**0**	**0**	**0**	**32,866**	**1,13,838**	**59,199**	**0**	**2,05,904**
Elec output-main activity producer ele plants	0	0	0	0	32,866	1,13,720	57,449	0	2,04,035
Elec output-autoproducer electricity plants	0	0	0	0	0	118	1,750	0	1,869

* Final consumption refers to End Use Consumption

P: Provisional

Table - II : Energy Balance of India for 2013-14 (Final)

All figures in KToE

	Coal	Crude Oil	Oil Products	Natural Gas	Nuclear	Hydro	Solar, Wind, Others	Electricity	Total
Production	2,56,931	38,620	0	32,569	8,920	11,608	5,798	0	3,54,446
Imports	83,250	1,93,401	16,637	16,374	0	0	0	481	3,10,144
Exports	-1,474	0	-69,891	0	0	0	0	-142	-71,507
Stock changes	-4,481	0	0	0	0	0	0	0	-4,481
Total primary energy supply	**3,34,225**	**2,32,021**	**-53,254**	**48,943**	**8,920**	**11,608**	**5,798**	**339**	**5,88,601**
Statistical differences	15,271	13,632	-9,923	1,325	0	0	0	-1,091	19,214
Main activity producer electricity plants	-1,94,980	0	-1,390	-10,379	-8,920	-11,597	-5,635	88,292	-1,44,609
Autoproducer electricity plants	0	0	0	0	0	-11	-164	12,813	12,638
Oil refineries	0	-2,27,391	2,24,632	0	0	0	0	0	-2,760
Energy industry own use	0	0	0	-15,669	0	0	0	-6,034	-21,703
Losses	0	-18,261	0	-62	0	0	0	-19,137	-37,460
Final consumption	**1,54,516**	**0**	**1,60,065**	**24,158**	**0**	**0**	**0**	**75,182**	**4,13,921**
Industry	**1,54,516**	**0**	**31,466**	**240**	**0**	**0**	**0**	**33,060**	**2,19,282**
Iron and steel	37,649	0	771	0	0	0	0	0	38,419
Chemical and petrochemical	1,389	0	11,431	0	0	0	0	0	12,820
Non-ferrous metals	0	0	250	0	0	0	0	0	250
Machinery	0	0	122	0	0	0	0	0	122
Mining and quarrying	0	0	943	0	0	0	0	0	943
Paper, pulp and print	1,297	0	0	0	0	0	0	0	1,297
Construction	8,957	0	390	0	0	0	0	0	9,346
Textile and leather	357	0	104	0	0	0	0	0	460
Non-specified (industry)	1,04,869	0	17,457	240	0	0	0	33,060	1,55,625
Transport	**0**	**0**	**28,023**	**5,773**	**0**	**0**	**0**	**1,336**	**35,133**
Road	0	0	18,767	5,431	0	0	0	0	24,198
Domestic aviation	0	0	5,865	0	0	0	0	0	5,865
Rail	0	0	2,724	0	0	0	0	1,336	4,060
Pipeline transport	0	0	0	342	0	0	0	0	342
Domestic navigation	0	0	667	0	0	0	0	0	667
Non-specified (transport)	0	0	0	0	0	0	0	0	0
Other	**0**	**0**	**1,00,575**	**1,083**	**0**	**0**	**0**	**40,786**	**1,42,444**
Residential	0	0	23,239	0	0	0	0	17,186	40,426
Commercial and public services	0	0	107	0	0	0	0	6,385	6,492
Agriculture/forestry	0	0	520	180	0	0	0	13,136	13,836
Non-specified (other)	0	0	76,710	903	0	0	0	4,078	81,691
Non-energy use	**0**	**0**	**0**	**17,062**	**0**	**0**	**0**	**0**	**17,062**
Non-energy use industry/transformation/energy	0	0	0	17,062	0	0	0	0	17,062
Non-energy use in transport	0	0	0	0	0	0	0	0	0
Non-energy use in other	0	0	0	0	0	0	0	0	0
Elect. output in GWh	**0**	**0**	**0**	**0**	**34,228**	**1,34,977**	**67,422**	**0**	**2,36,627**
Elec output-main activity producer ele plants	0	0	0	0	34,228	1,34,848	65,520	0	2,34,595
Elec output-autoproducer electricity plants	0	0	0	0	0	129	1,903	0	2,032

