सत्यमेव जयते

DATA FOR DEVELOPMENT

Report of the Expert Committee on Energy Statistics

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Government of India
Ministry of Statistics and Programme Implementation
National Statistical Office
Economic Statistics Division
https://www.mospi.gov.in

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Annexures

Acronyms

AEEE	Alliance for an Energy Efficient Economy	**IEA**	International Energy Agency
AQES	Annual Questionnaire on Energy Statistics	**IRES**	International Recommendation for Energy Statistics
ASI	Annual Survey of Industries	**IS**	International Standard
BEE	Bureau of Energy Efficiency	**ISIC**	International Statistical Industrial Classification of all Economic Activities
BIS	Bureau of Indian Standards	**ISM**	Indian School of Mines
CBG	Compressed Bio-gas	**ISP**	Indian Standard Procedure
CIL	Coal India Limited	**Ktoe**	Kilo Tonnes of Oil Equivalent
CIMFR	Central Mine Planning & Design Institute	**NIC**	National Industrial Classification
CMPDIL	Central Mine Planning & Design Institute	**PAT**	Perform Achieve Trade
DISCOM	Distribution Company	**PPAC**	Petroleum Planning and Analysis Cell
ESD	Economic Statistics Division	**SEEI**	State Energy Efficiency Index
EV	Electric Vehicle	**SIEC**	Standard International Energy-product Classification
GCV	Gross Calorific Value	**TERI**	The Energy Research Institute
GSI	Geologicla Survey of India	**TFC**	Total Final Consumption
HCES	Household Consumption Expenditure Survey	**TPES**	Total Primary Energy Supply
HSD	High Speed Diesel	**UNSC**	United Nation Statistical Commission

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प्रोफ़ेसर, ऊर्जा विज्ञान एवं अभियांत्रिकी विभाग
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Message

Energy is essential for any activity and critical for the development of the economy. The Energy Statistics India publication of the Ministry of Statistics & Program Implementation provides a consolidated and integrated source of data on production, supply and consumption of energy. In the context of India's ambitious targets for renewables and net zero, it is important that we understand the nature of the energy transition and have clarity on the energy supply and demand. Since several ministries and organisations are involved in different energy sectors of supply and demand there are often discrepancies and gaps in methodologies and data protocol. In this context the Government appointed an Expert Committee on Energy Statistics to provide a detailed technical review of the publication, including its coverage, definitions, classification systems, data sources and estimation methodologies. Particular attention was paid to identifying data gaps, emphasising the harmonization of the database, improving sectoral granularity, enhancing consistency across datasets and aligning domestic practices with international reporting standards.

The recommendations of the Expert Committee are aimed at strengthening the methodological soundness, inter-Ministerial data-consistency and analytical usefulness of energy statistics, while also improving the inter-agency coordination. I believe these recommendations will be useful to policymakers, researchers and industry in supporting evidence-based decision-making and in further strengthening India's energy statistics system.

Date: 18.06.2026

(Rangan Banerjee)

Acknowledgements

On behalf of the Expert Committee on Energy Statistics, I would like to acknowledge the support of all members of the Committee representing various ministries, institutions, organizations, the Chairman and Members of the Sub Committee of Coal, the different task teams constituted for a comprehensive evaluation of the existing system and coming up with suggestions on aspects like methodologies for capturing the statistics on Bio-fuel, consumption of electricity via decentralized/off-grid mode, roadmap for capturing demand side of energy-statistics, consumption of electricity in EVs etc. The active participation, relentless efforts and invaluable contributions of all the members has remained instrumental in shaping this report at its desired form.

The diverse perspectives and in-depth discussions provided by the members have greatly enriched the quality, accuracy and relevance of the final output. This report is the culminating form of the synergic effort and collaboration among its' all members and participants.

I personally express my sincere thanks to the Ministry of Statistics and Programme Implementation (MoSPI) for timely constitution of this Committee and the taking initiative to find a feasible solution to many of the arduous issues of the existing Energy Statistics database of India. I believe that the findings of this report will immensely assists to make a good stride forward to resolve the data-issues and come-up with a sound energy-Statistics database of India.

Dr. Rangan Banerjee

Director, IIT-Delhi

Chairman of the Expert Committee on Energy Statistics

Summary of Recommendations

The Expert Committee on Energy Statistics under the Chairmanship of Dr. Rangan Banerjee, Director, IIT-Delhi along with representatives from all the line energy-Ministries and domain experts had an extensive review and deliberations on the major data-issues and inconsistencies in the existing energy-Statistics database of India. The Committee reviewed these major areas and made the following recommendations:

- ***Meeting International Standards on Energy data:***

  i) Uniform adoption of sectoral-end-use categories for reporting consumption of energy-commodities:

  Recommendation: In order to ensure uniformity and harmonization in the energy-Statistics database of India, all the line energy-Ministries should capture the statistics on standard sectoral end-use consumption of energy-commodities. The Table 4(refer page no-7) provides the disaggregated level end-use consuming sectors which are in accordance with the ISIC Rev. 5 and NIC-2025. The Committee recommended the line energy-Ministries to report data as per these categories.

  ii) Use of Standard International Energy-product Classification (SIEC):

  Recommendation: A concordance between the domestic classification of energy-commodities with the International standards of SIEC, prescribed under IRES, needs to be developed. The same is indispensable for harmonising the database and international comparison.

  iii) Conversion Factors of energy-commodities:

  Recommendation: The use of uniform conversation factors among all the energy-Ministries is indispensable to ensure inter-consistency of statistics across databases maintained by them in terms of energy-units. The Committee reviewed and recommended the conversion factors maintained by MoSPI in its' annual publication 'Energy Statistics India' (refer *Annexure – VI*) for their adoption by other line energy-Ministries.

