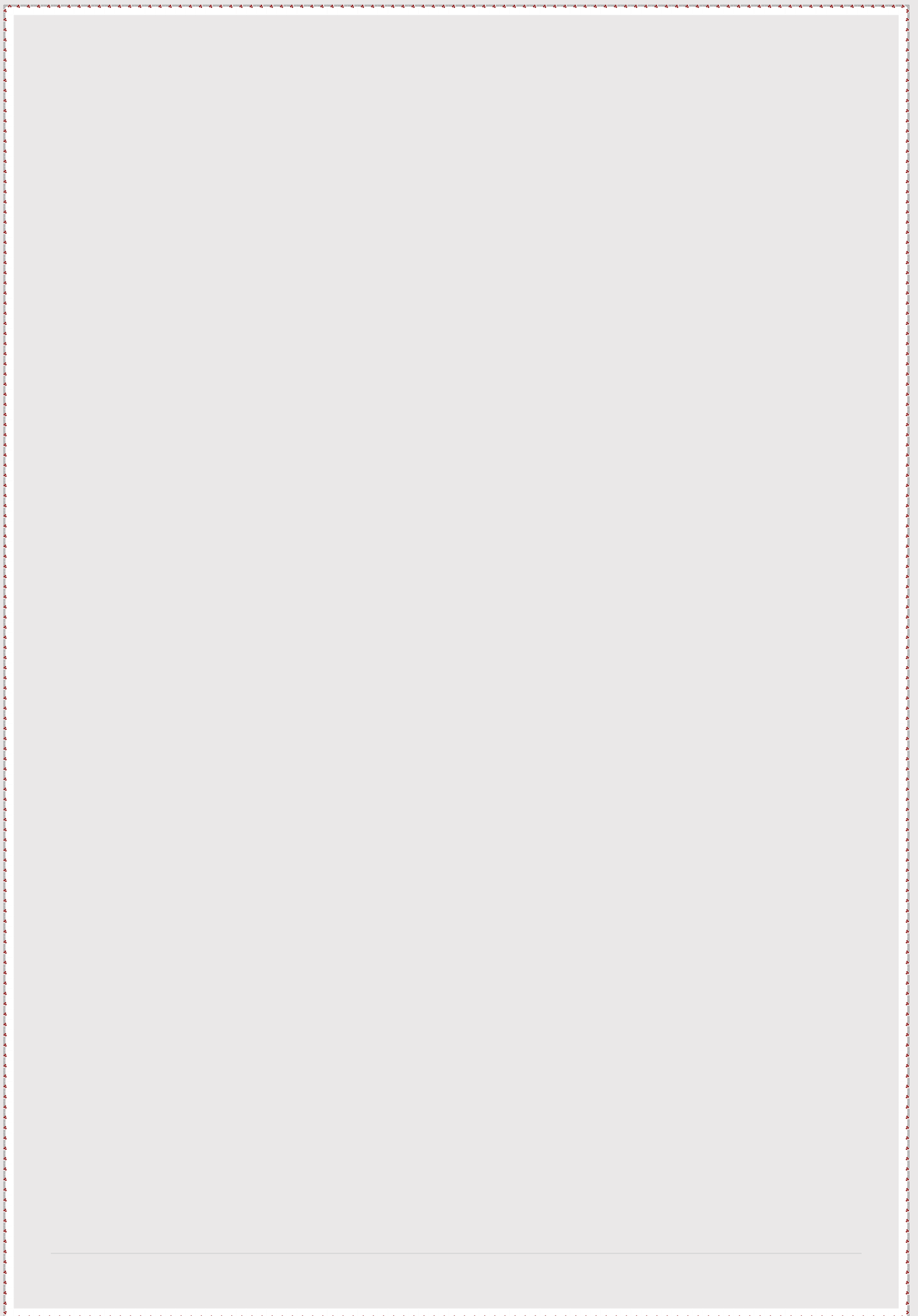# 8

Chapter

Sustainability and Energy

CHAPTER 8
Sustainability and Energy

Introduction

Sustainability has become an essential global objective, underlined by the **United Nations (UN) 2030 Agenda for Sustainable Development.** 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 and also covers the energy indicators for sustainable development. The chapter also focuses on the **economic dimension** of sustainable energy, social and environmental indicators which play a significant role in measuring the effectiveness of energy policies.

SDG 7 outlines specific targets to promote sustainability through energy access and efficiency improvements. These targets include:

- By 2030, ensure universal access to affordable, reliable, and modern energy services.
- By 2030, increase substantially the share of renewable energy in the global energy mix.
- By 2030, double the global rate of improvement in energy efficiency.
- By 2030, enhance international cooperation 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.
- 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.

The renewable energy sources identified in SDG 7—wind, solar, hydro, biomass, and geothermal—are clean, inexhaustible, and vital to achieving sustainable development.

Energy Indicators for Sustainable Development

To support the achievement of these targets, the **International Atomic Energy Agency**, **United Nations Department of Economic and Social Affairs**, **International Energy Agency**, **Eurostat**, and **European Environment Agency** have established core **Energy Indicators for Sustainable Development**. These indicators are designed to provide valuable insights on current energy trends, helping nations assess and formulate effective energy policies.

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Energy indicators describe the links between energy use and human activity in a disaggregated framework. They are essential measures of energy consumption and identifying the underlying factors driving that consumption; using these data the analyst commonly constructs ratios of the energy consumed per unit of a given output (energy intensities) in order to calculate changes in energy efficiency. Using index number methodologies, the indicators can be used to measure the impact of changes in energy intensities or changes in mix of activities on total energy use. The indicators are not meant to be normative; they are descriptive and analytical. Indicators help to show how energy use is shaped by economic and technical factors, such as energy prices, economic growths and new technologies. Disaggregated measures of energy intensities are necessary to determine the impact of prices, policies or other factors on reducing energy consumption and hence transcending the system from efficient to sustainable.

Energy security

Addressing the energy security is also one of the major objectives in the sustainable development criteria of many countries. Interruptions of energy supply can cause serious financial and economic losses. To support the goals of sustainable development, energy must be available at all times, in sufficient quantities and at affordable prices. The continuous monitoring of the Sustainable Energy Indicators is the key to ensure the same. Secured energy supplies are essential to provide reliable energy services to the society for maintaining the economic activity. The monitoring of trends of net energy imports and the availability of appropriate stocks of critical fuels are important for assessing energy security.

Economic Dimension Indicators

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 details than that are presented in Energy Statistics, thus this report is restricted to the economic dimension only. The Sustainable Energy Indicators on the Economic Dimension are useful,

- To determine the sectorial energy intensity of all the major sectors of economic growth;
- To determine the fuel-specific energy dependency of a nation;
- To evaluate the efficiency of the supply system of energy;
- To determine the import dependency of the nations for catering the energy need;
- To frame sustainable policies of a nation.

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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 Dimension: Themes and Sub-Themes

Themes	Sub-theme	Indicator
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

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Highlights

8.1 Electrification of Villages

India achieved 100% electrification of villages by March 2022, based on 2011 Census figures. This milestone is a crucial part of Sustainable Development Goal (SDG) 7, which aims to ensure access to affordable, reliable, sustainable, and modern energy for all. This accomplishment demonstrates India's commitment to ensuring that all its citizens have access to modern energy services, helping drive overall development and well-being.