* Final consumption refers to End Use Consumption

P: Provisional

Table - III : Energy Balance of India for 2014-15 (Final)

All figures in KToE

	Coal	Crude Oil	Oil Products	Natural Gas	Nuclear	Hydro	Solar, Wind, Others	Electricity	Total
Production	2,74,301	38,285	0	30,960	9,408	11,127	6,555	0	3,70,637
Imports	1,10,187	1,93,602	20,887	17,115	0	0	0	431	3,42,222
Exports	-835	0	-66,210	0	0	0	0	-381	-67,426
Stock changes	2,742	0	0	0	0	0	0	0	2,742
Total primary energy supply	**3,86,395**	**2,31,887**	**-45,323**	**48,075**	**9,408**	**11,127**	**6,555**	**49**	**6,48,175**
Statistical differences	1,979	14,323	-11,424	645	0	0	0	-1,255	4,268
Main activity producer electricity plants	-2,15,967	0	-1,187	-9,861	-9,408	-11,115	-6,326	96,049	-1,57,815
Autoproducer electricity plants	0	0	0	0	0	-12	-228	13,937	13,696
Oil refineries	0	-2,28,153	2,25,063	0	0	0	0	0	-3,090
Energy industry own use	0	0	0	-15,109	0	0	0	-6,559	-21,668
Losses	0	-18,058	0	-93	0	0	0	-20,649	-38,800
Final consumption	**1,72,407**	**0**	**1,67,129**	**23,657**	**0**	**0**	**0**	**81,573**	**4,44,767**
Industry	**1,72,407**	**0**	**33,543**	**490**	**0**	**0**	**0**	**35,978**	**2,42,418**
Iron and steel	38,943	0	823	0	0	0	0	0	39,766
Chemical and petrochemical	1,421	0	11,251	0	0	0	0	0	12,672
Non-ferrous metals	0	0	244	0	0	0	0	0	244
Machinery	0	0	112	0	0	0	0	0	112
Mining and quarrying	0	0	1,078	0	0	0	0	0	1,078
Paper, pulp and print	1,015	0	0	0	0	0	0	0	1,015
Construction	6,466	0	433	0	0	0	0	0	6,899
Textile and leather	877	0	127	0	0	0	0	0	1,004
Non-specified (industry)	1,23,686	0	19,473	490	0	0	0	35,978	1,79,627
Transport	**0**	**0**	**31,798**	**5,304**	**0**	**0**	**0**	**1,391**	**38,493**
Road	0	0	22,243	4,981	0	0	0	0	27,224
Domestic aviation	0	0	6,098	0	0	0	0	0	6,098
Rail	0	0	2,787	0	0	0	0	1,391	4,178
Pipeline transport	0	0	0	322	0	0	0	0	322
Domestic navigation	0	0	670	0	0	0	0	0	670
Non-specified (transport)	0	0	0	0	0	0	0	0	0
Other	**0**	**0**	**1,01,788**	**1,091**	**0**	**0**	**0**	**44,204**	**1,47,083**
Residential	0	0	24,989	0	0	0	0	18,697	43,685
Commercial and public services	0	0	60	0	0	0	0	6,742	6,801
Agriculture/forestry	0	0	655	166	0	0	0	14,527	15,347
Non-specified (other)	0	0	76,085	925	0	0	0	4,239	81,249
Non-energy use	**0**	**0**	**0**	**16,772**	**0**	**0**	**0**	**0**	**16,772**
Non-energy use industry/transformation/energy	0	0	0	16,772	0	0	0	0	16,772
Non-energy use in transport	0	0	0	0	0	0	0	0	0
Non-energy use in other	0	0	0	0	0	0	0	0	0
Elect. output in GWh	**0**	**0**	**0**	**0**	**36,102**	**1,29,388**	**76,220**	**0**	**2,41,710**
Elec output-main activity producer ele plants	0	0	0	0	36,102	1,29,244	73,563	0	2,38,908
Elec output-autoproducer electricity plants	0	0	0	0	0	145	2,656	0	2,801

* Final consumption refers to End Use Consumption

P: Provisional

Table - IV : Energy Balance of India for 2015-16 (Final)