- ***Filling up gaps in energy database:***

  i) Data-gap in capturing the end-use consumption of domestic and imported Coal into different end-use sectors:

  Recommendation: The methodology (refer *Annexure -III*) recommended by the Committee using the ASI database of MoSPI to bridge the above-mentioned data-gap, may be used by

MoSPI in its' annual publication of Energy Statistics India, till more structured and time-series statistics from PAT (Perform, Achieve and Trade) from BEE, M/o Power is available.

ii) **Data-gap in capturing the end-use consumption of High-Speed Diesel (HSD) against Retailers/Resellers:**

Recommendations: Based on the survey conducted during Oct-20 to Sep-21, the CRISIL report submitted to PPAC, MoPNG provides distribution of consumption figure of HSD sold to Retail/Resellers, into different end-use consuming sectors. MoSPI may adopt this categorization till better and more recent data becomes available. The Committee also recommended PPAC/MoPNG to conduct such studies more frequently to update these data.

iii) Non - capture of consumption of electricity against sub-sectors under Industry:

Recommendation: At present CEA and DISCOM do not maintain the industry-wise consumption of electricity. A methodology to estimate industry-wise consumption using the ASI database of MoSPI (refer *Annexure -III*) has been developed. The Committee reviewed and recommended the methodology to estimate the consumption of electricity into different sub-sectors under Industry.

iv) Incorporating the component of Bio-fuel:

Recommendation: The statistics on Bio-fuel should be captured using the methodology proposed under the study report (refer *Annexure -VIII*) by MNRE and TERI. The Committee recommends to use the same while preparing the energy-profile at the national level.

v) Capturing the Demand side consumption of Energy statistics:

Recommendation: The BEE and AEEE in their report (refer *Annexure IX*) have provided a structured framework, for streamlining the energy-Statistics database of India in order to capture the demand side of the energy-Statistics. The framework may be developed and detailed for its' effective implementation.

vi) Incorporating the Bunker Data in the Energy Balance table of India:

Recommendation: The statistics available under the different tables of IPNG Statistics from PPAC, MoPNG should be used by MoSPI for preparation of Energy Balance table at national level.

vii) Estimation of Off-grid energy consumption:

Recommendation: In the report prepared by Prayas and TERI, a methodology has been developed to capture the off-grid energy-consumption in India. The same may be used as the first-cut for better refinement and adaptation by the line energy-Ministries.

viii) The electricity demand in Electric Vehicles (EVs) of India:

Recommendation: In line with the International commitments made by Govt. of India, the vision like EV30@30, its' indispensable to systematically estimate and disseminate the electricity consumption by EVs in India. The methodology proposed in the report (refer *Annexure-XI*) may be further refined for more accurate and structured statistics and effective policy intervention.

- ***Resolving the inconsistencies across energy-datasets:***

i) "Per Capital Electricity Consumption of India" published by CEA and MoSPI:

Recommendation: The conceptual different between the two Ministries under GoI, in deriving the final Indicator, needs to be explicitly stated. Both the Ministries under of GoI may come-out with their compiled figures mentioning the methodology adopted, for avoiding any confusion among the reader community.

ii) Methodological difference of "Average calorific value" of Coal used in Power Station between CEA, MoP and ESD, MoSPI:

Recommendation: Since the sampling process at *loading/dispatch* points of Coal is as per the *laid-down-procedures* by MoC and also the basis for financial settlement between two parties; hence the methodology used by MoSPI by using the GCV of Coal at *loading/dispatch point*, for deriving the *representative/average calorific of Coal* is a better way of estimation. Accordingly, the Committee recommends the CEA, MoP to adopt the methodology/figures.

iii) Filling-up the Annual Questionnaire of Energy Statistics (AQES) of the UNSD (United Nation Statistical Division):

Recommendation: The individual data-points under each of the dataset needs detailed deliberation between the concerned Ministries. The matter to be resolved by MoSPI after conducting intense technical discussion with the concerned energy-Ministries and UNSD.

Chapter 1: Introduction

1.1 Energy is essential to the wellbeing of human being. From its' inception in the form of fire during the ancient ages to the ceaseless social and economic growth in the modern era, the 'energy' has remained omnipresent. It is the backbone for the development of any civilization and of absolute need for maintaining the evolving life-style of human being.

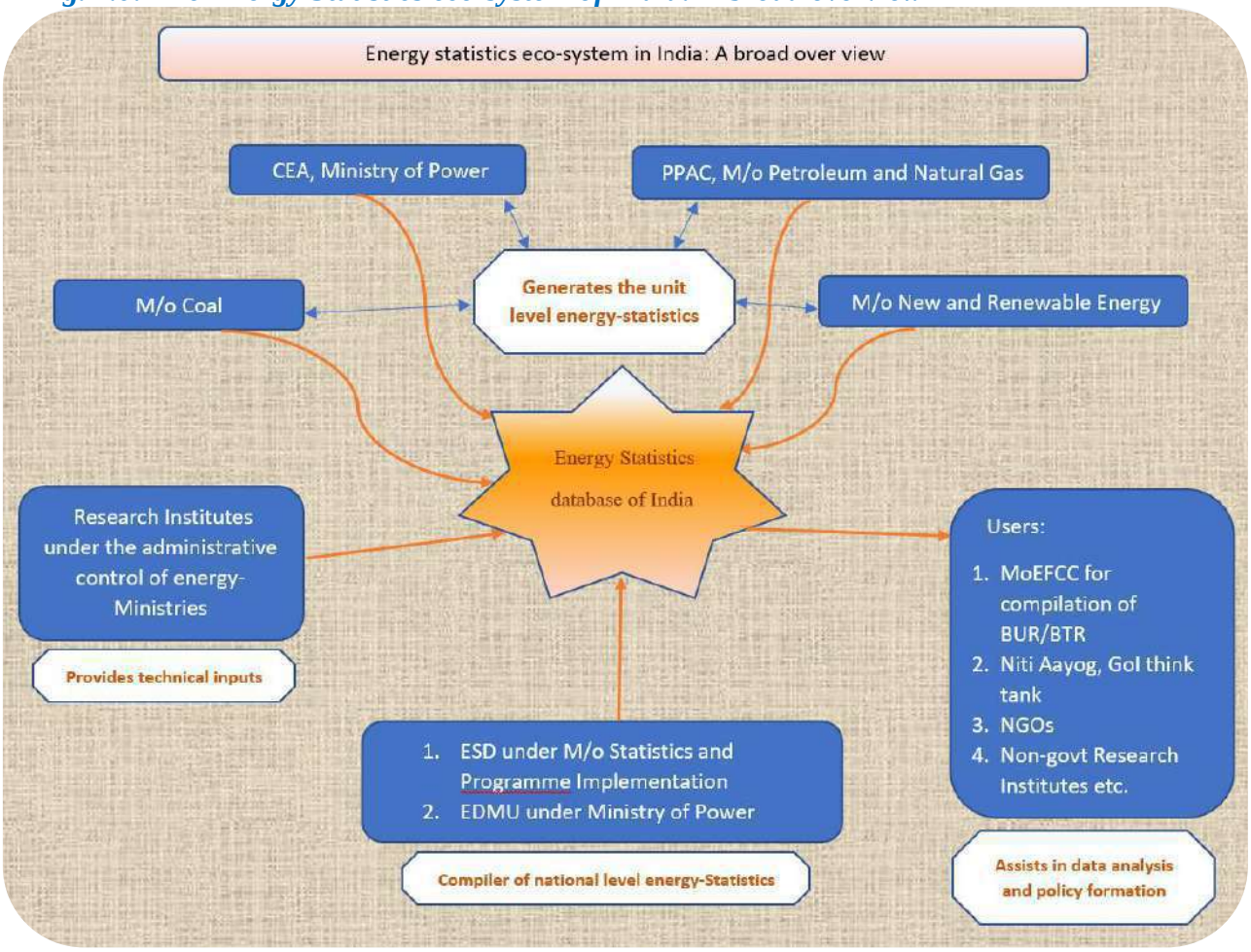
1.2 India faces a formidable challenge of keeping pace with its soaring energy demand. With a population exceeding 1.4 billion and ranked as the fifth-largest economy globally, India's energy-mix demands a fine balance between growth and sustainability to ensure the energy-security for the future generation, keeping in mind the vision of *Vikshit Bharat, 2047*. India's international commitment under COP26 in the shape of *Panchamrit (five nectar elements)*, a 5-point action plan which includes inter-alia, to achieve net-zero emissions by 2070 and also to meet fifty percent of its electricity requirements from renewable energy sources by 2030, is a task lying ahead of India to be vanquished, in the way to the global fight against climate change.

