

Energy Flows through Production and Consumption Structure of India's Economy

Rajesh Chadha and Ganesh Sivamani

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Centre for Social and Economic Progress (CSEP)
CSEP Research Foundation
6, Dr Jose P. Rizal Marg, Chanakyapuri,
New Delhi - 110021, India

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Designed by Mukesh Rawat

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Rajesh Chadha

Senior Fellow

Centre for Social and Economic Progress

New Delhi, India

Ganesh Sivamani

Research Analyst

Centre for Social and Economic Progress

New Delhi, India

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Abstract

In this technical note, the India Input-Output Table 2015–16 is used to compute the direct and indirect uses of energy sources required by the production sectors of the economy through the construction of an Energy Input-Output Table. The analysis shows the energy intensities of each of these sectors. This enables the computation of energy savings due to increased energy efficiencies, across sectors and at an economy-wide level. The implications of climate change policies may be analysed through a General Equilibrium model that considers the backward and forward linkages of one sector with all other sectors of the economy.

Backdrop

India's food and energy needs are going to expand in future. Climate change has links with both. India announced its National Action Plan on Climate Change (NAPCC) in June 2008, followed by submission of the Intended Nationally Determined Commitments (INDC) to the UN Convention on Climate Change (UNFCCC) in October 2015. With its objective of reducing energy intensity, India shall face constraints on the use of fossil fuels for energy generation. Increased greenhouse gas (GHG) emissions will adversely impact air quality and hence human health. Climate change will lead to adverse weather conditions in different parts of the country and affect agricultural production. Volatile monsoons and melting glaciers will impact water flows across the perennial rivers and lead to rising seawater levels, affecting water and soil. Lifestyles will change in tandem, as will consumption baskets (though differentially across agroclimatic zones and states). Therefore, there is an urgent need for research on the consequential impact of climate change on the economy and society.

Different sectors, both energy and non-energy, are affected through their inter-sectoral economic linkages. Economic impacts can be measured at the sectoral or the overall economy level using general equilibrium (GE) models. The GE models address the effects of a change in one sector on all sectors through sectoral linkages. Analytical studies can also be done at the single-sector level. Examples of such studies include emissions from, say, power generation or steel manufacturing. However, such studies limit the understanding of inter-sectoral linkages. Hence, it is pertinent to use a GE accounting framework based on the input-output structure that considers the backward and forward linkages of one sector—say production of petroleum products—with all other sectors of the economy. Other examples include understanding the impact of sectoral output changes, capital formation, employment, trade, income levels, and changing consumption baskets. While the data are available to conduct such studies at the national level, these can also be done for the sub-national or the agroclimatic zones, subject to data availability.

An economy's input-output transactions tables provide the necessary information on sectoral production, intermediate and final consumption, taxation, and income levels. The tables provide the accounting framework of the cost structure of intermediate sectoral production and the estimates of final consumption, capital formation and trade. These tables help compute income and employment multipliers at the sector level and the inter-sectoral forward and backward linkages measures. The input-output information can be extended to account for the full circular flow of money and activities—across the household, corporate, and government—to a Social Accounting Matrix (SAM). Climate change issues can be incorporated in the input-output tables and SAM to provide detailed environmental indicators. The extended tools are referred to as the energy input-output (EIO) table, environmentally extended input-output (EEIO) table, and environmentally extended SAM (EESAM). While the EIO accounts for the energy flows across sectors of an economy, the EEIO extends this further with data on GHG emissions and water consumption. The EEIO measures the emissions and primary natural resources embodied within the goods and services of an economy (Institute for Prospective Technological Studies, 2011).

Some of the extant literature addresses the issues of energy and emissions within an input-output and SAM framework. Miller and Blair (2009) provide detailed chapters on these issues. Hikita et al. (2007) extended India's input-output table for 1993–94 and 1998–99 for environmental analysis to estimate CO₂ emissions. Goldar et al. (2011) discuss the prioritisation of India's green export portfolio using the environmental input-output approach. Pohit and Pal (2014) worked on an environmentally-extended SAM (or EESAM) for India's climate change policy.

The EEIO tables and EESAM are amenable to computable general equilibrium (CGE) models for addressing and answering some critical policy questions. These include the impact of changing consumption baskets, energy requirements and cropping patterns on climate change. The models can also analyse the climate change implications of energy efficiency, renewable energy, environmental tax reform and carbon leakage, and border carbon adjustment in a multi-country framework.

The Input-Output Model

The Ministry of Statistics and Programme Implementation (MoSPI) publishes the Supply and Use Tables (SUTs) for India.¹ The latest Input-Output Table published by MoSPI was for 2007–08 (MoSPI, 2012). The corresponding Input-Output Table has been constructed by CSEP using the latest SUTs 2015–16—henceforth the CSEP India I-O Table 2015–16 (Chadha et al. 2020).

As mentioned, the input-output structure represents the interdependencies of various sectors in an economy. An essential use of the input-output model is computing the effects of the change in demand in one sector on demand of other sectors in an economy. The CSEP India I-O Table 2015–16 provides details of monetary values of inter-industry transactions in basic prices of 131 sectors producing goods and services in the form of a *commodity x commodity* ($C \times C$) matrix. Basic prices refer to the prices exclusive of taxes, subsidies, and trade and transport margins.

The output of each sector comprises (column-wise) the cost incurred on inputs used (goods and services), net indirect taxes (NIT) paid (taxes minus subsidies), and incomes earned by the factors of production (gross value added or GVA). The transaction flows (row-wise) provide information on the usage of these sectors in other sectors of the economy's production processes, final consumption (household and government), net exports, and capital formation.

The information provided in the input-output table can be used to compute the backward and forward linkages and income, output, and employment multipliers. In a balanced input-output table, the column total for a commodity (which includes the NIT and GVA) will equal the same commodity's row total (intermediate plus final consumption).