All figures in KToE

	Coal	Crude Oil	Oil Products	Natural Gas	Nuclear	Hydro	Solar, Wind, Others	Electricity	Total
Production	2,85,600	37,754	0	29,665	9,750	10,448	5,833	0	3,79,050
Imports	1,07,058	2,07,313	28,362	19,674	0	0	0	451	3,62,859
Exports	-1,061	0	-62,952	0	0	0	0	-443	-64,456
Stock changes	3,836	0	0	0	0	0	0	0	3,836
Total primary energy supply	**3,95,433**	**2,45,067**	**-34,590**	**49,339**	**9,750**	**10,448**	**5,833**	**8**	**6,81,289**
Statistical differences	-2,673	12,106	-14,566	144	0	0	0	-1,264	-6,251
Main activity producer electricity plants	-2,23,875	0	-898	-10,017	-9,750	-10,438	-5,657	1,00,412	-1,60,223
Autoproducer electricity plants	0	0	0	0	0	-9	-176	14,480	14,295
Oil refineries	0	-2,37,987	2,36,171	0	0	0	0	0	-1,817
Energy industry own use	0	0	0	-13,812	0	0	0	-6,820	-20,632
Losses	0	-19,186	0	-108	0	0	0	-20,714	-40,008
Final consumption	**1,68,885**	**0**	**1,86,117**	**25,547**	**0**	**0**	**0**	**86,102**	**4,66,651**
Industry	**1,68,885**	**0**	**41,446**	**502**	**0**	**0**	**0**	**36,423**	**2,47,256**
Iron and steel	34,122	0	962	0	0	0	0	0	35,085
Chemical and petrochemical	1,379	0	12,239	0	0	0	0	0	13,618
Non-ferrous metals	0	0	226	0	0	0	0	0	226
Machinery	0	0	188	0	0	0	0	0	188
Mining and quarrying	0	0	1,276	0	0	0	0	0	1,276
Paper, pulp and print	735	0	0	0	0	0	0	0	735
Construction	4,907	0	732	0	0	0	0	0	5,640
Textile and leather	534	0	113	0	0	0	0	0	647
Non-specified (industry)	1,27,208	0	25,710	502	0	0	0	36,423	1,89,843
Transport	**0**	**0**	**36,562**	**5,403**	**0**	**0**	**0**	**1,427**	**43,392**
Road	0	0	26,376	5,026	0	0	0	0	31,402
Domestic aviation	0	0	6,672	0	0	0	0	0	6,672
Rail	0	0	2,821	0	0	0	0	1,427	4,249
Pipeline transport	0	0	0	377	0	0	0	0	377
Domestic navigation	0	0	693	0	0	0	0	0	693
Non-specified (transport)	0	0	0	0	0	0	0	0	0
Other	**0**	**0**	**1,08,109**	**866**	**0**	**0**	**0**	**48,252**	**1,57,227**
Residential	0	0	26,012	0	0	0	0	20,543	46,555
Commercial and public services	0	0	63	0	0	0	0	7,399	7,463
Agriculture/forestry	0	0	714	172	0	0	0	14,894	15,780
Non-specified (other)	0	0	81,320	694	0	0	0	5,416	87,430
Non-energy use	**0**	**0**	**0**	**18,776**	**0**	**0**	**0**	**0**	**18,776**
Non-energy use industry/transformation/energy	0	0	0	18,776	0	0	0	0	18,776
Non-energy use in transport	0	0	0	0	0	0	0	0	0
Non-energy use in other	0	0	0	0	0	0	0	0	0
Elect. output in GWh	**0**	**0**	**0**	**0**	**37,414**	**1,21,487**	**67,827**	**0**	**2,26,727**
Elec output-main activity producer ele plants	0	0	0	0	37,414	1,21,377	65,781	0	2,24,571
Elec output-autoproducer electricity plants	0	0	0	0	0	110	2,046	0	2,156

* Final consumption refers to End Use Consumption

P: Provisional

Table - V : Energy Balance of India for 2016-17 (Final)