1.3 As the country navigates the challenges of meeting the growing energy demand while ensuring sustainability; it is essential for the country to have a robust mechanism to systematically generate, capture and monitor good quality, granular-level and comprehensive energy statistics, that accurately reflects the energy demand-supply scenario and supports informed policy-intervention.

- ***System of compilation of Energy Statistics in India:***

1.4 In India, the system of collection and compilation of energy statistics is decentralised in nature. Wherein different administrative energy-Ministries (like M/o Coal, MoPNG etc.) have been vested with the onus of systematic monitoring, collection, compilation and dissemination of statistics related to the concerned energy-Commodity; central Ministry like MoSPI comes-up with a consolidated information depicting the *overall energy-profile of India* at National level. A graphical overview of the same has been depicted below,

Fig. 1.0: The Energy Statistics eco-system of India: A broad overview



1.5 Since the energy statistics in India emanates from multiple institutions, the Ministry of Statistics and Programme Implementation (MoSPI), as the National Statistical Office (NSO), assumed responsibility for compiling and disseminating consolidated national energy statistics since 1995. The MoSPI collates all the information to come-up with different tables (like *Energy Balance tables*, *Energy Account tables*), graphs (like *Sankey Diagram)* and *sustainable energy-Indicators* following different international frameworks and standards, including IRES, SEEA, on annual basis. Lately, the Energy Data Management Unit (EDMU) under Ministry of Power has also been involved in the process of generating the *flow-of-energy* at National level. Further, there are GoI think-tanks like Niti Aayog, multiple Research and Development(R&D) agencies, premium institutes etc. all have been involved in the process of improvement of the energy-Statistics database of India.

1.6 At sub-national level, States/UT have the responsibility to compile energy statistics for their own use.

- ***Need for review of the existing Energy Statistics database of India:***

1.7 In the decentralised system of compilation of energy statistics, various energy Ministries produce data as per their own requirement while implementing and monitoring of different energy policies and programmes. The *International Recommendations for Energy Statistics (IRES)* adopted by the UN Statistical Commission during 2011 comes out with a complete guidance on maintaining the energy-Statistics database of a nation. It includes standards like *Standard International Energy-product Classification* (SIEC), guidelines for statistical units and data items, steps for compiling energy balance tables etc. along with a standard and uniform *end-use consuming sector* for all energy-commodities, which is directly linked with the *ISIC (International Statistical Industrial Classification of all Economic Activities)*. All the energy-Ministries in India needs to comply with these standards to ensure a uniform, consistent and harmonised energy-Statistics database of India. These are indispensable to facilitate cross-country comparison, meeting the international obligations and to enhance the accuracy and reliability of the energy-Statistics database of India.

1.8 There are issues related to mismatch of final/derived energy-statistics between the energy-Ministries due to conceptual and methodological differences. The use of *uniform conversion-factors* to keep the final figures of energy generation and consumption (in terms of Joules/Ktoe) consistent among the Ministries, to desist from creating any confusion among its' user community and entrench its' credibility at International level.

1.9 Further, the International Agencies like United Nation Statistical Division (UNSD) (*https://unstats.un.org/unsd/energystats/pubs/*) , International Energy Agency (IEA) (*https://www.iea.org/data-and-statistics/data-tools/energy-statistics-data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource*) systematically disseminate the national level energy-Statistics of all the major nations of World, including India; it has been observed that these statistics also doesn't reflect the domestically computed figures.

1.10 Besides these, there are a number of major data-gaps still remain in the process of generation of a complete energy-profile of India; such as non-capturing of end-use consumption of *Imported-coal*, the *Industry-wise consumption break-up of* electricity, the demand-side statistics of the energy in India, the generation/consumption of electricity via *off-grid* (like in Rooftop Solar System, Street Lighting System etc.) mode, use of electricity in charging of Electric Vehicles(EVs), a systematic sub-national level energy statistics etc.

1.11 All these have culminated into the need for constitution of an Expert Committee consists of suitable representatives across all the fields of energy to have intense technical discussion on these issues and seek for some feasible solutions.

- ***The Expert Committee on Energy Statistics:***

  - ***Scope:***

1.12 To have a close look into all of the issues mentioned above, the *Expert Committee on Energy Statistics* under the Chairpersonship of *Dr. Rangan Banerjee, Director, IIT-Delhi*, has been constituted with senior level representatives from all the line energy-Ministries and experts from eminent Institutes having domain knowledge. The composition of the Expert Committee is placed at ***Annexure – I.***

The Terms of Reference (ToR) of the Committee is given as under:

a) Review of International best practices on capturing the Energy Statistics vis-a-via Indian database.

b) Review of availability of energy-data in India and assessing the data-gaps across all the energy sector.

c) Improvement in the Energy Statistics database of India, including extending the scope, coverage, use of standardised concepts, definitions and terminology as per international guidelines, across all the energy sectors.

d) Recommendation on the development of domestic conversion factors of India against all the energy commodities.

e) Any other related issues with the permission of the Chair.

1.13 The Committee also sought inputs/recommendations from its' esteemed members which can be capitalized and included for the improvement of the annual publication of *Energy Statistics India* by MoSPI.

  - ***The stakeholders:***

1.14 The Committee aims to deliberate upon the critical issues for the holistic improvement of the energy-Statistics database of India. The stakeholders, who will be benefitted out of the final recommendations of the Expert Committee includes,

i) All the central energy-Ministries under GoI viz. M/o Coal, MoPNG, M/o Power, MoEFCC, MNRE: the major Stakeholders of this report.

ii) The different research institutes, NGOs etc. working on diverse fields of energy-Statistics assisting in shaping the policies at National and State-level;

iii) The States/UTs may be encouraged to develop the own energy-Statistics database for sound policy formation at State-level.