8.2 Energy Intensity and Per Capita Energy Consumption

Energy intensity is defined as the amount of energy consumed to generate one unit of GDP at constant prices. It is a crucial metric for evaluating the energy efficiency of a country's economy. **Per Capita Energy Consumption (PEC)** is computed by dividing total energy consumption for the year by the mid-year population of that year. While both of these indicators are typically based on conventional energy consumption, it is important to note that they may not fully account for the consumption of non-conventional energy sources, especially in rural areas.
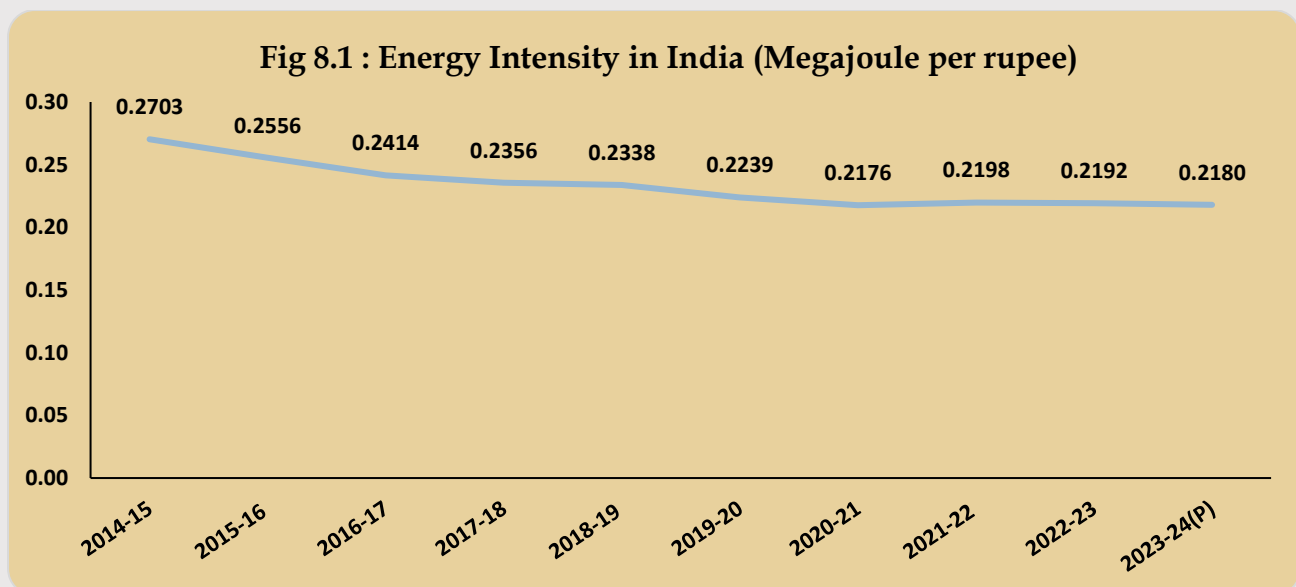

Fig 8.1 : Energy Intensity in India (Megajoule per rupee)

| Year	Value
2014-15	0.2703
2015-16	0.2556
2016-17	0.2414
2017-18	0.2356
2018-19	0.2338
2019-20	0.2239
2020-21	0.2176
2021-22	0.2198
2022-23	0.2192
2023-24(P)	0.2180

Figure 8.1 shows the energy intensity in India decreased from **0.2703 Mega Joules per rupee in 2014-15** to **0.2180 Mega Joules per rupee in 2023-24 (P)**. This decline indicates an improvement in the efficiency of energy use relative to the economic output, showcasing that India's economy is becoming more energy-efficient over time.

Similarly, figure 8.2 shows the India's per capita primary energy consumption increased from **22,434 Mega joules/person** in 2014-15 to **27,574 Mega joules/person** in FY 2023-24 (P), indicating a growing demand for energy.

Fig 8.2 :Per Capita Primary Energy Consumption in India (Megajoule/Person)
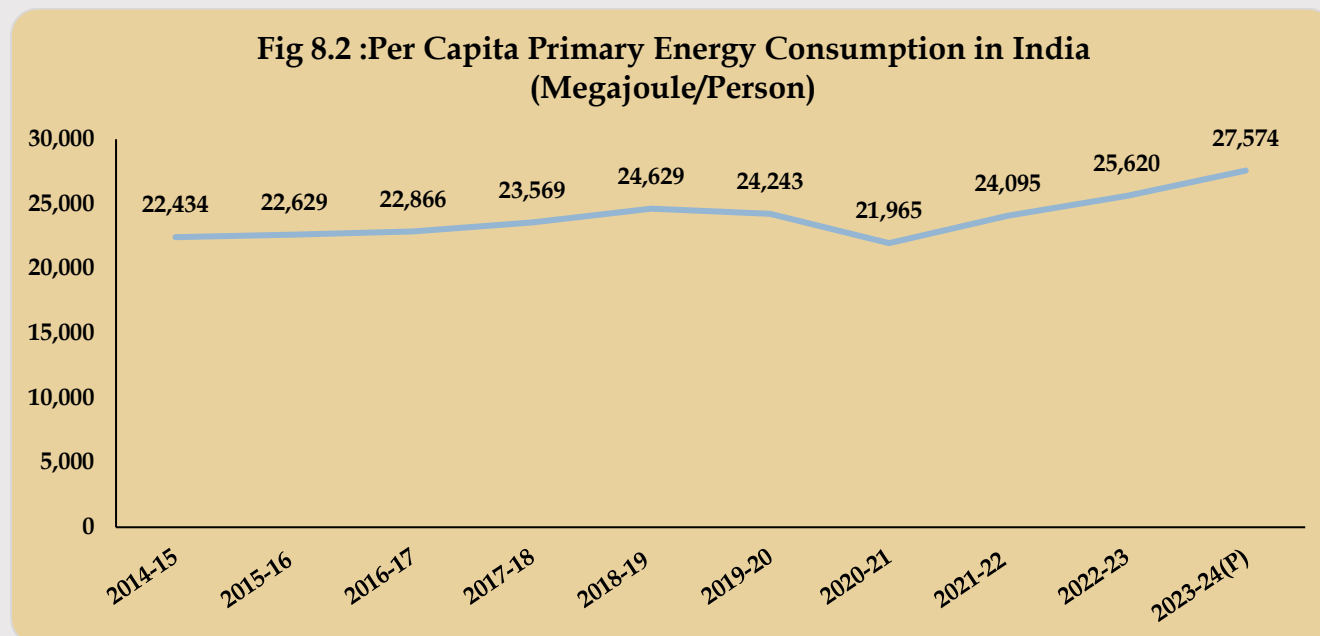
8.3 Emissions from the Energy Sector

India's **total CO2 emissions related to energy sector** increased from **19,09,766 GgCO2 equivalent** in 2014 to **22,38,409 GgCO2 equivalent** in 2020, based on the latest estimates by the Ministry of Environment, Forest and Climate Change (MoEFCC). The **Energy Industries** sector continues to be the largest contributor to these emissions, although its share decreased slightly from **59.74**% in 2014 to **56.53**% in 2020, reflecting progress toward cleaner energy sources (**Table 8.2**).

8.4 Overview of Sustainability Energy Indicators: Economic Dimension

8.4.1 Theme- Use and Production Pattern
(i)   **Sub Theme-Overall Use**
        Energy Indicator- Energy Use per Capita

This indicator measures the level of energy use on per capita basis and reflects the energy-use patterns and aggregated energy intensity of a society. The indicator is defined as:

(Total annual supply or use of energy) / (mid-year population)

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It is calculated as the ratio of the total annual use of energy to the mid-year population. It may be further classified into three (3) categories, which are given as below:

a) Total Primary Energy Supply (TPES) per capita
b) Total Final Energy Consumption (TFEC) of energy per capita
c) Electricity consumption per capita.
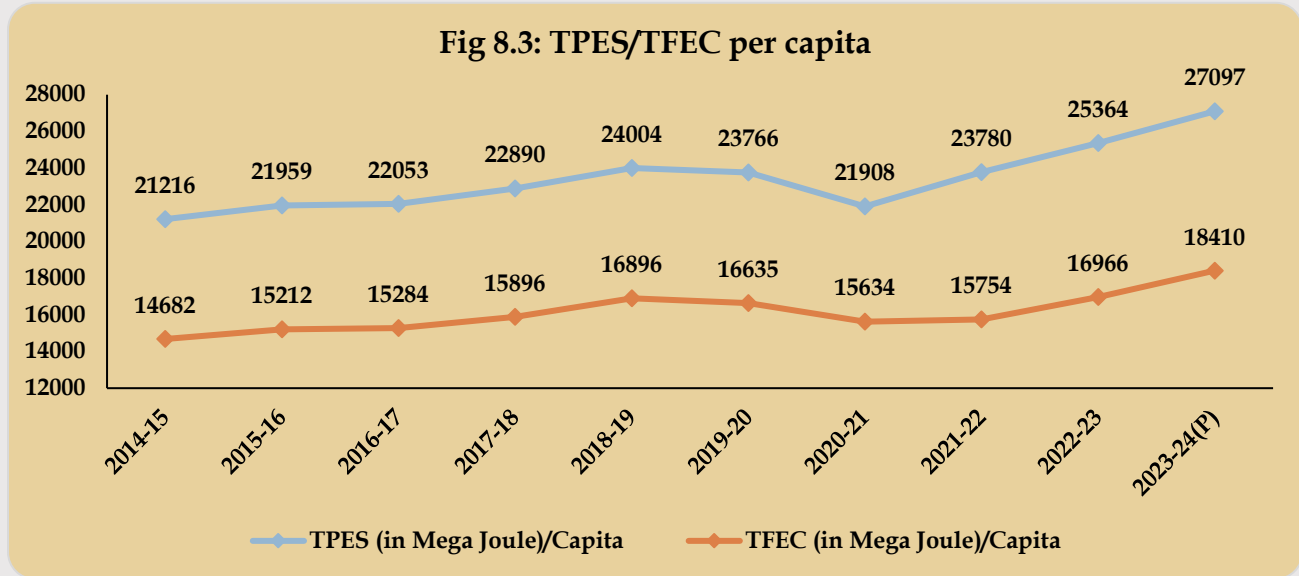
Fig 8.3: TPES/TFEC per capita