All figures in KToE

	Coal	Crude Oil	Oil Products	Natural Gas	Nuclear	Hydro	Solar, Wind, Others	Electricity	Total
Production	2,90,296	36,801	0	29,340	9,881	10,537	7,209	0	3,84,064
Imports	1,01,178	2,18,638	34,412	22,858	0	0	0	483	3,77,568
Exports	-1,195	0	-68,246	0	0	0	0	-577	-70,018
Stock changes	7,159	0	0	0	0	0	0	0	7,159
Total primary energy supply	**3,97,437**	**2,55,439**	**-33,833**	**52,198**	**9,881**	**10,537**	**7,209**	**-94**	**6,98,774**
Statistical differences	-6,108	15,832	-18,052	-36	0	0	0	-1,280	-9,644
Main activity producer electricity plants	-2,31,348	0	-816	-10,685	-9,881	-10,524	-7,013	1,06,241	-1,64,027
Autoproducer electricity plants	0	0	0	0	0	-12	-196	14,796	14,588
Oil refineries	0	-2,50,760	2,48,176	0	0	0	0	0	-2,584
Energy industry own use	0	0	0	-13,777	0	0	0	-6,970	-20,747
Losses	0	-20,511	0	-66	0	0	0	-21,431	-42,008
Final consumption	**1,59,981**	**0**	**1,95,475**	**27,634**	**0**	**0**	**0**	**91,262**	**4,74,352**
Industry	**1,59,981**	**0**	**45,881**	**730**	**0**	**0**	**0**	**37,858**	**2,44,449**
Iron and steel	30,282	0	1,146	0	0	0	0	0	31,428
Chemical and petrochemical	1,288	0	12,308	0	0	0	0	0	13,596
Non-ferrous metals	0	0	271	0	0	0	0	0	271
Machinery	0	0	183	0	0	0	0	0	183
Mining and quarrying	0	0	1,335	0	0	0	0	0	1,335
Paper, pulp and print	741	0	0	0	0	0	0	0	741
Construction	3,557	0	741	0	0	0	0	0	4,298
Textile and leather	422	0	107	0	0	0	0	0	530
Non-specified (industry)	1,23,691	0	29,789	730	0	0	0	37,858	1,92,067
Transport	**0**	**0**	**39,347**	**7,194**	**0**	**0**	**0**	**1,349**	**47,890**
Road	0	0	28,455	6,761	0	0	0	0	35,216
Domestic aviation	0	0	7,456	0	0	0	0	0	7,456
Rail	0	0	2,742	0	0	0	0	1,349	4,091
Pipeline transport	0	0	0	433	0	0	0	0	433
Domestic navigation	0	0	694	0	0	0	0	0	694
Non-specified (transport)	0	0	0	0	0	0	0	0	0
Other	**0**	**0**	**1,10,247**	**867**	**0**	**0**	**0**	**52,055**	**1,63,170**
Residential	0	0	26,486	0	0	0	0	22,001	48,487
Commercial and public services	0	0	77	0	0	0	0	7,725	7,801
Agriculture/forestry	0	0	687	169	0	0	0	16,439	17,294
Non-specified (other)	0	0	82,998	699	0	0	0	5,890	89,587
Non-energy use	**0**	**0**	**0**	**18,842**	**0**	**0**	**0**	**0**	**18,842**
Non-energy use industry/transformation/energy	0	0	0	18,842	0	0	0	0	18,842
Non-energy use in transport	0	0	0	0	0	0	0	0	0
Non-energy use in other	0	0	0	0	0	0	0	0	0
Elect. output in GWh	**0**	**0**	**0**	**0**	**37,916**	**1,22,521**	**83,825**	**0**	**2,44,262**
Elec output-main activity producer ele plants	0	0	0	0	37,916	1,22,378	81,548	0	2,41,842
Elec output-autoproducer electricity plants	0	0	0	0	0	144	2,277	0	2,421

* Final consumption refers to End Use Consumption

P: Provisional

Table-VI : Energy Balance of India for 2017-18 (Final)