- ***The approach:***

1.15 The Expert Committee had extensive deliberations on diverse issues over three (3) meetings held under the Chairmanship of *Dr. Rangan Banerjee*. The approved MoM, containing all the technical issues which were deliberated, of the all three (3) Expert Committee meetings has been placed as ***Annexure-II***.

1.16 Considering the multi-faceted aspects of the energy-domain, the Expert Committee, decided to constitute different sub-groups/committees having representations from the respective energy-Ministries and research bodies to deliberate upon the complex issues and suggest solution or way forward.

1.17 Accordingly, Sub-committees/Groups, with suitable representations from the line-Ministries and non-official members/research scholars, were constituted for having rounds of meetings and technical deliberations on the topics allotted to them. The Economic Statistics Division (ESD) of MoSPI had technical discussion with the representatives from MoC, CIL, GSI, CEA, MNRE, TERI, AEEE, CMPDIL, Prayas, MoEFCC, MoPNG, PPAC and other experts on the *actionable points* which emerged in the meetings of the Expert Committee. Deliberations on technical issues along with recommendations/way forward made by the Expert Committee are summarized under the following three major categories:

i. ***Meeting International Standards on Energy data***

ii. ***Filling up gaps in energy-Statistics database***

iii. ***Resolving inconsistencies across energy-datasets***

A summary of all the issues, deliberations and the final recommendations of the Expert Committee have been summarized below.

Chapter 2: The Technical Issues, deliberations and recommendation

2.1 Meeting International Standards on Energy Data

- ***Uniform adoption of sectoral-end-use categories for reporting consumption of energy-commodities:***

2.1.1 It has been observed that the *formats* used for capturing the *sectoral end-use consumption of energy-data* are not uniform across the different administrative source energy-Ministries, as mention in the diagram before (refer *Fig. 1.0*). Each energy Ministry has developed its own format for reporting energy data as per their requirement. As a result, these formats are varied widely across Ministries and do not strictly align with the *end-use consuming sectors* recommended by IEA/UNSC.

Some examples of the reporting formats are depicted below:

Table 1: End-use consuming sectors of Coal: Ministry of Coal

Steel and Washery	Cement	Fertilizer	Sponge Iron	Other basic Metal	Chemical
Paper and Pulp	Textile and Rayons	Bricks	Others	-	-

Source: Table 4.23 of the Coal Directory of India 2023-24 by M/o Coal

Table 2: End-use consuming sectors against HSD: M/o Petroleum and Natural Gas

Iron & Steel (Metallurgy)	Textile	Cement	Ceramic & Glass	Road Transport	Shipping	Chemicals & Allied
Aluminium	Civil Engineering	Elec./Electronics	Other consumer/ industrial goods	Aviation	Agriculture	Mechanical
Fertilizers	Mining and Quarrying	Reseller/Retail in other consumer/industrial goods	Railways	Miscellaneous and Pvt imports		

Source: Table V.15 of the Indian Petroleum and Natural Gas Statistics 2022-23 by MoPNG

Table 3: End-use consuming sectors of Electricity: Ministry of Power

Industry	Domestic	Agriculture	Traction
Public Water Works	Public Lighting	Commercial	Miscellaneous

Source: Table 1.4 of the All India Energy Statistics, General Review 2024 by CEA, MoP

2.1.2 The statistics on sectoral end-use consumption of energy commodities are received from the line energy-Ministry in varying formats by MoSPI, for its annual publication of Energy Statistics

India. In the process of generating energy-profile at national level in the form of tables like *Energy Commodity Balance, Energy Balance*, MoSPI ensures some suitable mapping/concordance between the *end-use-consuming sectors* mentioned under *Tables 1-3* with the *end-use sectors* prescribed under IEA under IRES (refer *Table 4*), which are directly linked with ISIC (International Standard Industrial Classification of all Economic Activity). Since the source energy-Ministries/department do not provide the required statistics in the internationally acknowledged format and it is developed by MoSPI internally; they may lead to some mis-classification errors. It was also observed that some of the categories in Table 1-3 are more detailed than broad IEA end use sectors and hence such information may be lost if only IEA categories get adopted.

2.1.3 Accordingly, MoSPI has developed a comprehensive and adoptable end-use consumption sub-sectors for all the energy-Commodities (refer *Table 4*) following the guidelines under IEA/UNSC, which may be implemented by all the line energy-Ministries to report their data, so as to ensure the uniformity across the database of Ministries, comply with the IEA classification and yet not lose the advantage of the current level of disaggregation.

Table 4: End-use consuming sectors, sub sectors for all Energy commodities

End Use Sectors (as per IEA/UNSC) (Industry)	**End use sub-Sectors of Industry (to be followed by the energy-Ministries) (Industry)**	**Codes as per *NIC 2025***
Iron and steel	Manufacture of basic iron and steel	Group 241
	Casting of Iron and Steel	Class: 2431
Chemical and petrochemical	Manufacture of Basic chemicals, fertilizers and nitrogen compounds, plastic, synthetic rubber and man-made fibres	Division 20
	Manufacture of basic pharmaceutical products and pharmaceutical preparations	Division 21
Non-ferrous metals	Manufacturing of basic precious and other non-ferrous metals like Aluminium, Copper etc.	Group 242
	Casting of non-ferrous metals	Class 2432
Non-metallic minerals	Manufacture of glass and glass products	Class 2310
	Manufacture of clay building materials such as bricks, ceramic pipes etc.	Class 2392
	Manufacturing of Cement, lime, plaster and articles of cements, plaster etc.	Class 2394 and 2395
	Manufacture of refractory products, other porcelain and ceramic products and manufacture of other non-metallic mineral products n.e.c.	Class 2391, 2393 and 2399