Energy Balance in a Representative Input-Output Model Framework

The CSEP India I-O Table 2015–16 has five energy sources (commodity sectors): three primary sectors (coal and lignite, crude petroleum, and natural gas), one secondary sector (petroleum products), and electricity (which includes both primary and secondary generation).² The secondary-energy source sectors use significant amounts of the requisite primary energy inputs. For example, the production of petroleum products requires significant inputs of crude petroleum and natural gas. Thermal electricity, as well as petroleum products, requires coal as an input. In addition, coal is also used as an input in non-energy sectors, including ferrous and non-ferrous metallurgy blast furnaces.

¹ Supply-use tables. <http://mospi.nic.in/publication/supply-use-tables>

² The CSEP India I-O Table 2015–16 does not have a separate sector for renewable energy. The work-in-progress shall construct a separate new sector with information drawn from reliable sources.

The present note highlights the energy flows matrix corresponding to the CSEP India I-O Table 2015–16.³ The energy flows have been depicted in monetary values, quantities, and thermal contents as oil equivalents. The energy-flows data has been sourced from MoSPI's *Energy Statistics 2017* (MoSPI 2017), which provides information on India's Energy Commodity Balance (ECB) regarding the sources and uses of various energy products within India's borders, and the details on the quantities⁴ of these products entering energy and non-energy products. The publication follows the methodology described in the UN *International Recommendations on Energy Statistics* (UN, 2018). The domestic supply from an energy source is computed by accounting for domestic production, imports, exports, and stock changes. The consuming sectors include energy transformation, agriculture and allied, mining, manufacturing, services, and households.

The Energy Balance (EB) of India shows the flows of energy entering, used, and exiting the country, measured in kilotonnes of oil equivalent⁵ (KToe) during a reference year. These energy measurements were computed using accepted conversion factors. The EB statistics have two major components—the total primary energy supply (TPES), and the total final consumption (TFC). While these values should be equal in theory, there is an additional 'statistical differences' component, the difference between TPES and TFC.

Quoting from *Energy Statistics India 2021* (MoSPI, 2021):

“The purpose of compiling an energy balance starting from the various commodity balances are numerous; they are to:

- Provide a comprehensive overview of the energy profile of a country to monitor energy security, energy markets, relevant policy goals and to formulate adequate energy policies;
- Provide the basis for aggregate socio-economic indicators, as well as for estimates of CO₂ emissions;
- Compare data of different reference periods and different countries;
- Provide a tool to ensure completeness, consistency and comparability of basic statistics;
- Calculate efficiencies of transformation processes and relative shares of different sectors or products in the country's total supply or consumption.”

As per the latest estimates, the primary energy supply in India was 675 MToe in 2015-16.⁶ The four primary energy sources are coal, crude oil, natural gas, and renewable energy, with coal contributing 51%, crude oil 34%, natural gas 7%, and renewables 8%.⁷ Secondary sources of energy convert the primary sources for further use. These include petroleum products and electricity. The manufacturing sector was the major consumer with about a 57% share (MoSPI, 2021).

This technical note aims to correlate India's energy commodity balance in juxtaposition with the most recent CSEP India I-O Table 2015–16 to construct an Energy Input-Output Table (EIO). The corresponding year's energy balance data are given in *Energy Statistics 2017*(MoSPI, 2017). The conclusions may be used to design energy policies that would meet the declared climate change goals. This would facilitate emissions reduction by using more energy-efficient technologies or by shifting to renewable energy sources. Further work may include using the results from this note in a general equilibrium framework to compute the energy linkages across sectors caused by policy shocks.

³ The most recent data available from MoSPI are the Supply and Use Tables for 2015–16, which were used for the construction of the CSEP India I-O Table 2015–16 for the same year. Technical coefficients from this table would not change much in the medium-term.

⁴ Coal and petroleum products are measured in thousand tonnes, natural gas in million metric standard cubic metres (MMSCM) and electricity in gigawatt hours (GWh).

⁵ 1 Toe = 41,868 megajoules; 1 KToe = 1000 Toe; 1 MToe = 1000 KToe.

⁶ The corresponding value in 2019-20 is 946 MToe

⁷ The corresponding values in 2019-20 are 63%, 27%, 6%, and 4%, respectively.

Hybrid Energy Input-Output Model: Energy Flows

The standard energy input-output models estimate the total energy consumption as direct consumption in the production process and indirect consumption embodied in the inputs going into these sectors (Leontief inverse approach).⁸

The “hybrid approach” to an input-output model transforms the monetary input-output tables to the corresponding structure, which records the energy flows in physical units (in this case, kilotonnes of oil equivalent). In contrast, all other flows continue to be reported in monetary terms (Bullard and Herendeen, 1975; Miller and Blair, 2009).⁹ This exercise will show the total change in energy requirements for a given change in output of a sector. For example, for an increase in the output of textiles, the direct energy change includes increased electricity usage to operate more machinery. In contrast, the indirect energy requirements would account for the coal needed to produce that additional electricity.

Understanding the sectoral requirements of different types of energy would help understand future energy requirements through using energy-saving technologies and clean energy generation, including solar, wind, and hydro. One of the limitations of using input-output structure is that the Leontief production function assumes that the inputs are not substitutable (elasticity of substitution is zero). However, in practice, inputs can be substituted—for example, using grid-supplied electricity versus captive generation.

Juxtaposing the Energy Balance with the CSEP India I-O Table 2015–16

Energy Statistics 2017 (MoSPI 2017) provides the ECB and the EB for 22 intermediate sectors of the economy (Annex-1 and Annex-2, respectively). The intermediate sectors in these tables include six primary sectors, nine manufacturing sectors (including petroleum products), electricity generation, five transport sectors, and one sector for commercial and public services. The primary sectors include two agriculture and allied sectors (agriculture & forestry and fishing) and four mining and quarrying sectors (coal and lignite, crude petroleum, natural gas, and other mining).

The tables show the flows of quantities and energies of five broad energy sectors: coal and lignite, crude petroleum, petroleum products, natural gas, and electricity. While the ECB table has information on the quantity flows of nine oil products, the EB table provides consolidated oil equivalent values of the nine oil products as one category. The EB provides additional information on oil equivalents (KToe) of power generation by nuclear, hydro, and solar-wind sources. Crude oil flows are depicted in EB but not in ECB.