All figures in KToE

	Coal	Crude Oil	Oil Products	Natural Gas	Nuclear	Hydro	Solar, Wind, Others	Electricity	Total
Production	2,89,971	36,469	0	30,033	9,993	10,856	8,958	0	3,86,280
Imports	1,10,334	2,25,282	33,920	25,240	0	0	0	436	3,95,212
Exports	-1,014	0	-69,568	0	0	0	0	-619	-71,201
Stock changes	-7,997	0	0	0	0	0	0	0	-7,997
Total primary energy supply	**3,91,294**	**2,61,751**	**-35,647**	**55,273**	**9,993**	**10,856**	**8,958**	**-183**	**7,02,295**
Statistical differences	27,432	17,355	-15,525	-1,246	0	0	0	-1,389	26,627
Main activity producer electricity plants	-2,52,328	0	-745	-11,064	-9,993	-10,847	-8,758	1,12,097	-1,81,639
Autoproducer electricity plants	0	0	0	0	0	-10	-200	15,461	15,251
Oil refineries	0	-2,57,477	2,59,169	0	0	0	0	0	1,692
Energy industry own use	0	0	0	-14,320	0	0	0	-7,065	-21,385
Losses	0	-21,630	0	-87	0	0	0	-22,306	-44,022
Final consumption	**1,66,397**	**0**	**2,07,252**	**28,556**	**0**	**0**	**0**	**96,615**	**4,98,820**
Industry	**1,66,397**	**0**	**48,907**	**919**	**0**	**0**	**0**	**40,301**	**2,56,524**
Iron and steel	35,269	0	1,123	0	0	0	0	0	36,392
Chemical and petrochemical	1,137	0	12,011	0	0	0	0	0	13,147
Non-ferrous metals	0	0	273	0	0	0	0	0	273
Machinery	0	0	176	0	0	0	0	0	176
Mining and quarrying	0	0	1,368	0	0	0	0	0	1,368
Paper, pulp and print	967	0	0	0	0	0	0	0	967
Construction	4,452	0	853	0	0	0	0	0	5,305
Textile and leather	685	0	78	0	0	0	0	0	763
Non-specified (industry)	1,23,888	0	33,025	919	0	0	0	40,301	1,98,132
Transport	**0**	**0**	**43,121**	**8,353**	**0**	**0**	**0**	**1,499**	**52,973**
Road	0	0	31,063	7,897	0	0	0	0	38,959
Domestic aviation	0	0	8,134	0	0	0	0	0	8,134
Rail	0	0	2,726	0	0	0	0	1,499	4,226
Pipeline transport	0	0	0	456	0	0	0	0	456
Domestic navigation	0	0	1,199	0	0	0	0	0	1,199
Non-specified (transport)	0	0	0	0	0	0	0	0	0
Other	**0**	**0**	**1,15,224**	**907**	**0**	**0**	**0**	**54,815**	**1,70,946**
Residential	0	0	26,599	0	0	0	0	23,525	50,124
Commercial and public services	0	0	96	0	0	0	0	8,063	8,159
Agriculture/forestry	0	0	705	173	0	0	0	17,135	18,014
Non-specified (other)	0	0	87,823	734	0	0	0	6,092	94,649
Non-energy use	**0**	**0**	**0**	**18,377**	**0**	**0**	**0**	**0**	**18,377**
Non-energy use industry/transformation/energy	0	0	0	18,377	0	0	0	0	18,377
Non-energy use in transport	0	0	0	0	0	0	0	0	0
Non-energy use in other	0	0	0	0	0	0	0	0	0
Elect. output in GWh	**0**	**0**	**0**	**0**	**38,346**	**1,26,235**	**1,04,168**	**0**	**2,68,749**
Elec output-main activity producer ele plants	0	0	0	0	38,346	1,26,123	1,01,839	0	2,66,308
Elec output-autoproducer electricity plants	0	0	0	0	0	112	2,328	0	2,441

* Final consumption refers to End Use Consumption

P: Provisional

Table - VII : Energy Balance of India for 2018-19 (Final)