End Use Sectors (as per IEA/UNSC) (Industry)	**End use sub-Sectors of Industry (to be followed by the energy-Ministries) (Industry)**	**Codes as per *NIC 2025***
Transport equipment	Manufacture of motor vehicles (including car, commercial vehicle, buses etc.) and bodies (coachworks) for motor vehicles.	Group 291, 292
	Manufacturing of parts and accessories for Motor vehicle.	Group 293
	Building of *ships and floating structures* includes sporting boats	Group 301
	Manufacture of *railway locomotives* (electric, diesel, steam) and rolling stock	Group 302
	Manufacture of *air and spacecraft* like airplanes, helicopters include parts and accessories of Aircrafts and Space Crafts	Group 303
	Manufacturing of military fighting vehicles	Group 304
	Manufacture of motorcycles, bicycles, electric scooters and other transport n.e.c	Group 309
Machinery	Manufacture of metal products, except machinery and equipment	Division 25
	Manufacturing of Computer, electronic and optical products	Division 26
	Manufacturing of Electrical equipment	Division 27
	Manufacturing of Machinery and equipment (mechanical)	Division 28
Mining and quarrying	Mining of iron ores	Group 071
	Mining of non-ferrous metal ores like uranium, aluminium zinc ores etc.	Group 072
	Quarrying of stone, sand and clay and others Mining and Quarrying n.e.c	Division 08
Food and tobacco	Manufacturing, processing, preserving of meat, fish etc.	Group 101 and 102
	Processing and preserving of fruit, vegetables, dairy products and others	Group 103,104,105,106,107 and class 1080
	Manufacture of beverages	Division 11
	Manufacture of tobacco products	Division 12
Paper, pulp and print	Manufacture of paper and paper products	Division 17
	Printing and service activities related to printing and reproduction of recorded media	Division 18
Wood and wood products	Manufacturing of Wood and wood products	Division 16
Construction	Construction of residential and non-residential buildings	Division 41

End Use Sectors (as per IEA/UNSC) (Industry)	**End use sub-Sectors of Industry (to be followed by the energy-Ministries) (Industry)**	**Codes as per *NIC 2025***
	Civil engineering (includes Construction of roads and railways)	Division 42
	Specialized construction activities (includes Demolition and site preparation)	Division 43
Textiles and leather	Spinning, weaving and finishing of textiles	Division 13
	Leather and related products	Division 15
Non-specified industry	Not included in the above sectors	

Accordingly, the Expert Committee made the following recommendations,

2.1.4 ***Recommendations:***

i. In order to ensure a robust, comprehensive and inter-comparable energy-statistics database across line energy-Ministries, the Committee recommended that all the line energy-Ministries should collate and disseminate the *sectoral end-use consumption* data of all the energy-products as per the recommended *end-use sectors* given under *Table 4*.

(Action: All line Energy Ministries)

ii. The mapping which has been developed by MoSPI (refer ***Annexure-III*****)** between the existing *end-use consuming sectors* used by different energy-Ministries and IEA will be followed for preparation of Energy Balance of India by MoSPI.

(Action: MoSPI)

iii. MoSPI will develop and provide formats for the end-use sectors for each line ministry for maintaining and reporting data.

(Action: MoSPI)

- ***Use of Standard International Energy-product Classification (SIEC)***

2.1.5 Coal is considered as the most heterogeneous energy-commodities among all. For grading coal resources in India, two broad classifications are in use namely, the *IS 770:2013, "Indian Standard on Classification and Codification of Indian coals, Lignite and Semi-Anthracites*" developed by the Bureau of Indian Standards (BIS), based on its physical/chemical properties (like *Mean random Reflectance, Volatile Matter, Moisture Content* etc.) and *Indian Standard Procedure (ISP) 2022* which categorizes the Indian Coal according to its Gross Calorific Value (*GCV), values/Ash content*. Table 5, 6 and 7 depict the categories of coal as per ISP 2022, IS 770:2013 and SIEC respectively. At present, no concordance/mapping is available among these classifications to enable international reporting of data as per SIEC categories.

Table 5: Classification of Coal: as per ISP 2022

Types of Coal	**Classes**					
Coking	Steel Gr. I	Steel Gr. II	Washery Gr. I	Washery Gr. II	Washery Gr. III	Washery Gr. IV
	Washery Gr. V	Washery Gr. VI				
Non-Coking	G1	G2	G3	G4	G5	G6
	G7	G8	G9	G10	G11	G12
	G13	G14	G15	G16	G17	
Semi-Coking	Semi Coking Gr. I		Semi Coking Gr. II			

Table 6: Classification of Coal: as per IS 770:2013

Sr. No.	**Class and Type**	**Nature**
1.	Lignite	Non-caking
2.	Sub-bituminous	Non-caking
3.	High volatile bituminous	Non-caking
4.	High volatile bituminous	Weakly caking
5.	Medium volatile bituminous	Medium to strongly caking
6.	Medium volatile bituminous	Strongly caking
7.	Bituminous	Strongly caking- Medium — Low volatile
8.	Low volatile bituminous	Low volatile weakly caking
9.	Low volatile bituminous	Low volatile Non-caking
10.	Semi-anthracite	Non-caking
11.	Tertiary (Assam coal)	Non-caking/Caking

Table 7: Classification of Coal: as per SIEC

Division/Group	Class
Hard Coal	Anthracite
	Bituminous Coal
	Coking coal
	Other bituminous coal
Brown coal	Sub-bituminous coal
	Lignite

2.1.6 These classifications are based on multiple parameters and conditions, which vary widely from International Coal to that of the Domestic coal. In India, the ISP: 2022 (which categorises coal into G1- G17 for Non-Coking Coal and six grades under the Coking Coal) is widely used by Ministry of Coal and Geological Survey of India (GSI) for commercial valuation and auctioning and for maintaining national coal inventory. However, neither ISP:2022 categories not IS 770:2013 is having a direct *one-to-one mapping/concordance* with the SIEC. In view of complexities involved in the mapping of Coal and to have closer look into the issue, a *Sub-Committee*, under the Chairmanship of *Prof. Ram Madhav Bhattacharya* from IIT(ISM) was constituted to look into all aspects and suggest a workable concordance between two classifications. Constitution of the Sub-Committee on Coal is placed in ***Annexure – IV.***

2.1.7 Based on a pilot exercise using *120 coal-samples*, the sub-committee submitted its findings (refer ***Annexure – V***) along with the following recommendation:

"…the attempt of one-to-one mapping of different classes of coal & lignite between the ISO 770:2013, ISP:2022 and SIEC may be too simplistic and may not reasonably achieve the objective of harmonization…."

2.1.8 Since, the absence of such mapping between domestic and international classification of Coal may lead to ad-hoc mapping by individual organizations which may not reflect accurate representation of coal data of the country, the Expert Committee requested the Chairman of the *Sub-Committee* to relook into the matter considering the international reporting obligations. The subsequent report submitted by the sub-Committee concluded with the following findings,

> *'The Sub-Committee could not arrive at any conclusive logical concordance in this matter because of the inherent diversity of origin of coal from country to country and in absence of a comprehensive classification system. Any attempt to evolve a concordance does not seem to be logical and may invite unforeseen complications in future, which may have commercial and legal implications*.'