Some details on electricity and natural gas have been extracted from other sources. Annex-3 provides information on all-India electricity sales sourced from CEA (2018). Data on petroleum products and natural gas was taken from the *Indian Petroleum & Natural Gas Statistics 2019–20* (Annex-4).

Some issues were noticed in the ECB table in Annex-1, and steps were taken to rectify these issues (details provided in Annex-5). For example, the final consumption of electricity value is mentioned as 14,79,026 GWh in the ECB, which does not match the corresponding figure (10,01,191 GWh) mentioned in the CEA (2018) report (see Annex-3). Another major typo is the value of electricity consumed by industry (manufacturing and construction). While it is mentioned as 5,81,192 GWh in the ECB data, the correct value is 4,23,523 GWh (published in the CEA (2018) report). The base energy-use data was rectified accordingly.

Two matrices, each with dimensions 5 x 22 (representing the 5 energy sectors and 22 intermediate sectors), have been constructed using the data from the ECB and EB—one matrix represents the physical

⁸ See Chapter 2, “Foundations of Input-Output Analysis”, in Miller and Blair (2009).

⁹ See Chapter 9, “Energy Input-Output Analysis”, in Miller and Blair (2009).

quantity flows and the other the energy flows in oil equivalent terms. This was done by apportioning each energy sector's final domestic consumption using the CSEP India I-O Table 2015–16 proportions across all intermediate and final use sectors. The table was compressed from its 131 x 131 dimensions to 22 x 22 dimensions to align its sectors with the energy balance sectors. While the ECB and EB tables contained data on the intermediate and final energy consumption, they did not match the CSEP India I-O Table 2015–16 apportioning.

Annex-6 shows the concordance between the 131 sectors of the CSEP India I-O Table 2015–16 and the 22 sectors used for the EIO, Annex-7 shows the 22-sector CSEP I-O Table 2015–16, and Annex 8 shows both the 5 x 22 ECB and the 5 x 22 EB which were computed using MoSPI data and CSEP India I-O Table 2015–16 proportions.

The average basic price for each energy commodity was computed using the final consumption prices from the CSEP India I-O Table 2015–16 and final consumption quantities from the ECB. There were some discrepancies when compared to prices reported in other sources, as shown in Table 1. These include coal and lignite computed to be INR 2,300/tonne compared to INR 2,100/tonne, and petroleum products computed to be INR 42.50/litre compared to INR 24.00/litre.¹⁰ Further, the assumption made in this methodology is that all intermediate sectors pay the same basic price, which does not hold for certain energy commodities. For example, there are price differences between metallurgical coal and thermal coal. There is further scope to improve the ECB and EB in this regard.

Table 1: Prices of Energy Commodities – EIO and Reference Price Comparisons

Energy	Price from EIO (INRlakh)	Price from EIO (INR)	Reference Price 2015–16(INR)
Coal and lignite	23 / KT	2300 / T	2100 / T*
Crude Petroleum	247 / KT	24,700 / T	23,799 / T**
Natural Gas	106 / MMSCM	10.60 / m ³	10.04 / m ³ ***
Petroleum Products	490 / KT	42.50 / litre	24.00 / litre**
Electricity	52 / GWh	5.20 / KWh	5.21 / KWh***

* Coal Directory of India 2015–16 (MoC 2017)

**Indian Petroleum & Natural Gas Statistics 2019–20 (MoPNG 2020)

*** “Cost of state electricity supply in India FY 2009–2019” (Jaganmohan 2020)

Computing the Energy Requirements in the Economy

As mentioned earlier, the monetary unit approach computes the Leontief Inverse with energy units measured in rupee terms. On the other hand, the hybrid approach uses the I-O table to compute the Leontief Inverse in energy unit terms (i.e., KToe). The computed Leontief Inverse matrix provides the coefficients indicating the economy's direct and indirect energy requirements per rupee output.

\mathbf{X} is the vector of total outputs, and \mathbf{F} is the final demand vector (both 22 x 1 vectors, representing the 22 intermediate sectors). \mathbf{Z}_{ij} is the 22 x 22 matrix of intermediate monetary flows. The 22 x 22 direct input coefficients matrix is computed by dividing the monetary value inputs by the total monetary output ($\mathbf{A} = \frac{\mathbf{Z}_{ij}}{\mathbf{X}_i}$). To compute the total requirements matrix, i.e., the direct and indirect input coefficients, the Leontief Inverse, \mathbf{L} , is taken: $\mathbf{L} = (\mathbf{I} - \mathbf{A})^{-1}$

¹⁰ In the case of petroleum products, the input-output table seems to over-report the basic prices. The *Annual Survey of Industries 2015–16* shows a weighted average petroleum products basic price of INR 28/litre compared to the INR 24/litre weighted average reported by Indian Petroleum and Natural Gas Statistics. <https://mopng.gov.in/en/petroleum-statistics/indian-png-statistics>

The Leontief Inverse matrix consists of the Leontief coefficients for each sector. In the hybrid-units approach, there is a similar setup. X^* is the vector of total outputs, and F^* is the final demand vector. Energy flows are given in KToes and non-energy flows in rupee terms. Z^* is similar to the 22 x 22 matrix of intermediate flows in both KToe and rupee terms. A^* is computed by matrix multiplication: $A^* = Z^* \times (X^*)^{-1}$. Finally, the hybrid Leontief inverse, L^* , is found to compute the total requirements matrix (in KToe per rupee output): $L^* = (I - A^*)^{-1}$

The exercise results are shown in Tables 2 to 4, taking the resulting KToe values and converting them into their original quantity terms. Table 1 shows the total energy requirements of each of the 22 sectors, Table 2 shows their direct energy requirements, and Table 3 shows the indirect energy requirements (the difference between the values for each of the 22 sectors in Table 1 and Table 2).