All figures in KToE

	Coal	Crude Oil	Oil Products	Natural Gas	Nuclear	Hydro	Solar, Wind, Others	Electricity	Total
Production	3,10,731	34,956	0	30,239	9,854	11,624	11,217	0	4,08,621
Imports	1,23,696	2,31,480	33,120	26,437	0	0	0	378	4,15,111
Exports	-898	0	-63,507	0	0	0	0	-728	-65,134
Stock changes	-2,900	0	0	0	0	0	0	0	-2,900
Total primary energy supply	**4,30,630**	**2,66,436**	**-30,388**	**56,676**	**9,854**	**11,624**	**11,217**	**-350**	**7,55,699**
Statistical differences	24,121	18,353	-20,292	-1,532	0	0	0	-1,484	19,166
Main activity producer electricity plants	-2,67,302	0	-849	-11,043	-9,854	-11,601	-10,901	1,17,973	-1,93,577
Autoproducer electricity plants	0	0	0	0	0	-23	-316	18,324	17,985
Oil refineries	0	-2,62,863	2,67,135	0	0	0	0	0	4,272
Energy industry own use	0	0	0	-15,136	0	0	0	-7,171	-22,308
Losses	0	-21,926	0	-86	0	0	0	-23,234	-45,246
Final consumption	**1,87,449**	**0**	**2,15,606**	**28,879**	**0**	**0**	**0**	**1,04,058**	**5,35,991**
Industry	**1,87,449**	**0**	**51,252**	**999**	**0**	**0**	**0**	**44,651**	**2,84,351**
Iron and steel	41,103	0	1,175	0	0	0	0	0	42,279
Chemical and petrochemical	958	0	12,635	0	0	0	0	0	13,592
Non-ferrous metals	0	0	407	0	0	0	0	0	407
Machinery	0	0	192	0	0	0	0	0	192
Mining and quarrying	0	0	1,589	0	0	0	0	0	1,589
Paper, pulp and print	1,014	0	0	0	0	0	0	0	1,014
Construction	5,325	0	1,078	0	0	0	0	0	6,403
Textile and leather	705	0	77	0	0	0	0	0	782
Non-specified (industry)	1,38,344	0	34,100	999	0	0	0	44,651	2,18,094
Transport	**0**	**0**	**46,479**	**8,966**	**0**	**0**	**0**	**1,620**	**57,065**
Road	0	0	33,398	8,468	0	0	0	0	41,866
Domestic aviation	0	0	8,845	0	0	0	0	0	8,845
Rail	0	0	2,809	0	0	0	0	1,620	4,429
Pipeline transport	0	0	0	497	0	0	0	0	497
Domestic navigation	0	0	1,427	0	0	0	0	0	1,427
Non-specified (transport)	0	0	0	0	0	0	0	0	0
Other	**0**	**0**	**1,17,875**	**980**	**0**	**0**	**0**	**57,787**	**1,76,642**
Residential	0	0	27,755	0	0	0	0	24,789	52,544
Commercial and public services	0	0	97	0	0	0	0	8,448	8,544
Agriculture/forestry	0	0	782	177	0	0	0	18,353	19,312
Non-specified (other)	0	0	89,241	804	0	0	0	6,197	96,241
Non-energy use	**0**	**0**	**0**	**17,934**	**0**	**0**	**0**	**0**	**17,934**
Non-energy use industry/transformation/energy	0	0	0	17,934	0	0	0	0	17,934
Non-energy use in transport	0	0	0	0	0	0	0	0	0
Non-energy use in other	0	0	0	0	0	0	0	0	0
Elect. output in GWh	**0**	**0**	**0**	**0**	**37,813**	**1,35,164**	**1,30,433**	**0**	**3,03,409**
Elec output-main activity producer ele plants	0	0	0	0	37,813	1,34,894	1,26,759	0	2,99,465
Elec output-autoproducer electricity plants	0	0	0	0	0	270	3,674	0	3,944

* Final consumption refers to End Use Consumption

P: Provisional

Table - VIII : Energy Balance of India for 2019-20 (Final)