Figure 8.3 shows, from 2014 to 2024, the Total Primary Energy Supply (TPES) increased from **21,216 MJ** to **27,097 MJ**, with slight fluctuations, including a dip in 2020-21 to **21,908 MJ**, but rising again from 2021-22 onwards. Similarly, Total Final Energy Consumption (TEFC) grew from **14,682 MJ** in 2014-15 to **18,410 MJ** in 2023-24, with fluctuations, including a decline to **15,634 MJ** in 2020-21 due to the COVID-19 pandemic. However, TEFC rebounded after 2020-21, reaching **18,410 MJ** in 2023-24(P), reflecting an economic recovery and increased energy demand.
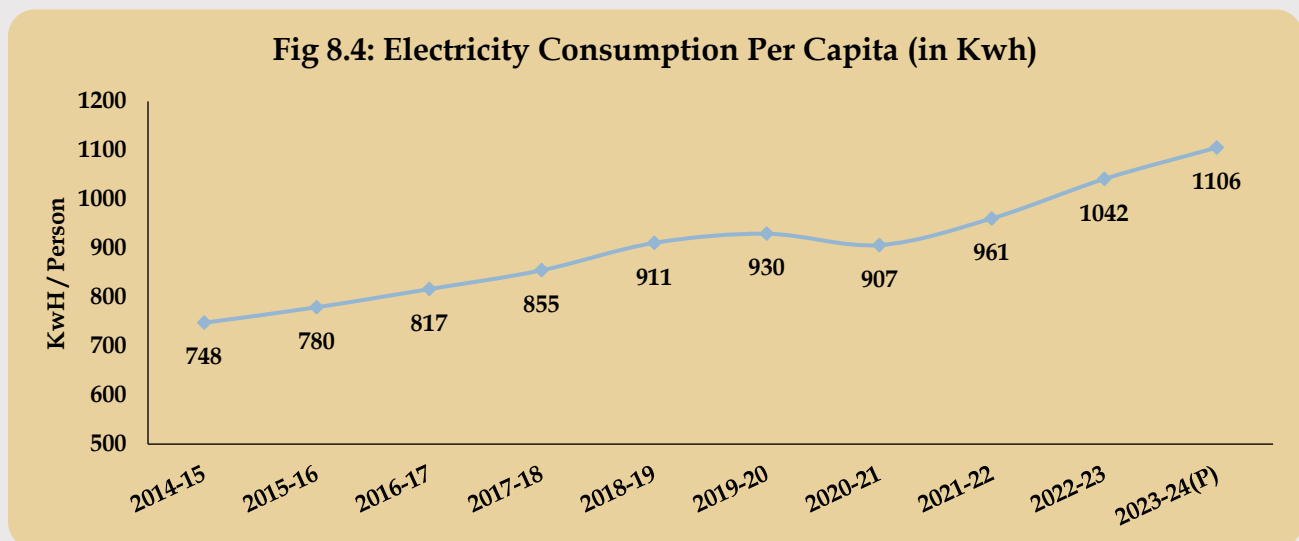
Fig 8.4: Electricity Consumption Per Capita (in Kwh)

Figure 8.4 shows the steady increase in electricity consumption per capita from **748 Kwh** in 2014-15 to **1,106 KWh** in 2023-24(P). The slight dip in 2021-22 (907 kWh) likely reflects the impact of the COVID-19 pandemic, which temporarily reduced energy consumption. However, consumption rebounded in subsequent years, reaching **1,106 kWh** in 2023-24(P).

(ii)   Sub theme -Overall Productivity
Energy Indicator-Energy Use per Unit of GDP

This indicator reflects the trends in overall energy use relative to GDP, indicating the general relationship of energy use to economic development. The indicator is defined as:

> (Total supply or use of energy / GDP at constant price)

It has been further classified into three (3) categories, which are given as below:

a) Total Primary Energy Supply (TPES) per 000' rupees of GDP
b) Total Final Energy Consumption (TFEC) of energy per 000'rupees of GDP
c) Electricity Use per 000' rupees of GDP
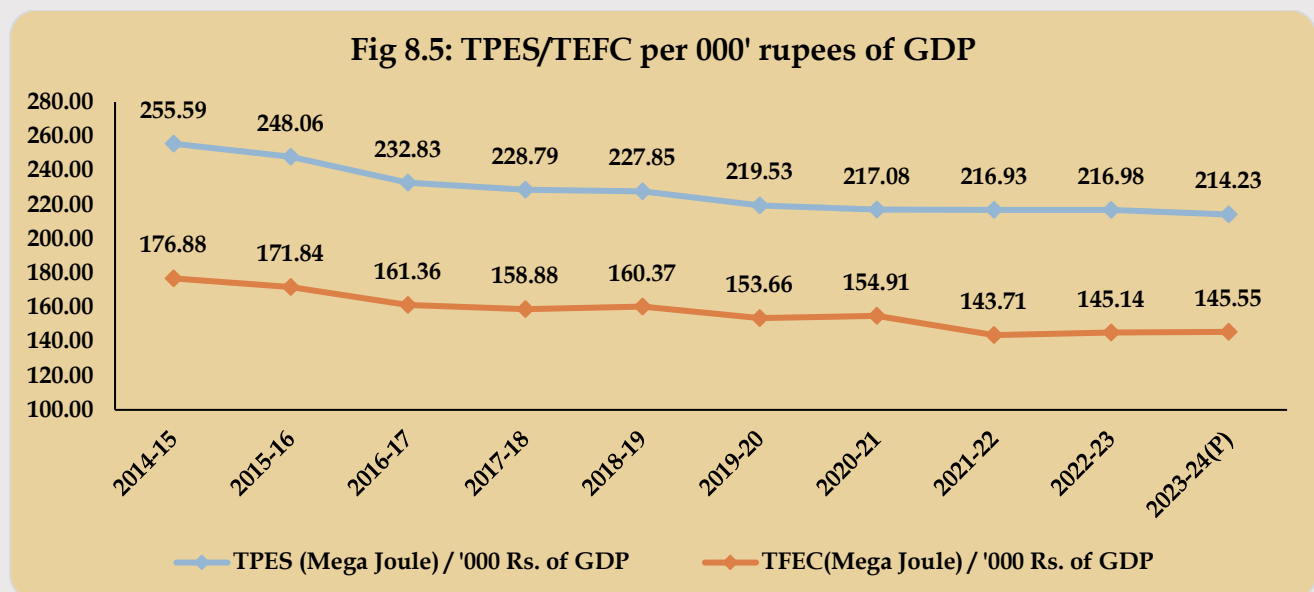

Fig 8.5: TPES/TEFC per 000' rupees of GDP

Figure 8.5 shows, from 2014-24, both TPES and TFEC per '000 Rs. of GDP generally declined, suggesting improved energy efficiency. The slight increases in TFEC in 2022-24 suggest a small rise in energy demand, possibly due to economic recovery or growth in energy-intensive sectors.

Fig 8.6: Electricity use KwH / '000 Rs. of GDP
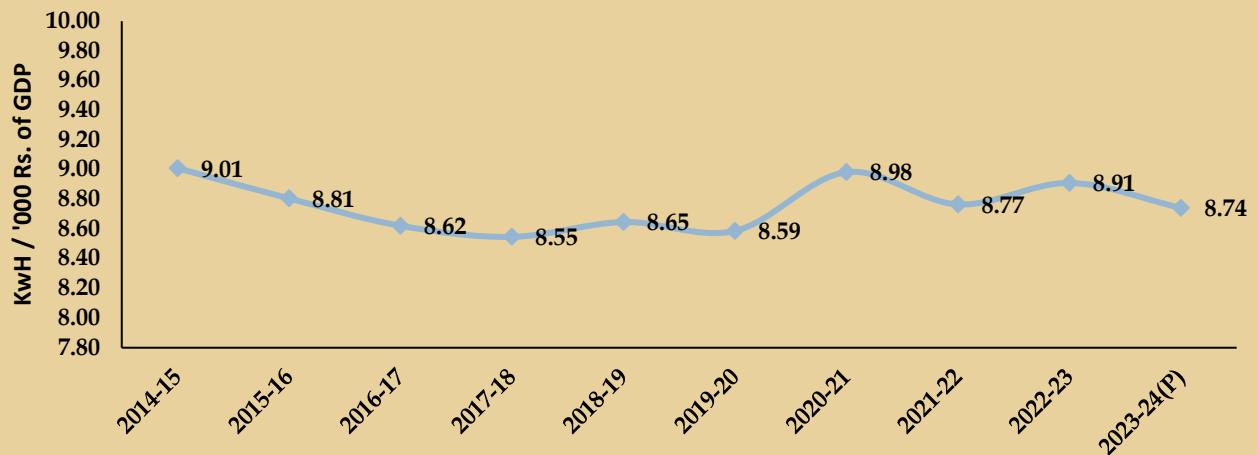
Figure 8.6 shows, from 2014-15 to 2020-21, the efficiency of electricity uses per unit of GDP generally improved, as less electricity was needed to produce each unit of economic output, but a slight increase in electricity uses per GDP unit after 2020, possibly due to growth in energy-intensive sectors or changes in energy consumption patterns, leading to a higher demand for electricity.