Table 2: Total (Direct and Indirect) Energy Requirements of 22 Sectors

Sector	Direct and Indirect Energy Requirements (per INR lakh output)				
	Coal and lignite (kg)	Crude petroleum (litres)	Natural gas (m ³)	Petroleum products (litres)	Electricity (KWh)
Coal and lignite	416	152	26	134	409
Crude petroleum	484	141	22	78	450
Natural gas	463	276	46	234	567
Petroleum products	1074	2291	405	242	607
Electricity	2875	333	58	345	548
Agriculture and Forestry	178	93	15	65	441
Fishing	50	29	5	24	74
Mining and quarrying	454	195	32	151	568
Textile and leather	900	213	32	109	647
Paper, pulp, and print	2304	164	26	110	1042
Chemicals and pharmaceuticals	1056	769	105	125	479
Iron and steel	5058	228	39	205	968
Non-ferrous metals	3206	256	42	210	1813
Machinery	1337	176	30	152	1429
Construction	789	134	22	112	743
NEC industry	1465	188	31	134	1015
Railway transport	1028	146	25	150	1214
Land transport	399	439	77	466	548
Water transport	796	234	40	223	1552
Air transport	731	338	59	346	2623
NEC transport	430	286	50	300	1400
Commercial and public services	342	124	21	107	688

Table 3: Direct Energy Requirements of 22 Sectors

Sector	Direct Energy Requirements (per INR lakh output)				
	Coal and lignite (kg)	Crude petroleum (litres)	Natural gas (m ³)	Petroleum products (litres)	Electricity (KWh)
Coal and lignite	57	0	0	74	69
Crude petroleum	0	0	0	12	172
Natural gas	0	0	0	149	289
Petroleum products	520	2016	359	147	169
Electricity	2213	1	0	250	133
Agriculture and forestry	0	0	0	25	273
Fishing	0	0	0	4	0
Mining and quarrying	38	0	0	84	210
Textile and leather	426	0	0	21	269
Paper, pulp, and print	1340	0	0	17	503
Chemicals and pharmaceuticals	469	422	54	36	102
Iron and steel	3489	0	0	79	413
Non-ferrous metals	1714	0	0	67	1157
Machinery	271	0	0	42	845
Construction	2	0	0	17	267
NEC industry	668	2	1	23	432
Railway transport	691	0	0	91	994
Land transport	0	0	0	383	206
Water transport	0	0	0	115	1000
Air transport	0	0	0	206	2101
NEC transport	0	0	0	199	1062
Commercial and public services	69	2	0	54	457

Table 4: Indirect Energy Requirements of 22 Sectors

Sector	Indirect Energy Requirements (per INR lakh output)				
	Coal and lignite (kg)	Crude petroleum (litres)	Natural gas (m ³)	Petroleum products (litres)	Electricity (KWh)
Coal and lignite	359	152	26	60	340
Crude petroleum	484	141	22	66	278
Natural gas	463	276	46	85	278
Petroleum products	554	275	46	95	438
Electricity	662	332	58	95	415
Agriculture and forestry	178	93	15	40	169
Fishing	50	29	5	20	74
Mining and quarrying	416	195	32	67	358
Textile and leather	473	213	32	88	378
Paper, pulp, and print	964	164	26	93	539
Chemicals and pharmaceuticals	587	347	50	89	378
Iron and steel	1569	228	39	126	556
Non-ferrous metals	1492	256	42	143	656
Machinery	1065	176	30	110	584
Construction	786	134	22	95	476
NEC industry	797	185	30	111	583
Railway transport	338	146	25	59	220
Land transport	399	439	77	84	342
Water transport	796	234	40	108	553
Air transport	731	338	59	141	522
NEC transport	430	286	50	101	338
Commercial and public services	273	122	21	53	232

Policy Implications

The results in this note show the direct, indirect, and total energy requirements across the production sectors through the computation of Leontief coefficients from an input-output model table. The analysis helps understand the energy intensity of each of the sectors. This enables the computation of energy savings through using more efficient technologies, which would have energy-saving impacts on other sectors of the economy through inter-linkages. The EIO table constructed in this note can be used to provide the energy-use projections for the future.

Results from this note may be used for partial and general equilibrium models (PE and GE) to analyse the impacts of climate-change mitigation policies on the economy, people, and environment. While the PE accounting framework and models provide information on the impact on a single sector, the GE models address the effects on all the sectors through inter-linkages across sectors of production and changing consumption patterns. Examples of PE include the sectoral studies of the impact of emissions from power generation and steel manufacturing on human health. However, such studies limit the understanding of inter-sectoral linkages. Hence, it is pertinent to use a GE accounting framework that considers the backward and the forward links of one sector, say production of petroleum products, with all other sectors of the economy. Other examples include understanding the impact of sectoral output changes, capital formation, employment, trade, income levels, and increasing consumption baskets.

Future Work

Further research is underway to disaggregate relevant sectors, including renewable energy, biomass, and some energy-intensive manufacturing sectors. The CO₂ equivalent of the GHG emissions (CO₂e) from each sector shall be computed, including emissions from industrial processes, agriculture, waste, and mitigation through carbon sinks. Data issues regarding captive coal mining and electricity generation by the non-utility sectors and non-energy uses of natural gas and petroleum products need to be fine-tuned.

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Annex-1: Energy Commodity Balance 2015–16 in Energy Statistics 2017

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

(P): Provisional

Statistical Difference= Estimated Production - Estimated Consumption. Final consumption = Transformation+Energy sector+Total Industrial. Consumption+Consumption by Other sectors+Non energy Use.