2.1.9 After detailed examination of both the reports submitted by sub-Committee on Coal, the Expert Committee opined that,

a. India has significant coal reserves. Indian coal has low sulphur and high ash content and has historically been classified based on ash and moisture content - useful heating values (UHV). Successive BIS standards have provided mechanisms of classifications based on GCV and also attempted to harmonise with international classifications.

b. Due to the structure of the organisations and legacy issues related to the coal sector there is an inertia and reluctance to change any classification measures. It is in this context that a sub-committee of domain experts was entrusted the task of mapping and harmonisation. However, the sub-committee essentially rejected the attempt to harmonise or map to the international classification scheme. The *Expert Committee* constituted by MOSPI respectfully disagrees with the recommendation made by the sub-committee.

c. A mechanism for mapping the different grades of Coal based on BIS is provided in *Table 8* below, depicting the concordance between IS 770 and SIEC. The ministry of coal need not change its method of classification for pricing/ commercial operations but needs to add the mapping methodology for all its national reports.

Table 8: Concordance between domestic and international classification of Coal

SIEC			**IS 770**		
Division/Group/ Class	**Nomenclature**	**Property**	**Sr. no. as per IS 770**	**Class & Type; Nature**	**Remarks as per IS 770**
01	Hard Coal	GCV>=24MJ/kg or 5736 kcal/kg; or if GCV<24 MJ/kg provided Vitrinite mean reflectance>0.6%			
001	Anthracite	Vitrinite mean reflectance>= 2% and GCV>=24MJ/kg or 5736 kcal/kg	x)	Semi Anthracite, Non-caking (Reflectance 2-2.5) (GCV 8250-8700 kcal/kg)	GCV in case of SIEC>=24MJ/kg. Presumption: GCV falling within IS 770 range.
012	Bituminous coal	GCV>24 MJ/kg and Vitrinite mean reflectance <2%; or GCV<24 MJ/kg provided Vitrinite mean reflectance>=0.6%			
0121	Coking coal	Bituminous coal that can be used in production of coke capable of supporting blast furnace charge	iv) to viii)	iv High Vol Bit; weakly caking v Medium Val Bit, medium to strongly caking vi Med. Vot Bit; strongly caking vii Bituminous; strongly caking viii Low vol bituminous; weakly caking	Mean random reflectance range for bituminous coking coal is 0.65-1.79% as per IS 770: 2013;

0122	Other bituminous coal	Bituminous coal not included under coking coal	iii) and ix	iii High volatile bituminous; non-caking ix Low volatile bituminous, non-caking	For iii. High volatile bituminous (non-caking) reflectance should be in range 0.55-0.64% as per IS 770-2013
02	Brown coal	GCV<24MJ/kg and Vitrinite mean reflectance<0.6%			
021	Sub Bituminous Coal	Brown coal with GCV>=20MJ/kg (4776 kcal/kg) but less than 24 MJ/kg (5736 kcal/kg)	ii, iii	ii Sub Bituminous; non-caking (GCV 6950-7500 kcal/kg) iii High vol Bituminous; non-caking (GCV 7500-7800 kcal/kg)	Mapping is based on mean reflectance basis: GCV range does not correspond with IS 770:2013
022	Lignite	Brown coal with GCV<20 MJ/kg	i	i Lignite non-caking	Mapping is based on mean reflectance basis; GCV range does not correspond with IS 770:2013

The Committee further put-forward the following recommendations:

2.1.10 ***Recommendation:***

1. The Expert Committee recommends that this issue be taken up by the Secretary MoSPI with Secretary Coal to ensure a more rational view in view of integration with national prerogatives and global practices.

(Action: MoSPI and M/o Coal)

- ***Conversion Factors of energy-commodities:***

2.1.11 The conversion factor is defined as the *multiplicative factor* which converts a certain *energy commodity into equivalent energy unit* (i.e. Joule or Ktoe). The energy-Ministries generally disseminate energy-statistics in terms of physical unit only such as, MT, BCM etc. which needs to be converted into equivalent 'energy-units' for estimating parameters like TPES (Total Primary Energy Supply), TFC (Total Final Consumption) and generating tables on *Energy Balance, Energy Account*, depicting the energy-profile of a nation. In order to maintain inter-consistency, it is indispensable that a uniform conversion factors/representative calorific values are adopted for all the energy-Commodities by the Ministries like MoEFCC, MoSPI , MoP, while deriving the final figures.

2.1.12 Besides the national conversion factors, the different International agencies like UNSC, IEA also release *energy-profile of different countries* in their respective publications, *using* '*country-specific'* representative *conversion factors;* the methodology of which however are not available in public domain. This leads to data inconsistencies between the final figures of *energy-supply and consumption* statistics (in terms of Joules/Ktoe) as available in International publications and at national level.

2.1.13 Some discrepancy has been observed in the Gross Calorific Value (GCV) of Coal dispatched to Power Sector, used by CEA and those used by MoSPI in their respective annual publications.

2.1.14 The MoSPI has been using a host of Conversion factors of energy-Commodities like Coal, Petroleum Products etc., developed after due consultation with the line energy-Ministries, for generation of energy-profile at national level in terms of energy units like *Joules/Kilo Tonnes of Oil Equivalent (Ktoe)* in its annual publication. The methodology and findings (refer ***Annexure-VI***) was shared with all the members of the Expert Committee for their views and opinions. The Committee recommends that,

2.1.15 ***Recommendations:***

1. The representative calorific values of Coal, Petroleum Products and other energy commodities developed by MoSPI in consultation with energy Ministries, may be used by all the line energy-Ministries as per ***Annexure – VI***.
2. For the energy-commodities not covered under ***Annexure VI*** such as Bio-fuels, MoSPI in consultation with the concerned ministry may develop methodology for finalizing the representative Calorific Values for incorporating the same in the energy-balance table of India.