(iii) Sub theme- Supply Efficiency
   Energy Indicator-Efficiency of Energy Conversion and Distribution

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:

(Losses in transmission of electricity / Gross generation of electricity)

Fig 8.7: Efficiency of energy conversion and distribution
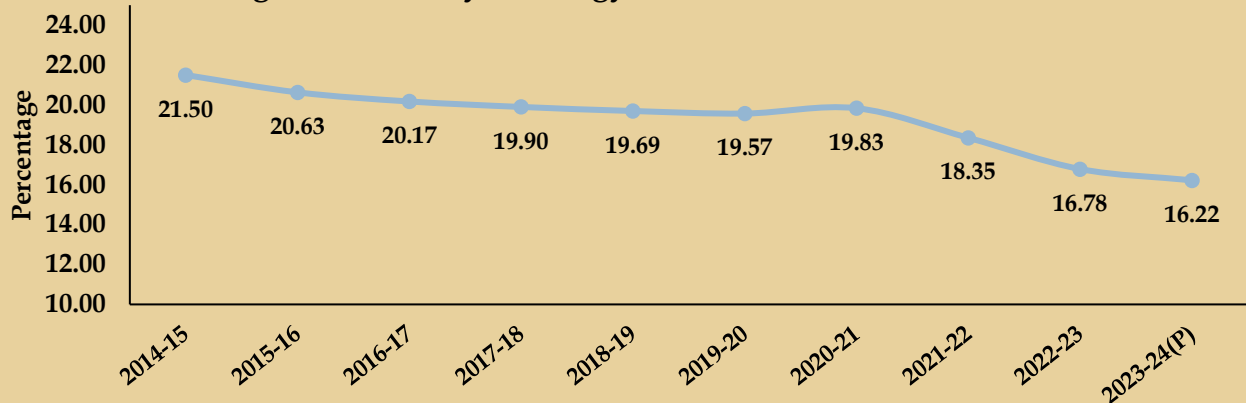
Figure 8.7 shows that the steady decline in transmission and distribution losses from **21.50%** in 2014-15 to **16.22%** in 2023-24 indicates improved efficiency in the electricity grid.

(iv) Sub theme- Production
Energy Indicator- Reserve-to-Production Ratio

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 resources* (demonstrated and inferred) 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. The indicator is computed as:

> (Proven energy reserves of a commodity at the end of a year / Total production of that commodity in that year)

Figure 8.8 shows that the fluctuating coal reserves-to-production ratio, ranging from 213 to 247, indicates sufficient long-term coal availability, with a peak in 2020-21 reflecting either higher reserves or reduced production. The lignite ratio steadily increased from 128 in 2014-15 to 186 in 2023-24, while the combined ratio of coal, lignite, crude oil, and natural gas rose from 175 in 2014-15 to 211 in 2020-21, before slightly declining to 187 in 2023-24, suggesting stable but slightly lower future reserves relative to production.

Fig 8.8: Reserves to Production Ratio

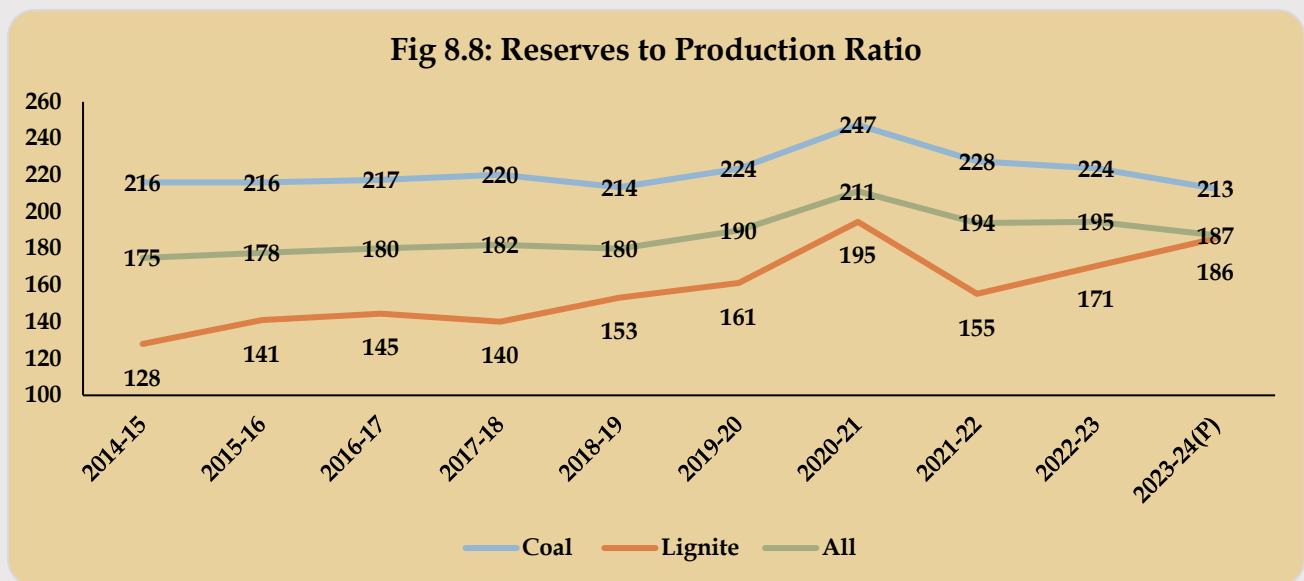Note: All incudes coal, lignite, Crude Oil and natural Gas

(v) Sub theme- Production
Energy indicator- Resources-to-Production Ratio

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 indicator is measured as:

$$\text{(Proven energy resources of a commodity at the end of a year / Total production of that commodity in that year)}$$

Figure 8.9 shows that the resource-to-production ratio increase for crude oil (from 17 in 2014-15 to 23 in 2023-24), indicating more resources available for production. Natural gas fluctuated, peaking at 48 in 2020-21 before decreasing to 30 in 2023-24. Coal's ratio decreased from 503 in 2014-15 to 390 in 2023-24, suggesting improved efficiency or reduced resources. Lignite's ratio increased from 914 in 2014-15 to 1102 in 2023-24, indicating growing reliance or reduced production efficiency.
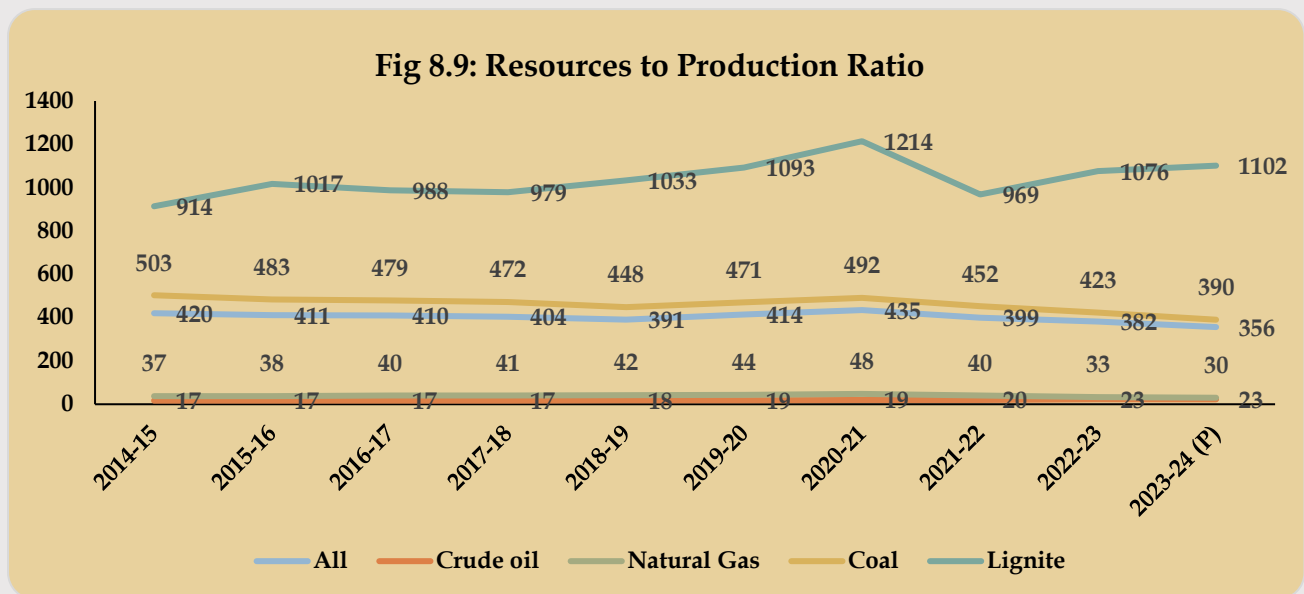
Fig 8.9: Resources to Production Ratio