All figures in KToE

	Coal	Crude Oil	Oil Products	Natural Gas	Nuclear	Hydro	Solar, Wind, Others	Electricity	Total
Production	3,08,652	32,877	0	28,685	12,111	13,426	12,440	0	4,08,191
Imports	1,30,997	2,31,947	43,047	31,171	0	0	0	546	4,37,708
Exports	-715	0	-68,496	0	0	0	0	-816	-70,027
Stock changes	13,759	0	0	0	0	0	0	0	13,759
Total primary energy supply	**4,52,693**	**2,64,824**	**-25,449**	**59,856**	**12,111**	**13,426**	**12,440**	**-270**	**7,89,631**
Statistical differences	-6,401	19,290	-24,702	-2,262	0	0	0	-1,527	-15,602
Main activity producer electricity plants	-2,67,636	0	-877	-10,192	-12,111	-13,396	-11,897	1,18,974	-1,97,135
Autoproducer electricity plants	0	0	0	0	0	-30	-543	20,603	20,030
Oil refineries	0	-2,59,982	2,67,734	0	0	0	0	0	7,752
Energy industry own use	0	0	0	-16,600	0	0	0	-7,164	-23,764
Losses	0	-24,132	0	-62	0	0	0	-23,280	-47,475
Final consumption	**1,78,656**	**0**	**2,16,706**	**30,740**	**0**	**0**	**0**	**1,07,335**	**5,33,437**
Industry	**1,78,656**	**0**	**51,332**	**644**	**0**	**0**	**0**	**45,822**	**2,76,455**
Iron and steel	39,936	0	1,089	0	0	0	0	0	41,024
Chemical and petrochemical	948	0	12,593	0	0	0	0	0	13,541
Non-ferrous metals	0	0	336	0	0	0	0	0	336
Machinery	0	0	165	0	0	0	0	0	165
Mining and quarrying	0	0	1,688	0	0	0	0	0	1,688
Paper, pulp and print	837	0	0	0	0	0	0	0	837
Construction	4,903	0	1,092	0	0	0	0	0	5,995
Textile and leather	82	0	63	0	0	0	0	0	145
Non-specified (industry)	1,31,949	0	34,306	644	0	0	0	45,822	2,12,722
Transport	**0**	**0**	**47,806**	**10,494**	**0**	**0**	**0**	**1,647**	**59,947**
Road	0	0	35,135	10,011	0	0	0	0	45,146
Domestic aviation	0	0	8,524	0	0	0	0	0	8,524
Rail	0	0	2,627	0	0	0	0	1,647	4,273
Pipeline transport	0	0	0	483	0	0	0	0	483
Domestic navigation	0	0	1,520	0	0	0	0	0	1,520
Non-specified (transport)	0	0	0	0	0	0	0	0	0
Other	**0**	**0**	**1,17,568**	**973**	**0**	**0**	**0**	**59,866**	**1,78,408**
Residential	0	0	28,228	0	0	0	0	26,552	54,780
Commercial and public services	0	0	86	0	0	0	0	9,120	9,206
Agriculture/forestry	0	0	751	184	0	0	0	18,171	19,107
Non-specified (other)	0	0	88,503	789	0	0	0	6,023	95,315
Non-energy use	**0**	**0**	**0**	**18,628**	**0**	**0**	**0**	**0**	**18,628**
Non-energy use industry/transformation/energy	0	0	0	18,628	0	0	0	0	18,628
Non-energy use in transport	0	0	0	0	0	0	0	0	0
Non-energy use in other	0	0	0	0	0	0	0	0	0
Elect. output in GWh	**0**	**0**	**0**	**0**	**46,472**	**1,56,117**	**1,44,647**	**0**	**3,47,237**
Elec output-main activity producer ele plants	0	0	0	0	46,472	1,55,769	1,38,337	0	3,40,579
Elec output-autoproducer electricity plants	0	0	0	0	0	348	6,310	0	6,659

* Final consumption refers to End Use Consumption

P: Provisional

Annexure – VI

Energy Indicators of India for Sustainability from 2012-13 to 2020-21 (Based on Domestic Conversion Factors and Final, Audited data)