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

Source: MoSPI (2017)

Annex-2: Energy Balance 2015-16 in *Energy Statistics 2017*

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

P: Provisional

Source: MoSPI (2017)

Annex-3: Electricity Usage by Sector in All India Electricity Statistics: General Review 2018

Category	Energy Sold During 2016-17 (GWh)	% of Total Sold in 2016-17	Energy Sold During 2015-16 (GWh)	% of Total Sold in 2015-16	& Increase in Sale over Previous Year 2015-16
Domestic	255826.01	24.11	238875.69	23.86	7.10
Commercial	89824.93	8.46	86036.57	8.59	4.40
Industrial Power	440205.52	41.48	423522.94	42.30	3.94
Public Lighting	9399.12	0.89	8931.25	0.89	5.24
Railway/ Tramways	15682.75	1.48	16594.33	1.66	-5.49
Agriculture	1911 50.89	18.01	173185.37	17.30	10.37
Public Water Works & Sewage Pumping	19410.91	1.83	20121.58	2.01	-3.53
Miscellaneous	39682.51	3.74	33922.96	3.39	16.98
Total	1061182.64	100.00	1001190.68	100.00	5.99

Source: CEA (2018)

Annex-4: Consumption of Natural Gas in Indian Petroleum & Natural Gas Statistics 2019-20

Sector	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20 (P)	% Share of Total 2019-20
1	2	3	5	6	7	8	9	
(a) Energy Purpose								
Power	11284	10720	10889	11616	12028	12005	11029	19.5
Industrial & Manufacturing	261	533	545	794	999	1086	701	1.2
City or Local natural Gas	5904	5416	5464	7350	8585	9206	10883	19.3
Distribution Network incl. Road Transport								
Tea Plantation	196	180	187	183	189	192	200	0.4
Internal Consumption for Pipeline System	372	351	410	471	496	541	525	0.9
Refinery	3968	4574	5077	5374	6533	7047	7786	13.8
LGP Shrinkage	982	1005	754	759	798	874	858	1.5
Miscllaneous	7479	5941	4112	3746	3226	3393	4209	7.5
Total (a)	30446	28721	27437	30294	32855	34343	36191	64.1
(b) Non-Energy Purpose								
Fertilizer Industry	15869	15190	16135	15429	14676	14987	16115	28.6
Petrochemical	2405	2890	3733	4170	4024	3386	3569	6.3
Sponge Iron	274	154	544	885	1278	1124	567	1.0
Total (b)	18548	18234	20412	20484	19978	19497	20251	35.9
Total Sectoral Sales (a+b)	48994	46955	47850	50778	52832	52832	53840	100.0
Total Consumption**	52375	51300	52517	55697	59170	60798	64143	-
Total Consumption in MMSCMD	143.49	140.55	143.49	152.59	162.11	166.57	175.26	-

Note. **Availability Basis (Net Production+LNG Imports)

P: Provisional

Source: MoPNG (2020)

Annex-5: Data Issues with the Energy Commodity Balance and Energy Balance

As mentioned earlier, this paper considers five energy sectors, namely coal and lignite, crude petroleum, petroleum products, natural gas, and electricity. The corresponding data are available in the EB, ECB, and the CSEP I-O Table 2015-16. Data issues were noted in three sectors:

- Petroleum products:
 - ECB shows Petrol/Motor Spirit is only used by non-specified transport. Data in “Indian Petroleum & Natural Gas Statistics 2019–20” (MoPNG, 2020) shows that this should be allocated to road transport and domestic consumption. The split has been done based on the CSEP I-O Table 2015-16 proportions and the conversion factor (from KT to KToe values) from the Engineering Toolbox.
- Natural gas:
 - Issues with use of natural gas by ‘Energy Sector’. In the ECB, 5,077 MMSCM goes to petroleum refineries, and 4,110 MMSCM goes to the Other Energy sector. It is unclear as to which sectors the ‘Other Energy sector’ refers. The data (MoPNG, 2020) matches the ECB and shows that 5,077 MMSCM goes to refineries, and 4,112 MMSCM goes to the sectors grouped as Miscellaneous. This flow has been allocated to coal, crude, and natural gas using the CSEP I-O Table 2015-16 proportions.
 - The data (MoPNG, 2020) shows that 20,412 MMSCM of natural gas is used by non-energy sectors, compared to the 21,166 MMSCM shown in the ECB. Using the ECB data, the sectors segregation ratios are taken from the MoPNG (2020) data (97% used by chemicals and 3% used iron and steel). The EB value was split in the same ratio.
 - Some of the non-energy uses of natural gas and petroleum products are included in the EB and ECB reporting.
 - The use of natural gas by land transport and households were allocated to the petroleum sector to be consistent with the format of the input-output table. The CSEP I-O Table 2015–16 considers natural gas to be the primary extraction sector, and the end-use of natural gas (such as for fuel and home use) is done through the petroleum products sector.
- Electricity:
 - The data for electricity used by industry is incorrect in the ECB—it is given as 5,81,192 GWh, while it should be 4,23,523 GWh, as given by *All India Electricity Statistics: General Review 2018* data for 2015–16 (CEA, 2018).
 - Both the ECB and EB allocate all electricity use by industry under ‘Non-Specified (Industry)’, which is incorrect. The data was segregated amongst all industrial sectors using the CSEP I-O Table 2015–16 proportions.
 - The EB does not give a value for the electricity industry’s own use, while it does so in the ECB (electricity used in electricity plants). This refers to the use of electricity by auxiliary equipment in the power plants. The corresponding value for the EB was computed using the constant conversion factor that has been applied for the electricity sector.
 - Distribution losses have been allocated to the industrial and household sectors in proportion to their electricity demands.