Note: All incudes coal, lignite, Crude Oil and natural Gas

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(vi) Sub theme- End use
Energy Indicator- Sectoral Energy Intensities

This indicator measures the sectoral energy-intensity of major energy-consuming sectors. How efficiently the technologies are being used in different sectors to improve the efficiency of energy-generation, gets captured in this Indicator. The use of sophisticated and environment-friendly technology in generating the revenue of any sector will imply lesser use of energy to do so. The indicator has been measured as:

$$\boxed{(\text{Amount of energy consumed by a sector} / \text{GVA of that sector})}$$

The indicator is computed against the following major consuming end-use sectors of Energy:

(a) Industrial Energy Intensities-

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.

(b) Transport Energy Intensities

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.

© Agricultural Energy Intensities:

This indicator is 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.

Fig 8.10 : Energy Intensity (in MJ/'000 Rs. of GVA) of major sectors
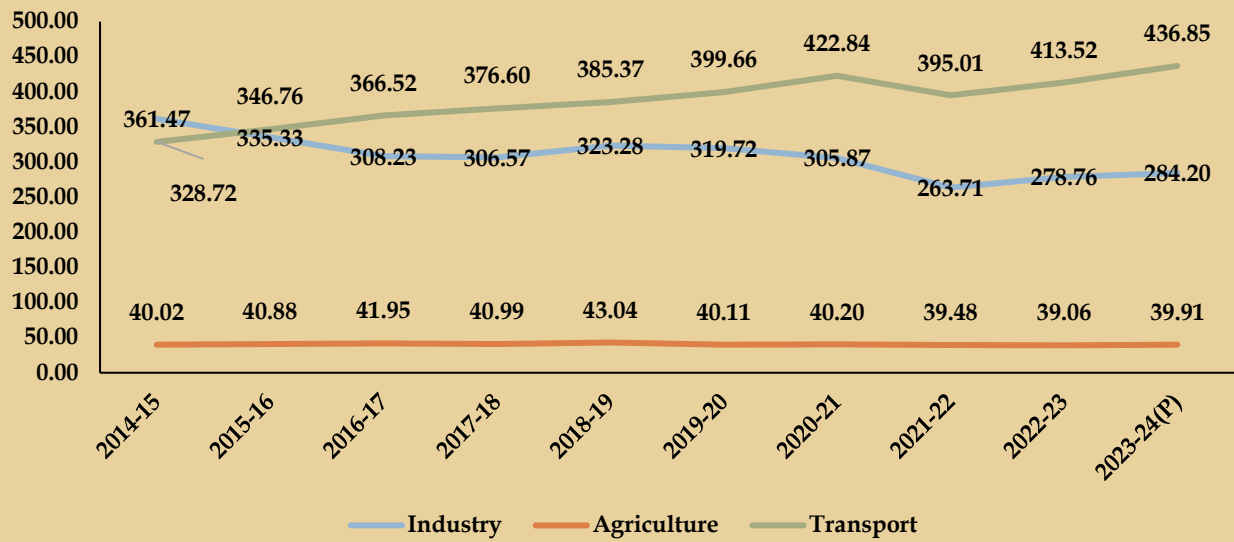
(vii) Sub theme- End use

Energy Indicator- Sectoral Electricity Intensities

This indicator measures the sectoral electricity-intensity of major energy-consuming sectors. The indicator is closely related to the *Sectoral Energy Indicator*. It aims to measure how efficiently the technologies are being used in different sectors to improve the efficiency of electricity consumed. The indicator has been measured as:

(Amount of electricity consumed against a sector / GVA of that sector)

The indicator is also computed against the following major consuming end-use sectors of Energy:

(a) **Industrial Electricity Intensities*:***

This Indicator represents the average use of electricity per thousand units of output. It is worth noting that the specific functions of industry as an energy producer and industry regenerator are important components of sustainable development programmes in some countries.

(b) Transport Electricity Intensities:

This Indicator measures the effective use of electricity in the field of Transport. How efficiently we are able to make use of the energy resources to generate a greater amount of electricity in the field of transport over time can be measures using this Indicator.

(c) Agricultural Electricity Intensities:

This Indicator measures the effective use of electricity in the field of Agriculture. How efficiently we are able to make use of the energy resources to generate a greater amount of electricity in the field of Agriculture over time can be measures using this Indicator.

Fig 8.11: Electricity Intensity (in Kwh/'000 Rs. of GVA) of major sectors

Year	Industry	Agriculture	Transport
2014-15	14.90	10.52	3.30
2015-16	13.72	10.72	3.17
2016-17	13.26	11.07	2.87
2017-18	13.38	10.83	2.96
2018-19	14.10	11.36	3.04
2019-20	14.72	10.59	3.05
2020-21	14.07	10.67	3.05
2021-22	13.69	10.53	3.60
2022-23	14.35	10.57	4.56
2023-24(P)	14.04	10.77	4.79
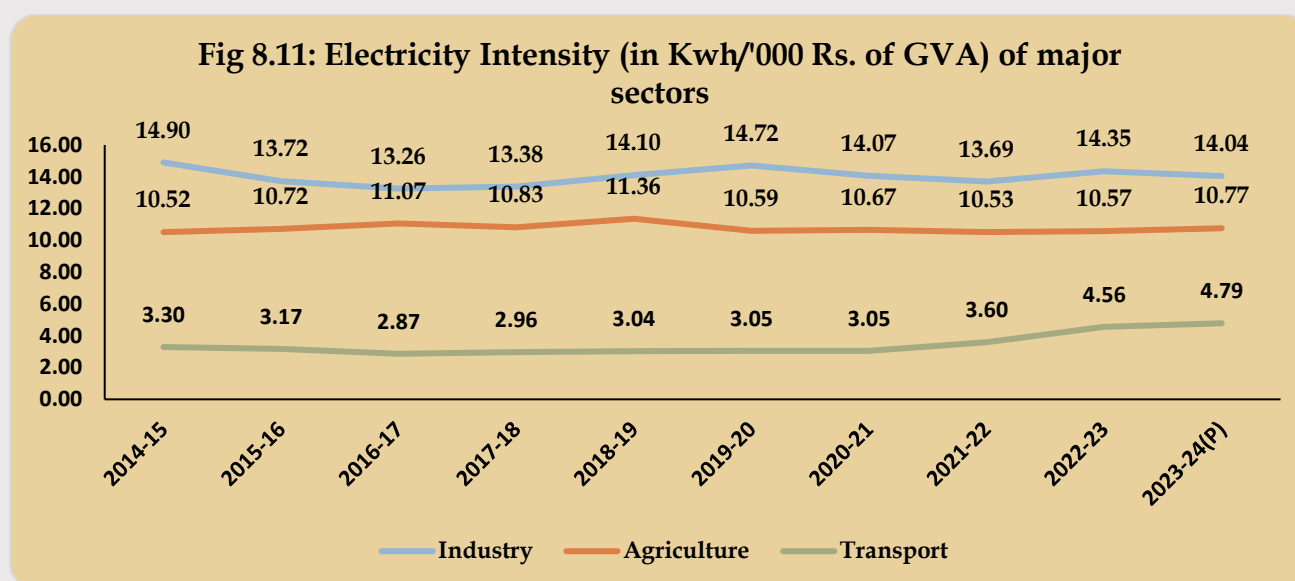
(viii) Sub theme- Diversification (Fuel Mixed)

Energy Indicator- Fuel share in Total Primary Energy Supply (TPES)

This indicator measures the share of different energy-commodities in the Total Primary Energy Supply (TPES). The indicator depicts the dependency of the nation over a particular fuel and also helps us to understand that in a country like India what is the trend of fuel-specific dependency over time. How much we have been able to shift from fossil fuel to non-fossil fuel. This indicator is measured as:

Energy supplied by a particular energy-commodity / Total Primary Energy Supply

Fig 8.12: Fuel Share of energy commodities in TPES

Year	Coal	Crude Oil	Natural Gas	Nuclear Energy
2014-15	59.27	36.08	7.48	1.46
2015-16	57.56	36.38	7.32	1.45
2016-17	55.97	37.32	7.63	1.44
2017-18	56.70	36.44	7.70	1.39
2018-19	57.31	34.99	7.44	1.29
2019-20	55.79	34.75	7.85	1.59
2020-21	56.30	32.67	8.04	1.58
2021-22	58.57	31.79	7.73	1.58
2022-23	58.40	31.95	6.71	1.43
2023-24(P)	60.21	29.83	6.99	1.38
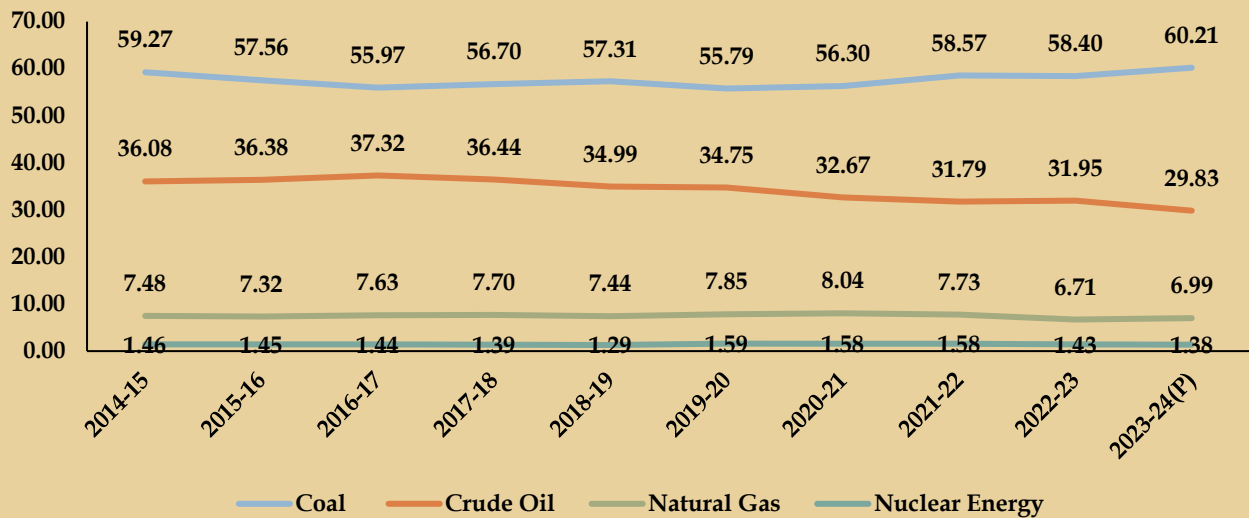
Figure 8.12 shows that coal remains the dominant energy source in India's TPES, while crude oil's share has gradually decreased. Natural gas has seen fluctuations, with a slight decline in recent years, and nuclear energy's contribution has remained low and stable.

(ix) Sub theme- Diversification (Fuel Mix)

Energy Indicator- Fuel share in Total Final Energy Consumption (TFEC)

This indicator measures the share of different energy-commodities in the total final consumption of energy. The indicator depicts the dependency of the nation over a particular fuel and also helps us to understand that in a country like Indian where we are having an increasing demand of energy, how much we have able to meet from which energy-commodity. This indicator is measured as:

> Energy consumed from a particular energy-commodity / Total Final Energy Consumption (TFEC)

Fig 8.13 : Fuel Share of energy commodities in TFEC
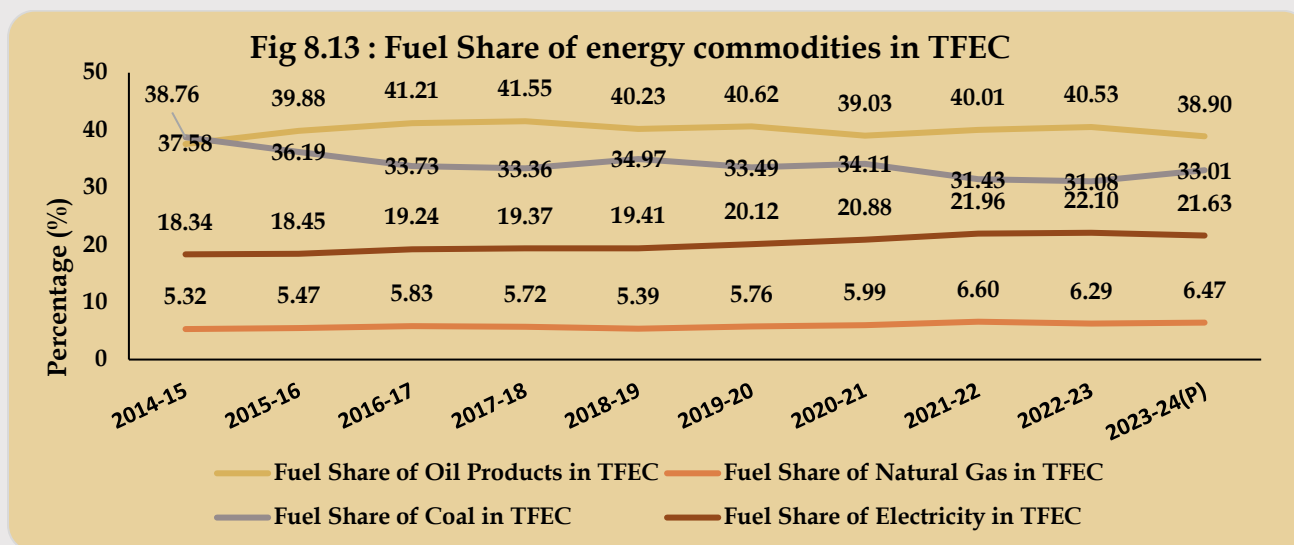
Figure 8.13 shows a gradual shift in India's Total Final Energy Consumption, with a slight decline in oil products and coal use, an increase in electricity consumption, and a modest rise in natural gas usage, indicating a move toward cleaner energy sources.

(x) Sub theme- Diversification (Fuel Mix)
Energy Indicator-Fuel share in electricity

This indicator measures the share of different energy-commodities in the total generation of electricity. The indicator depicts the dependency of the nation over a fossil fuel, what is the trend of use of thermal/non-thermal source in the generation of the electricity in India.

Table 8.13 shows that thermal energy's share in electricity generation decreased from 81% in 2014-15 to 78% in 2020-21, then rose slightly to 79% in 2023-24. Nuclear energy remained stable at 2%-3%, while hydro energy's share declined from around 9% to 7% by 2023-24. Renewable energy (excluding hydro) grew significantly from 6% in 2014-15 to 12% by 2023-24, reflecting a shift towards cleaner energy sources.

8.4.2 Theme- Security

(i) Sub theme- Imports
Energy Indicator- Net energy import dependency

This indicator measures the extent to which a country relies on imports to meet its energy requirements. This indicator is computed as:

(Net imports of the energy commodity / Total Supply of that energy commodity)

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.