(Action: MoSPI, All line Energy Ministries)

2.2 Filling up Gaps in the Energy Database:

In the process of generation of the energy-profile at country level, the following eight (8) major issues relating to data gaps have been identified and deliberated,

- ***Data-gap in capturing the end-use consumption of domestic and imported Coal into different end-use sectors:***

2.2.1 The Ministry of Coal, in their annual publication of Coal directory comes-up with the sectoral end-use consumption of Coal against the following sectors,

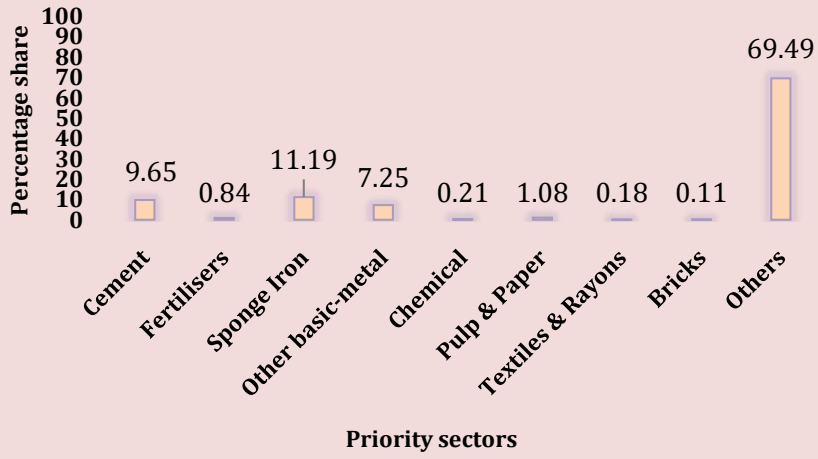
Power (Utility & Captive)	Steel and Washery	Cement	Fertilisers	Sponge Iron
Chemical	Textile and Rayons	Pulp and Paper	Bricks	**Others**

A close look into the share of the *Coal dispatched to Non-Power sector* reveals an unusually higher level of concentration against the sector *others/Non-specified* as depicted in Fig 2.0.

2.2.2 As per Fig. 2.0 around 70% of the Coal dispatched to *Non-Power sector* is clubbed under the category of *Others/Non-Specified*. It means that a large part of consumption of coal could not be categorised appropriately against the actual industries which diminishes the use of such data for policy purposes.

2.2.3 The same goes for the data on Imported Coal also; over 20% of the domestic demand of Coal is met via Imported Coal of superior quality from countries like, South Africa, Indonesia, Australia. In the Coal Directory of India from MoC, it is observed that, the end-use consumption of the *Non-Coking part of the Imported Coal* is not available. Since the *Non-Coking* coal consists of around 75-80% of the total Imported Coal in India, the sectoral end-use consumption of a significant amount of *Coal* is missing in the existing energy-statistics database. As a result, the *sectoral end-use consumption* statistics of a significant portion of the *Coal* remains *unaccounted* and also fails to provide clear picture of the actual

Fig 2.0 : Percentage share of Non-power end-use sectors in the consumption of raw coal during 2023-24



flow/demand of energy across different priority sectors. It is desirable that the percentage under others or unaccounted sectors should be significantly reduced.

2.2.4 Besides M/o Coal, there exist alternative data sources which provide disaggregated data on industry wise use of coal. These include *Annual Survey of Industries (ASI)* of MoSPI and the *Perform Achieve and Trade (PAT)* scheme of BEE, MoP. The *Prayas, an* NGO was requested to analyse those data sources. As per the report submitted by Prayas (refer ***Annexure -VII***), there are some limitations in both these sources as indicated below:

- The ASI data on the of consumption of Coal comes with a lag of two years. To overcome this, the Committee recommends the use of moving average of five-years so as to capture the trend/pattern of consumption. Also, the ASI data doesn't provide information on Coal consumed by captive plants and its' bifurcation in Coking/Non-Coking Coal categories.
- The statistics under the PAT scheme of BEE, MoP gets collected for the purpose of carbon-compliances and issuance of 'energy savings certificates'; hence it is expected to be more accurate. But it has limited information to result in a conclusion on the pattern of consumption of coal in India into different priority sectors. It covers only a small proportion of the total consumption of coal, in any particular financial year also the required statistics is not available over a sufficient span of period to draw any conclusion.

2.2.5 However, in the absence of detailed data from other sources, the use of ASI data provides the best alternative. As per the methodology proposed under ***Annexure III***, for the sectors *other than power*, the proportions of sectoral consumption of coal, as available from ASI may be used on the remaining part (other than power) of coal, consumed over a financial year. Using this methodology, the Expert Committee observed a significant reduction of the end-use consumption of Coal into 'Others/Non-specified' category. A comparative summary has been given below in Table 9.

Table 9: Sectoral end-use consumption of Coal: A comparative study between existing and proposed methodology

				All figures are in Million Tonnes
End-use Consuming Sectors	**2022-23**		**2023-24**	
	Existing	**Proposed (using ASI data)**	**Existing**	**Proposed (using ASI data)**
Domestic dispatch of Coal to Power Sector (Captive + Utility) (source : MoC)	785.4	785.4	859.34	859.34
Imported Coal: Dispatched to Power Sector (source: Table 7.7 under *All India Electricity Statistics* by CEA	-	55.64	-	65.73
Agriculture/forestry	-	0.00	-	0.01
Iron and Steel	77.53	62.84	88.13	79.87
Non-ferrous minerals	-	70.03	-	78.77
Chemical and Petrochemicals	0.86	29.99	0.8	33.46
Non-metallic minerals (presently *Construction*)	9.42	66.38	9.26	72.43
Transport equipment	-	0.08	-	0.08
Machinery	-	0.59	-	0.68
Mining and Quarrying	-	0.09	-	0.10
Food, beverages and tobacco	-	9.89	-	10.82
Paper, pulp and print	1.26	13.92	1.03	14.78
Wood and wood products	-	0.19	-	0.19
Textiles and leather	0.09	18.16	0.17	19.31
Non-specified industry	***240.67***	***2.04***	***278.98***	***2.15***
Total consumption (including Imported Coal)	**1,115**	**1,115**	**1,237**	**1237**
% of coal dispatched to Non-Specified Industry	**21.60%**	**0.20%**	**22.55%**	**0.17%**

Considering all these methodological aspects, the following recommendations are made:

2.2.6 ***Recommendations:***

1. Until more comprehensive PAT data is available, MoSPI's methodology on estimating the sectoral end use consumption of coal using the ASI data as given in ***Annexure III*** may be adopted in the annual publication of Energy Statistics India by MoSPI. Whenever detailed PAT data is available for sectors, this can be integrated in future reports.