Annex-6: Concordance between 131 Input-Output Sectors and 22 Energy Statistics Sectors

#	Input-Output Table	Intermediate Mapping	Energy Statistics
1	Paddy	Agriculture and logging	Agriculture and logging
2	Wheat		
3	Jowar		
4	Bajra		
5	Maise		
6	Gram		
7	Pulses		
8	Sugarcane		
9	Groundnut		
10	Coconut		
11	Other oilseeds		
12	Jute		
13	Cotton		
14	Tea		
15	Coffee		
16	Rubber		
17	Tobacco		
18	Fruits		
19	Vegetables		
20	Other crops		
21	Milk and milk products		
22	Poultry and eggs		
23	Other livestock products		
24	Animal services		
25	Forestry and logging		
26	Fishing and Aquaculture	Fishing and aquaculture	Fishing and aquaculture
27	Coal and lignite	Coal and lignite	Coal and lignite
28	Crude petroleum	Crude petroleum	Crude petroleum
29	Natural gas	Natural gas	Natural gas
30	Iron ore	Mining	Mining
31	Manganese ore		
32	Bauxite		
33	Copper ore		
34	Other metallic minerals		
35	Limestone		
36	Mica		
37	Other non-metallic minerals		

47	Khadi, cotton textiles(handlooms)	Textile and leather products	Textile and leather products
48	Cotton textiles		
49	Woollen textiles		
50	Silk textiles		
51	Artificial silk, synthetic fibre textiles		
52	Jute, hemp, mesta textiles		
53	Carpet weaving		
54	Miscellaneous textile products		
55	Readymade garments		
60	Leather footwear		
61	Leather and leather products		
57	Paper, paper products and newsprint	Paper, pulp and print	Paper, pulp and print
58	Publishing, printing and allied activities		
64	Petroleum products	Petroleum products	Petroleum products
66	Inorganic heavy chemicals	Chemicals and pharma	Chemicals and pharma
67	Organic heavy chemicals		
68	Fertilisers		
69	Pesticides		
70	Paints, varnishes and lacquers		
71	Soaps, cosmetics and glycerine		
72	Synthetic fibres, resin		
73	Other chemicals		
74	Drugs and medicine		
78	Iron, steel and ferro alloys	Iron and steel	Iron and steel
79	Iron and steel casting and forging		
80	Iron and steel foundries		
81	Non-ferrous basic metals (including alloys)	Non-ferrous basic metals (including alloys)	Non-ferrous basic metals (including alloys)
82	Hand tools, hardware	Machinery	Machinery
83	Miscellaneous metal products		
84	Tractors and agri. implements		
85	Industrial machinery(F&T)		
86	Industrial machinery(others)		
87	Machine tools		
88	Other non-electrical machinery		
89	Electrical industrial machinery		
90	Electrical wires and cables		
91	Batteries		
92	Other electrical machinery		
93	Electrical appliances		
94	Electronic equipment(including TV)		
95	Watches and clocks		
96	Communication equipment		

38	Sugar	Food and tobacco	
39	Khandsari, boora		
40	Hydrogenated oil (vanaspati)		
41	Edible oils other than vanaspati		
42	Tea and coffee processing		
43	Miscellaneous food products		
44	Grain mill products, starch and starch products		
45	Beverages		
46	Tobacco products		
56	Wood and wood products except furniture	Wood products	Misc. industry
59	Furniture and fixtures		
62	Rubber products	Rubber and plastic	
63	Plastic products		
65	Coal tar products	Non-metallic mineral products	
75	Structural clay products		
76	Cement		
77	Other non-metallic mineral products		
97	Ships and boats	Transport equipment	
98	Rail equipment		
99	Motor vehicles		
100	Motorcycles and scooters		
101	Bicycles, cycle-rickshaw		
102	Other transport equipment		
103	Aircraft and spacecraft		
104	Medical, precision and optical instruments	Misc. industry	
105	Gems and jewellery		
106	Miscellaneous manufacturing		
107	Construction and construction services	Construction and construction services	Construction and construction services
108	Electricity	Electricity	Electricity
110	Railway transport	Railway transport	Railway transport
111	Land transport	Land transport	Land transport
112	Water transport	Water transport	Water transport
113	Air transport	Air transport	Air transport
114	Supportive and auxiliary transport activities	Misc. transport	Misc. transport

109	Water supply	Commerce and public services	Commerce and public services
115	Storage and warehousing		
116	Communication services		
117	Trade		
118	Hotels and restaurant		
119	Financial services		
120	Insurance services		
121	Ownership of dwellings		
122	Education and research		
123	Medical and health		
124	Legal services		
125	Computer-related services		
126	Other business services		
127	Real estate services		
128	Renting of machinery and equipment		
129	Community, social and personal services		
130	Other services		
131	Public administration and defence		

Annex-7: 22-Sector Input-Output Table India 2015-16

Input Output Table 2015-16 (₹ lakhs)		1	2	3	4	5	6	7	8
		Agriculture + Forestry	Fishing	Coal and lignite	Crude petroleum	Natural gas	Mining and quarrying	Textile and leather	Paper, pulp and print
1	Agriculture + Forestry	30796906	634455	0	0	0	0	8224514	296634
2	Fishing	0	289311	0	0	0	0	220	37
3	Coal and lignite	0	0	14685	0	0	16936	769887	485126
4	Crude petroleum	0	0	0	76	33	0	0	0
5	Natural gas	0	0	0	399	107	0	0	0
6	Mining and quarrying	0	561464	0	283461	217728	0	201	1620
7	Textile and leather	57775	4158	117662	2067	2089	48479	12822562	10943
8	Paper, pulp and print	84174	0	7337	245	75	104596	63963	4076475
9	Petroleum products	3090583	30277	366216	80552	335606	726234	748984	120936
10	Chemicals and pharma	10911758	45476	288463	1358218	422984	1401330	10251800	884015
11	Iron and Steel	0	0	0	641657	156060	0	9053	18346
12	Non-ferrous metals	1515	0	0	0	0	0	7666	222616
13	Machinery	617907	31590	840040	107945	36207	2450999	1318741	263426
14	Construction	1773651	0	21339	4213	4264	24037	142935	512071
15	NEC Industry	3831578	27579	874595	330779	5200	543319	2047650	695563
16	Electricity	3927639	0	40498	131413	76779	214737	1110885	416146
17	Railway transport	559101	4528	60232	326717	134692	155204	114945	36675
18	Land transport	5128730	218032	208087	489846	262058	479678	3586381	530483
19	Water Transport	218460	5360	4791	20577	7564	7224	11305	12990
20	Air transport	52659	105	3726	40709	16653	9956	54879	8729
21	NEC Transport	486231	20723	20816	60593	84353	51405	366440	49915
22	Commercial and public services	18500993	345913	1453974	1622115	209232	1421838	6647320	1250905
	Total Inputs	80039660	2218971	4322461	5501580	1971684	7655971	48300329	9893649
	NIT	-5135155	49329	181979	372379	68401	352986	1163979	348053
	GVA	200222114	13105400	6690460	8724610	3030145	11528743	29283739	5543180
	Total Outputs	275126620	15373700	11194900	14598569	5070230	19537700	78748047	15784882