Fig. 8.14: Net Energy Import Dependency of major energy commodities
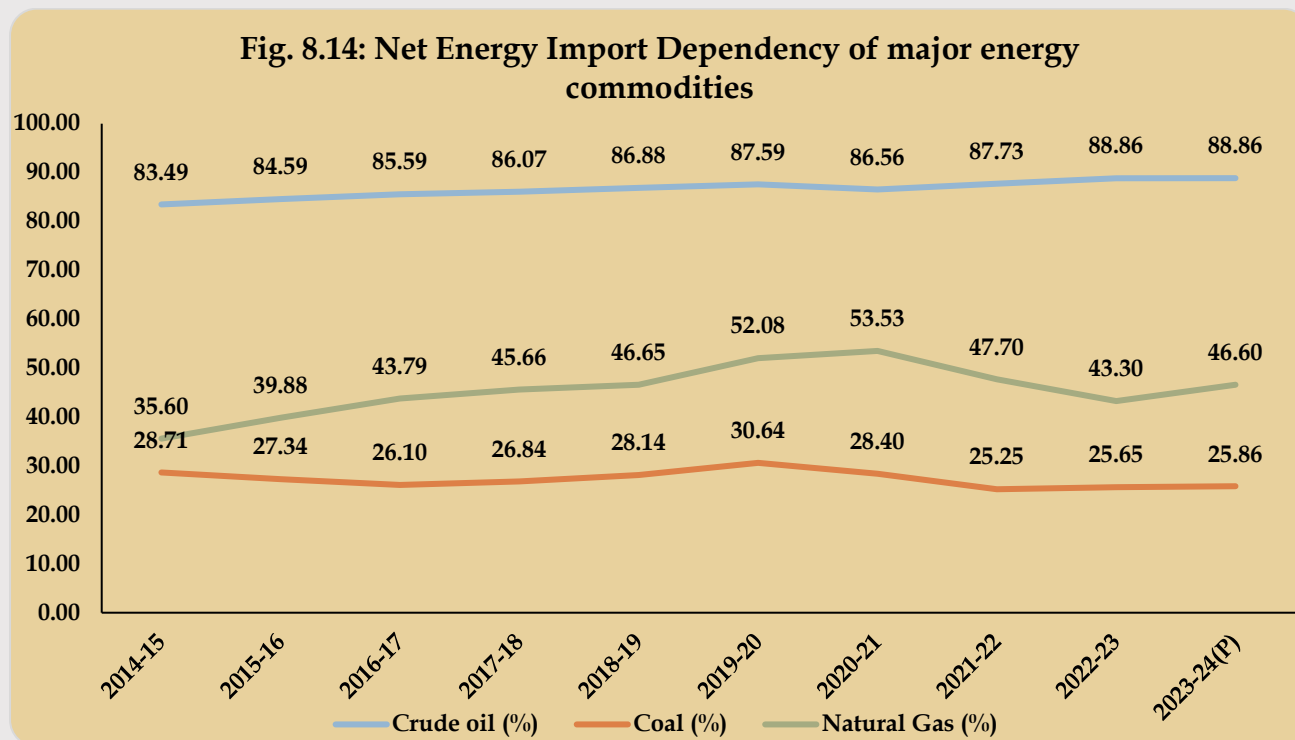
Figure 8.14 shows that India's dependency on energy imports remains high for crude oil, with a slight increase over the years, reaching **88.86%** in 2023-24. The import dependency for coal fluctuates but decreases slightly over time, from **28.71%** in 2014-15 to **25.86%** in 2023-24. Natural gas import dependency rises significantly from **35.60%** in 2014-15 to **46.60%** in 2023-24, reflecting growing reliance on imported natural gas.

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Table 8.1: Per-Capita Primary 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)
2014-15	28,453	1,268,310	10,527,674	22,434	0.2703
2015-16	29,063	1,284,350	11,369,493	22,629	0.2556
2016-17	29,713	1,299,434	12,308,193	22,866	0.2414
2017-18	30,966	1,313,815	13,144,582	23,569	0.2356
2018-19	32,712	1,328,206	13,992,914	24,629	0.2338
2019-20	32,548	1,342,586	14,534,641	24,243	0.2239
2020-21	29,807	1,356,980	13,694,869	21,965	0.2176
2021-22	33,018	1,370,311	15,021,846	24,095	0.2198
2022-23	35,430	1,382,894	16,164,913	25,620	0.2192
2023-24(P)	38,479	1,395,478	17,650,591	27,574	0.2180
Growth rate of 2023-24 over 2022-23 (%)	**8.60**	**0.91**	**9.19**	**7.62**	**-0.54**
CAGR 2014-15 to 2023-24(P) (%)	**3.41**	**1.07**	**5.91**	**2.32**	**-2.36**

 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.

Energy consumption from Primary Energy Resources

Table 8.2 India's Total Emissions related to Energy Sector

(GgCO2 Equivalent)*

GHG sources and removals	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
A. Fuel Combustion activities	**1,604,503**	**1,704,639**	**1,774,788**	**1,871,709**	**2,055,017**	**2,092,250**	**2,168,704**	**2,307,753**	**2,338,432**	**2,211,513**
1. Energy Industries	924,258	1,005,813	1,053,981	1,140,983	1,197,123	1,206,587	1,255,716	1,324,177	1,331,901	1,265,328
2. Manufacturing industries & construction	338,816	343,603	356,771	351,910	394,092	397,739	393,312	412,086	404,676	390,667
3. Transport	221,202	236,020	241,253	250,173	261,517	274,434	290,732	307,328	314,817	297,371
4. Other sectors	120,228	119,202	122,783	128,643	202,286	213,490	228,944	264,162	287,039	258,147
B. Fugitive emission from fuels	**47,426**	**43,047**	**38,771**	**38,057**	**37,084**	**37,179**	**35,559**	**36,572**	**35,898**	**26,896**
1. Solid fuels	16,388	16,086	15,568	16,547	16,614	17,121	16,065	16,862	17,017	16,709
2. Oil and natural gas	31,037	26,961	23,203	21,511	20,470	20,058	19,494	19,710	18,880	10,187
Total Energy (A+B)	**1,651,928**	**1,747,686**	**1,813,559**	**1,909,766**	**2,092,102**	**2,129,428**	**2,204,263**	**2,344,325**	**2,374,330**	**2,238,409**

Source: India Fourth Biennial Update Report to The United Nations Framework Convention on Climate Change, Ministry of Environment, Forest and Climate Change, December 2024

*GgCO2 Equivalent : Gigagrams of carbon dioxide equivalent

Theme	Sub-theme	Indicator	Category	Unit	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24(P)
					Table 8.3 Energy Indicators (Economic Dimension) for Sustainability from FY : 2014-15 to FY : 2023-24(P)									
Use and Production Pattern	Overall Use	Energy use per capita	TPES	toe/person	0.5067	0.5245	0.5267	0.5467	0.5733	0.5676	0.5233	0.5680	0.6058	0.6472
			TFC	toe/person	0.3507	0.3633	0.3650	0.3797	0.4035	0.3973	0.3734	0.3763	0.4052	0.4397
			Electricity	Kwh/person	747.86	779.53	816.65	855.09	910.98	929.61	906.58	960.92	1041.52	1105.71
	Overall Productivity	Energy use per unit of GDP	TPES	toe/000'rupees	0.0061	0.0059	0.0056	0.0055	0.0054	0.0052	0.0052	0.0052	0.0052	0.0051
			TFC	toe/000'rupees	0.00422	0.00410	0.00385	0.00379	0.00383	0.00367	0.00370	0.00343	0.00347	0.00348
			Electricity	Kwh/000'rupees	9.01	8.81	8.62	8.55	8.65	8.59	8.98	8.77	8.91	8.74
	Supply Efficiency	Efficiency of energy conversion and distribution	All	%	21.50	20.63	20.17	19.90	19.69	19.57	19.83	18.35	16.78	16.22
	Production	Reserves-to-production ratio	All	years	175	178	180	182	180	190	211	194	195	187
			coal	years	216	216	217	220	214	224	247	228	224	213
			lignite	years	128	141	145	140	153	161	195	155	171	186
		Resources-to-production ratio	All	years	420	411	410	404	391	414	435	399	382	356
			Crude oil	years	17	17	17	17	18	19	19	20	23	23
			Natural Gas	years	37	38	40	41	42	44	48	40	33	30
			Coal	years	503	483	479	472	448	471	492	452	423	390
			Lignite	years	914	1017	988	979	1033	1093	1214	969	1076	1102
	End Use	Sectoral Energy Intensities	Industry	toe/000'rupees	0.00863	0.00801	0.00736	0.00732	0.00772	0.00764	0.00731	0.00630	0.00666	0.00679
			Agriculture	toe/000'rupees	0.00096	0.00098	0.00100	0.00098	0.00103	0.00096	0.00096	0.00094	0.00093	0.00095
			Transport	toe/000'rupees	0.00785	0.00828	0.00875	0.00899	0.00920	0.00955	0.01010	0.00943	0.00988	0.01043
		Sectoral Electricity Intensities	Industry	Kwh/000'rupees	14.90	13.72	13.26	13.38	14.10	14.72	14.07	13.69	14.35	14.04
			Agriculture	Kwh/000'rupees	10.52	10.72	11.07	10.83	11.36	10.59	10.67	10.53	10.57	10.77
			Transport	Kwh/000'rupees	3.30	3.17	2.87	2.96	3.04	3.05	3.05	3.60	4.56	4.79
	Diversification (Fuel Mix)	Fuel shares in TPES	Crude Oil	%	36.08	36.38	37.32	36.44	34.99	34.75	32.67	31.79	31.95	29.83
			Natural Gas	%	7.48	7.32	7.63	7.70	7.44	7.85	8.04	7.73	6.71	6.99
			Coal	%	59.27	57.56	55.97	56.70	57.31	55.79	56.30	58.57	58.40	60.21
			Nuclear	%	1.46	1.45	1.44	1.39	1.29	1.59	1.58	1.58	1.43	1.38
			Renewable Energy	%	2.75	2.42	2.59	2.76	3.00	3.39	3.69	3.64	3.85	3.53
		Fuel share in TFC	Oil Products	%	37.58	39.88	41.21	41.55	40.23	40.62	39.03	40.01	40.53	38.90
			Natural Gas	%	5.32	5.47	5.83	5.72	5.39	5.76	5.99	6.60	6.29	6.47
			Coal	%	38.76	36.19	33.73	33.36	34.97	33.49	34.11	31.43	31.08	33.01
			Electricity	%	18.34	18.45	19.24	19.37	19.41	20.12	20.88	21.96	22.10	21.63
		Fuel share in electricity	Thermal	%	81.10	83.03	82.64	81.88	80.86	78.61	78.22	77.75	77.02	78.54
			Nuclear	%	2.82	2.80	2.69	2.59	2.39	2.86	2.69	2.78	2.51	2.46
			Hydro	%	10.12	9.09	8.71	8.51	8.53	9.62	9.43	8.97	8.87	6.90
			RE (other than Hydro)	%	5.96	5.08	5.96	7.02	8.23	8.91	9.66	10.49	11.60	12.10
Security	Imports	Net energy import dependency	Overall	%	36.96	37.95	38.85	39.61	40.35	42.53	42.12	40.31	39.37	40.27
			Crude Oil	%	83.49	84.59	85.59	86.07	86.88	87.59	86.56	87.73	88.86	88.86
			Natural gas	%	35.60	39.88	43.79	45.66	46.65	52.08	53.53	47.70	43.30	46.60
			Coal	%	28.71	27.34	26.10	26.84	28.14	30.64	28.40	25.25	25.65	25.86
			Electricity	%	0.04	0.01	-0.08	-0.14	-0.26	-0.19	0.00	-0.08	-0.34	-0.24
	Strategic Fuel Stocks	Stocks of critical fuels per corresponding fuel consumption	Coal	%	7.22	7.81	9.18	6.90	5.95	8.52	12.03	10.61	7.57	8.79