Table 8.4 Energy Indicators for Sustainability from FY : 2012-13 to FY : 2020-21

Theme	Sub-theme	Indicator	Category	Unit	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Use and Production Pattern	Overall Use	Energy use per capita	TPES	toe/person	0.4700	0.4700	0.5111	0.5305	0.5378	0.5345	0.5690	0.5881	0.5402
			TFC	toe/person	0.3202	0.3305	0.3507	0.3633	0.3650	0.3797	0.4035	0.3973	0.3734
			Electricity	Kwh/person	666.7915	698.1008	747.8628	779.5310	816.6499	855.0876	910.9819	929.6133	906.5778
	Overall Productivity	Energy use per unit of GDP	TPES	toe/000'rupees	0.0063	0.0060	0.0062	0.0060	0.0057	0.0053	0.0054	0.0054	0.0054
			TFC	toe/000'rupees	0.0043	0.0042	0.0042	0.0041	0.0039	0.0038	0.0038	0.0037	0.0037
			Electricity	Kwh/000'rupees	8.9471	8.9192	9.0098	8.8059	8.6218	8.5467	8.6470	8.5980	9.0734
	Supply Efficiency	Efficiency of energy conversion and distribution	All	%	22.00	21.68	21.50	20.63	20.17	19.90	19.69	19.57	19.83
	Production	Reserves-to-production ratio	All	years	167	171	169	172	175	178	176	187	209
			coal	years	221	223	216	216	217	220	214	224	247
			lignite	years	133	140	128	141	145	140	153	161	195
		Resources-to-production ratio	All	years	416	423	408	400	400	397	385	408	436
			Crude oil	years	20	20	17	17	17	17	18	19	19
			Natural Gas	years	33	40	37	38	40	41	42	44	48
			Coal	years	537	533	503	483	479	472	448	471	492
			Lignite	years	930	977	914	1017	988	979	1033	1093	1214
	End Use	Sectoral Energy Intensities	Industry	toe/000'rupees	0.00818	0.00835	0.00863	0.00801	0.00736	0.00732	0.00772	0.00763	0.00754
			Agriculture	toe/000'rupees	0.00089	0.00086	0.00096	0.00098	0.00100	0.00098	0.00103	0.00096	0.00097
			Transport	toe/000'rupees	0.00820	0.00770	0.00785	0.00828	0.00875	0.00900	0.00920	0.00954	0.00987
		Sectoral Electricity Intensities	Industry	Kwh/000'rupees	14.469	14.647	14.899	13.719	13.257	13.376	14.099	14.712	14.517
			Agriculture	Kwh/000'rupees	9.674	9.492	10.520	10.716	11.075	10.828	11.360	10.659	10.806
			Transport	Kwh/000'rupees	3.284	3.405	3.300	3.167	2.867	2.960	3.038	3.049	2.980
	Diversification (Fuel Mix)	Fuel shares in TPES	Crude Oil	%	39.16	39.42	35.78	35.97	36.56	37.27	35.26	33.54	31.64
			Natural Gas	%	9.23	8.32	7.42	7.24	7.47	7.87	7.50	7.58	7.79
			Coal	%	55.09	56.78	59.61	58.04	56.88	55.72	56.98	57.33	57.67
			RE &Others	%	4.04	4.47	4.18	3.82	3.95	4.24	4.33	4.81	5.11
		Fuel share in TFC	Oil Products	%	40.08	38.67	37.58	39.88	41.21	41.55	40.23	40.62	39.03
			Natural Gas	%	6.04	5.84	5.32	5.47	5.83	5.72	5.39	5.76	5.99
			Coal	%	35.97	37.33	38.76	36.19	33.73	33.36	34.97	33.49	34.11
			Electricity	%	17.91	18.16	18.34	18.45	19.24	19.37	19.41	20.12	20.88
		Fuel share in electricity	Thermal	%	81.42	79.87	81.10	83.03	82.64	81.88	80.86	78.61	78.22
			Nuclear	%	2.96	2.91	2.82	2.80	2.69	2.59	2.39	2.86	2.69
			Hydro	%	10.27	11.48	10.12	9.09	8.71	8.51	8.53	9.62	9.43
			RE (other than Hydro)	%	5.34	5.73	5.96	5.09	5.96	7.02	8.23	8.91	9.66
Security	Imports	Net energy import dependency	Overall	%	34.21	35.55	37.00	37.98	31.16	40.07	40.64	42.26	42.01
			Crude Oil	%	83.00	83.36	83.49	84.59	55.01	86.07	86.88	87.59	86.56
			Natural gas	%	30.22	33.46	35.60	39.88	43.79	45.66	46.65	52.08	53.53
			Coal	%	23.20	24.91	28.52	27.07	25.46	28.20	28.72	28.94	27.33
			Electricity	%	0.43	0.47	0.39	0.39	0.40	0.34	0.32	0.46	0.60
	Strategic Fuel Stocks	Stocks of critical fuels per corresponding fuel consumption	Coal	%	8.84	7.51	7.22	7.81	9.18	6.90	5.95	8.52	12.03

Note: 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.

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