Input Output Table 2015-16 (₹ lakhs)		9	10	11	12	13	14	15	16
		Petroleum products	Chemicals and pharma	Iron and Steel	Non-ferrous metals	Machinery	Construction	NEC Industry	Electricity
1	Agriculture + Forestry	531	8084552	25675	505	87751	15041657	56992958	992635
2	Fishing	272	657103	2	0	179	84	1822565	10183
3	Coal and lignite	1351007	1318086	4556497	1021024	583325	15133	4649086	3468055
4	Crude petroleum	46537048	10551925	0	0	0	0	147259	12159
5	Natural gas	4303373	705866	0	0	0	0	32091	1142
6	Mining and quarrying	205	53460	4903461	2201368	2317489	6454960	4475292	44905
7	Textile and leather	62800	1187455	13384	8517	131447	117521	863552	198069
8	Paper, pulp and print	511172	234528	63536	11330	178568	78429	906209	919896
9	Petroleum products	7382458	1964603	2009713	775385	1745688	1998232	3055919	7590381
10	Chemicals and pharma	2770944	40723819	1373901	1455348	2293908	4098793	16421790	59624
11	Iron and Steel	1967136	490973	13280246	3709202	5640754	20002155	8645493	4138265
12	Non-ferrous metals	55	581846	875309	1729540	10154191	6467	11707070	17295
13	Machinery	2210927	948443	1301513	564199	6163059	9085230	12357054	263639
14	Construction	1321738	408889	1016222	1032897	1231662	2634	2757315	2854448
15	NEC Industry	1964270	3903829	1599334	1927813	3976311	35222475	43279009	746286
16	Electricity	1001335	651914	1230330	1573721	4147030	3766961	6865850	476567
17	Railway transport	1802476	471465	496514	396836	463285	1162811	2079031	940030
18	Land transport	1911711	2896595	1091993	733025	3034485	11164036	13586440	1318884
19	Water Transport	159370	85047	36343	30889	23054	293789	331628	136200
20	Air transport	804778	257796	140795	102334	407198	95832	752927	32293
21	NEC Transport	181142	258268	98391	62848	218795	1123135	1109148	129723
22	Commercial and public services	7098768	6413743	5696077	2598071	10400432	50245416	36113120	15761063
	Total Inputs	83343515	82850205	39809237	19934852	53198610	159975750	228950807	40111740
	NIT	8421245	5990418	8024434	1269031	3921484	8904417	5603905	1244292
	GVA	21481268	33732538	9119567	4775828	36602456	100429800	69013512	26999700
	Total Outputs	113246028	122573161	56953238	25979711	93722549	269309967	303568224	68355732

Input Output Table 2015-16 (₹ lakhs)		17	18	19	20	21	22		
		Railway transport	Land transport	Water Transport	Air transport	NEC Transport	Commercial and public services	IIUSE	PFCE
1	Agriculture + Forestry	0	2399042	0	0	0	35878885	159456700	114790586
2	Fishing	0	0	0	0	0	364803	3144759	11916419
3	Coal and lignite	239368	0	0	0	0	1449082	19937297	120686
4	Crude petroleum	0	0	0	0	0	290062	57538562	0
5	Natural gas	0	0	0	0	0	27251	5070230	0
6	Mining and quarrying	0	0	0	0	11	1124202	22639825	0
7	Textile and leather	145264	375614	32954	238960	55153	1856712	18353137	44974350
8	Paper, pulp and print	191043	1270436	35165	222732	158884	5018615	14137408	3567751
9	Petroleum products	614012	15222310	112640	763686	1690530	21939779	72364724	29859501
10	Chemicals and pharma	0	0	0	0	0	21567095	116329265	8688654
11	Iron and Steel	0	0	7	0	8	1669622	60368976	0
12	Non-ferrous metals	0	0	0	0	15	1682110	26985693	0
13	Machinery	56568	364530	10069	202130	198145	8632963	48025322	7894893
14	Construction	581332	346391	15205	188957	334444	15296814	29871459	0
15	NEC Industry	148889	3440461	685564	170036	222279	18821237	124464056	126823288
16	Electricity	786819	964387	115137	919436	1062666	21899547	51379798	16751479
17	Railway transport	25050	71420	627	7465	49227	2279547	11637876	2061931
18	Land transport	195102	1009901	54589	457148	1101667	19178173	68637047	12558116
19	Water Transport	4816	101380	308	5726	1317	1055224	2553361	344415
20	Air transport	1979	14205	405	1555	4500	2013364	4817376	2466353
21	NEC Transport	3751	76327	721	6558	20319	563290	4992890	9537352
22	Commercial and public services	1902398	18955782	394892	3079948	4618739	122976045	317706784	368504150
	Total Inputs	4896392	44612185	1458283	6264335	9517903	305584424	1240412545	760859926
	NIT	175008	3493119	6117	56665	172192	10560203	55244479	13269303
	GVA	10043700	41433495	735300	2035000	9413900	600009856	1243954311	0
	Total Outputs	15115100	89538800	2199700	8356000	19103995	916154482	2539611335	774129229