Note: The difference in the figures (net energy import dependency- crude oil) 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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Table 8.4: Energy Use per Capita in India

Year	TPES (in Mega Joule)/Capita	TFEC (in Mega Joule)/Capita	Electricity Consumption per capita (Kwh)*
2014-15	21216	14682	748
2015-16	21959	15212	780
2016-17	22053	15284	817
2017-18	22890	15896	855
2018-19	24004	16896	911
2019-20	23766	16635	930
2020-21	21908	15634	907
2021-22	23780	15754	961
2022-23	25364	16966	1042
2023-24(P)	27097	18410	1106
*End use			

Table 8.5: Energy Consumption per 000'rupees of GDP

Year	TPES (Mega Joule) / '000 Rs. of GDP	TFEC(Mega Joule) / '000 Rs. of GDP	Electricity use KwH / '000 Rs. of GDP
2014-15	255.59	176.88	9.01
2015-16	248.06	171.84	8.81
2016-17	232.83	161.36	8.62
2017-18	228.79	158.88	8.55
2018-19	227.85	160.37	8.65
2019-20	219.53	153.66	8.59
2020-21	217.08	154.91	8.98
2021-22	216.93	143.71	8.77
2022-23	216.98	145.14	8.91
2023-24(P)	214.23	145.55	8.74

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Table 8.6: Efficiency of energy conversion and distribution

Year	Percentage of Losses (w.r.t. Production) in Electricity
2014-15	21.50
2015-16	20.63
2016-17	20.17
2017-18	19.90
2018-19	19.69
2019-20	19.57
2020-21	19.83
2021-22	18.35
2022-23	16.78
2023-24(P)	16.22

Table 8.7 Reserves to Production Ratio of Coal, Lignite and All

Year	Coal	Lignite	All
2014-15	216	128	175
2015-16	216	141	178
2016-17	217	145	180
2017-18	220	140	182
2018-19	214	153	180
2019-20	224	161	190
2020-21	247	195	211
2021-22	228	155	194
2022-23	224	171	195
2023-24(P)	213	186	187

Note : All incudes Coal, Lignite, Crude Oil and Natural Gas

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Table 8.8: Resources to Production Ratio of all Energy Commodities					
Year	**Coal**	**Lignite**	**Crude Oil**	**Natural Gas**	**All**
2014-15	503	914	17	37	420
2015-16	483	1017	17	38	411
2016-17	479	988	17	40	410
2017-18	472	979	17	41	404
2018-19	448	1033	18	42	391
2019-20	471	1093	19	44	414
2020-21	492	1214	19	48	435
2021-22	452	969	20	40	399
2022-23	423	1076	23	33	382
2023-24(P)	390	1102	23	30	356
Note: All includes coal, lignite, Crude Oil and Natural Gas					

Table 8.9 Energy Intensity (in MJ/'000 Rs. of GVA) of major sectors			
Year	**Industry**	**Agriculture**	**Transport**
2014-15	361.47	40.02	328.72
2015-16	335.33	40.88	346.76
2016-17	308.23	41.95	366.52
2017-18	306.57	40.99	376.60
2018-19	323.28	43.04	385.37
2019-20	319.72	40.11	399.66
2020-21	305.87	40.20	422.84
2021-22	263.71	39.48	395.01
2022-23	278.76	39.06	413.52
2023-24(P)	284.20	39.91	436.85

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Table 8.10: Electricity Intensity (in Kwh/'000 Rs. of GVA) of major sectors

Year	Industry	Agriculture	Transport
2014-15	14.90	10.52	3.30
2015-16	13.72	10.72	3.17
2016-17	13.26	11.07	2.87
2017-18	13.38	10.83	2.96
2018-19	14.10	11.36	3.04
2019-20	14.72	10.59	3.05
2020-21	14.07	10.67	3.05
2021-22	13.69	10.53	3.60
2022-23	14.35	10.57	4.56
2023-24(P)	14.04	10.77	4.79

Table 8.11 Fuel Share of major Energy Commodities in Total Primary Energy Supply (TPES)

Year	Coal	Crude Oil	Natural Gas	Renewable Energy	Nuclear Energy
2014-15	59.27	36.08	7.48	2.75	1.46
2015-16	57.56	36.38	7.32	2.42	1.45
2016-17	55.97	37.32	7.63	2.59	1.44
2017-18	56.70	36.44	7.70	2.76	1.39
2018-19	57.31	34.99	7.44	3.00	1.29
2019-20	55.79	34.75	7.85	3.39	1.59
2020-21	56.30	32.67	8.04	3.69	1.58
2021-22	58.57	31.79	7.73	3.64	1.58
2022-23	58.40	31.95	6.71	3.85	1.43
2023-24(P)	60.21	29.83	6.99	3.53	1.38

Table 8.12: Fuel share of different energy commodities in Total Final Energy Consumption (TFEC)

Year	Oil Products	Coal (includes Lignite)	Electricity	Natural Gas
2014-15	37.58	38.76	18.34	5.32
2015-16	39.88	36.19	18.45	5.47
2016-17	41.21	33.73	19.24	5.83
2017-18	41.55	33.36	19.37	5.72
2018-19	40.23	34.97	19.41	5.39
2019-20	40.62	33.49	20.12	5.76
2020-21	39.03	34.11	20.88	5.99
2021-22	40.01	31.43	21.96	6.60
2022-23	40.53	31.08	22.10	6.29
2023-24(P)	38.90	33.01	21.63	6.47

Table 8.13: Share of different fuel in Total Generation of Electricity (in percentage)

Year	Non-Renewable			Renewable		
	Thermal	Nuclear	Total	Hydro	RE (other than hydro)	Total
2014-15	81.10	2.82	83.92	10.12	5.96	16.08
2015-16	83.03	2.80	85.83	9.09	5.08	14.17
2016-17	82.64	2.69	85.34	8.71	5.96	14.66
2017-18	81.88	2.59	84.47	8.51	7.02	15.53
2018-19	80.86	2.39	83.24	8.53	8.23	16.76
2019-20	78.61	2.86	81.47	9.62	8.91	18.53
2020-21	78.22	2.69	80.91	9.43	9.66	19.09
2021-22	77.75	2.78	80.53	8.97	10.49	19.47
2022-23	77.02	2.51	79.53	8.87	11.60	20.47
2023-24(P)	78.54	2.46	81.00	6.90	12.10	19.00

Table 8.14: Net Energy Import Dependency of energy commodities

Year	Crude oil (%)	Coal (%)	Natural Gas (%)	Electricity (%)	Overall (%)
2014-15	83.49	28.71	35.60	0.04	36.96
2015-16	84.59	27.34	39.88	0.01	37.95
2016-17	85.59	26.10	43.79	-0.08	38.85
2017-18	86.07	26.84	45.66	-0.14	39.61
2018-19	86.88	28.14	46.65	-0.26	40.35
2019-20	87.59	30.64	52.08	-0.19	42.53
2020-21	86.56	28.40	53.53	0.00	42.12
2021-22	87.73	25.25	47.70	-0.08	40.15
2022-23	88.86	25.65	43.30	-0.34	39.37
2023-24(P)	88.86	25.86	46.60	-0.24	40.27