Input Output Table 2015-16 (₹ lakhs)									
		GFCE	GFCF	CIS	Exports	Valuables	Less Imports	TFUSE	Supply
1	Agriculture + Forestry	0	406085	1090156	3488747	0	4105654	115669920	275126620
2	Fishing	0	0	0	350831	0	38309	12228941	15373700
3	Coal and lignite	0	0	0	75406	0	8938489	-8742397	11194900
4	Crude petroleum	0	0	0	0	0	42939993	-42939993	14598569
5	Natural gas	0	0	0	0	0	0	0	5070230
6	Mining and quarrying	0	0	858438	879930	0	4840493	-3102125	19537700
7	Textile and leather	0	360718	1034718	18410730	0	4385606	60394910	78748047
8	Paper, pulp and print	0	0	273555	768612	0	2962444	1647474	15784882
9	Petroleum products	0	0	3489991	18642288	0	11110475	40881304	113246028
10	Chemicals and pharma	0	0	4524392	17250372	0	24219522	6243896	122573161
11	Iron and Steel	0	0	1067088	5324398	0	9807223	-3415738	56953238
12	Non-ferrous metals	0	0	460676	2684453	0	4151111	-1005982	25979711
13	Machinery	0	71140272	2559694	14305460	0	50203090	45697227	93722549
14	Construction	0	230663187	8935731	600763	0	761172	239438508	269309967
15	NEC Industry	0	54746981	4605124	52495260	21760963	81327448	179104168	303568224
16	Electricity	0	0	0	224455	0	0	16975934	68355732
17	Railway transport	0	379674	0	1002860	32759	0	3477224	15115100
18	Land transport	0	844529	0	7328336	170771	0	20901753	89538800
19	Water Transport	0	18880	0	3753577	3490	4474023	-353661	2199700
20	Air transport	0	90940	0	2599259	5637	1623564	3538624	8356000
21	NEC Transport	0	2440896	0	2105346	27511	0	14111105	19103995
22	Commercial and public services	142258221	22425730	0	106892401	302767	41935571	598447698	916154482
	Total Inputs	142258221	383517893	28899561	259183481	22303897	297824187	1299198791	2539611335
	NIT	456236	11652791	0	13680604	523812	0	39582746	94827226
	GVA	0	0	0	0	0	0	0	1243954311
	Total Outputs	142714457	395170684	28899561	272864086	22827708	297824187	1338781537	3878392872

Annex-8: Energy Balance and Energy Commodity Balance 2015-16

Energy Input Output Table 2015-16		1	2	3	4	5	6	7	8
		Agriculture + Forestry	Fishing	Coal and lignite	Crude petroleum	Natural gas	Mining and quarrying	Textile and leather	Paper, pulp and print
Energy Flows (KToe)									
1	Coal and lignite	0	0	417	0	0	481	21888	13792
2	Crude petroleum	0	0	0	0	0	0	0	0
3	Natural gas	0	0	0	3	1	0	0	0
4	Petroleum products	5928	58	702	155	644	1393	1437	232
5	Electricity	6451	0	67	216	126	353	1825	683
Energy Flows (KT, KT, MMSCM, KT, GWh)									
1	Coal and lignite	0	0	640	0	0	738	33570	21153
2	Crude petroleum	0	0	0	0	0	0	0	0
3	Natural gas	0	0	0	4	1	0	0	0
4	Petroleum products	5739	56	680	150	623	1349	1391	225
5	Electricity	75008	0	773	2510	1466	4101	21215	7947

Energy Input Output Table 2015-16		9	10	11	12	13	14	15	16
		Petroleum products	Chemicals and pharma	Iron and Steel	Non-ferrous metals	Machinery	Construction	NEC Industry	Electricity
Energy Flows (KToe)									
1	Coal and lignite	38409	37473	129540	29027	16584	430	132173	98596
2	Crude petroleum	188341	42705	0	0	0	0	596	49
3	Natural gas	37357	6128	0	0	0	0	279	10
4	Petroleum products	14161	3768	3855	1487	3349	3833	5862	14560
5	Electricity	1645	1071	2021	2585	6811	6187	11276	783
Energy Flows (KT, KT, MMSCM, KT, GWh)									
1	Coal and lignite	58909	57473	198680	44520	25435	660	202717	151220
2	Crude petroleum	188341	42705	0	0	0	0	596	49
3	Natural gas	40612	6661	0	0	0	0	303	11
4	Petroleum products	13710	3648	3732	1440	3242	3711	5675	14096
5	Electricity	19123	12450	23496	30054	79198	71940	131121	9101

Energy Input Output Table 2015-16		17	18	19	20	21	22		
		Railway transport	Land transport	Land transport	Air transport	NEC Transport	Commercial and public services	IIUSE	PFCE
Energy Flows (KToe)									
1	Coal and lignite	6805	0	0	0	0	41197	566813	3431
2	Crude petroleum	0	0	0	0	0	1174	232865	0
3	Natural gas	0	0	0	0	0	237	44014	0
4	Petroleum products	1178	29199	216	1465	3243	42085	138809	57276
5	Electricity	1292	1584	189	1510	1745	35968	84386	27512
Energy Flows (KT, KT, MMSCM, KT, GWh)									
1	Coal and lignite	10437	0	0	0	0	63185	869338	5262
2	Crude petroleum	0	0	0	0	0	1174	232865	0
3	Natural gas	0	0	0	0	0	257	47849	0
4	Petroleum products	1140	28269	209	1418	3139	40743	134386	55451
5	Electricity	15026	18417	2199	17559	20294	418228	981229	319913

Energy Input Output Table 2015-16									
		GFCE	GFCF	CIS	Exports	Valuables	Less Imports	TFUSE	Supply
Energy Flows (KToe)									
1	Coal and lignite	0	0	0	2144	0	254119	-248545	318269
2	Crude petroleum	0	0	0	0	0	173783	-173783	59082
3	Natural gas	0	0	0	0	0	0	0	44014
4	Petroleum products	0	0	6694	35759	0	21312	78418	217227
5	Electricity	0	0	0	369	0	0	27881	112267
Energy Flows (KT, KT, MMSCM, KT, GWh)									
1	Coal and lignite	0	0	0	3288	0	389750	-381200	488138
2	Crude petroleum	0	0	0	0	0	173783	-173783	59082
3	Natural gas	0	0	0	0	0	0	0	47849
4	Petroleum products	0	0	6481	34620	0	20633	75919	210305
5	Electricity	0	0	0	4287	0	0	324199	1305429

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6, Dr Jose P. Rizal Marg, Chanakyapuri, New Delhi - 110021, India



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