(Action: MoSPI)

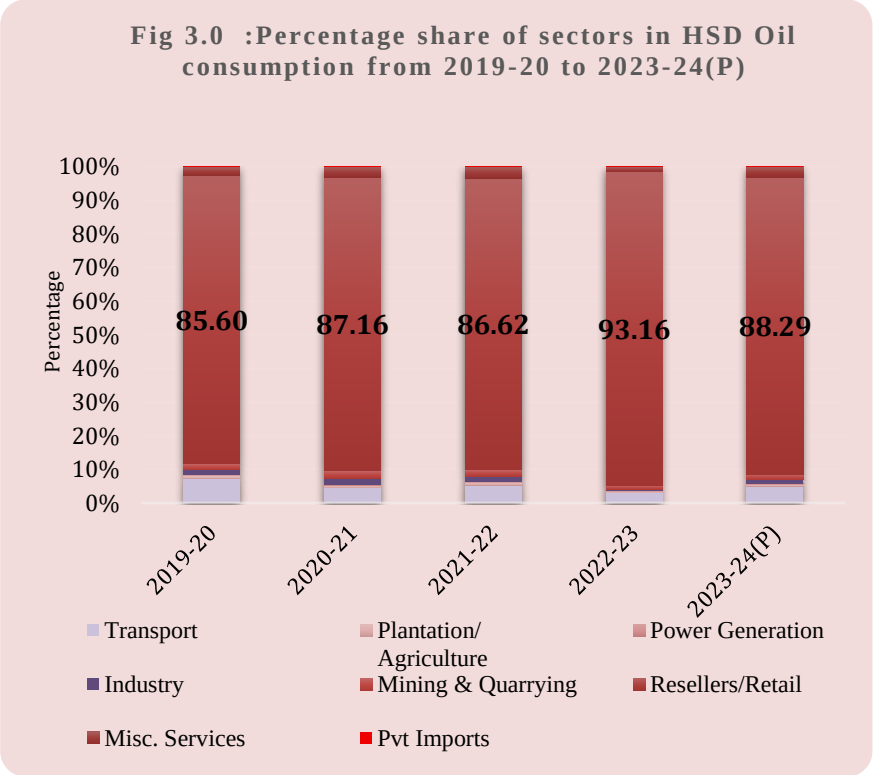
- ***Data-gap in capturing the end-use consumption of High-Speed Diesel (HSD) against Retailers/Resellers:***

2.2.7 As per the IPNG Statistics from MoPNG, the end use consumption of HSD oil in India is broadly classified into following sectors:

Transport	Agriculture	Power sector	Mining & Quarrying
Manufacturing Industry	Private Import	***Reseller/Retail***	Miscellaneous

A close look into the shares of consumption of HSD against the *above sectors (refer Fig 3.0)* reveals an unusually high level of concentration against the sector '*Retail/Reseller'* [1] (around 85-90%).

2.2.8 *Retailers* are entities authorized to operate fuel-dispensing units (Retail Outlets) for direct sale of petroleum products to the end consumers, whereas *Resellers* are commercial intermediaries who procure petroleum products in bulk from Oil Marketing Companies for onward distribution to institutional, industrial or commercial users, excluding direct retail sale to the public.



Retail/Reseller share of HSD oil has consistently remained above 85% as shown in fig 4.0, indicating a long-term pattern in distribution.

2.2.9 As retailers and resellers are not the ultimate end-users, the absence of clarity on actual consuming sectors limits our understanding of the final HSD consumption pattern, hindering demand-side planning and targeted interventions.

[1] Source: Table 6.6 (A) of Energy Statistics India 2025

2.2.10 In the absence of end use sectors for retail/reseller, the compilation of the national *energy-profile* (in the form of tables like *Energy Commodity Balance, Energy Balance* etc.), the entire value of retail/reseller is reported under *'Non-Specified/Others/Miscellaneous'* sector.

2.2.11 A study was conducted by CRISIL during Oct-2020 to Sep-2021 under the guidance of PPAC, MoPNG where the end-use consumption pattern of petrol and diesel across 3,000 Retail Outlets (RO)s having high diesel sales, across 212 districts in 20 states and two union territories were assessed. The survey was conducted on seven (7) consecutives days in each of the quarters. The final report consists of detailed tableau containing consumption pattern of Diesel and Petrol against each zones of India.

2.2.12 In the report, under *Figure 17: Direct Sales and Retail Sales-diesel*, sectoral end-use consumption of *Diesel* across India has been reported. The proportionate share of consumption, as we have from the study report, may be utilized to segregate the amount of HSD adjusted against *Retail/Reseller*, in the annual publication of IPNG Statistics by MoPNG. Accordingly, the following table has been prepared.

Table 10: Proportionate shares consumption of HSD against different end-use sectors as per CRISIL report

FY	Total Consumption of HSD under Retail/Reseller	Segregated into end-use sectors using CRISIL report						
		Road Transport	Shipping	Railways	Agriculture	Power Generation	Other Consumer/ Industrial Goods	Others
2021-22	**66,404**	51,663	531	1,394	3,187	1,062	4,183	4,383
2022-23	**80,026**	62,260	640	1,681	3,841	1,280	5,042	5,282
2023-24	**79,135**	61,567	633	1,662	3,798	1,266	4,986	5,223

A detailed technical deliberation culminated into the following recommendations by the Expert Committee,

2.2.13 ***Recommendations:***

ii) The committee recommends, that the sectoral end-use consumption proportions available under the *CRISIL* report from PPAC, MoPNG, may be used for the time being in the annual publication of Energy Statistics India (***refer Annexure -III***).

(Action: MoSPI)

iii) The Committee further recommended PPAC to conduct periodic surveys to ascertain the share of each *end-use consuming sectors* under HSD.

(Action: MoPNG)

iv) As a way forward for a long-term solution, feasibility of collecting sectoral end use consumption of HSD Oil, through sales data may be explored.

(Action: MoPNG)

- ***Non - capture of consumption of electricity against sub-sectors under Industry***

2.2.14 Sectoral and sub-sectoral distribution of electricity consumption is critical for capturing variations in demand across different segments of the economy, including industry, agriculture, transport, residential and commercial sectors. Such granularity of data enables policymakers to identify sector-specific consumption patterns, evaluate efficiency levels and design targeted interventions tailored to the distinct energy needs of each sector.

2.2.15 In the publication of *Annual General Review* from CEA, MoP, the *sectoral end-use consumption of electricity* has been provided against the following sectors:

Industry	Domestic	Agriculture	Traction
Public Water Works	Public Lighting	Commercial	Miscellaneous

Source: Table 1.4 of the All India Energy Statistics, General Review 2024 by CEA

It is observed that the entire consumption of electricity against the different types of ***Industries*** has been clubbed into a solitary figure. As per the *Energy Balance tables* prepared and disseminate by international organizations like IEA/UNSD, the major sector Industry ought to be *further categorised into different sub-sectors* indicated below.

Iron and Steel	Chemical and Petrochemicals	Non-ferrous metal	Non-metallic minerals
Transport equipment	Machinery	Mining and Quarrying	Food and tobacco
Paper, pulp and print	Wood and wood products	Construction	Textile and Leather and *Others (Miscellaneous)*

2.2.16 It has been observed that, a partial information on '*consumption under sub-sectors under Industry*' is available for other energy-Commodities like Coal, Natural Gas, Petroleum products etc., no such information has been provided in the annual publication of CEA, MoP. Non-availability of sectoral end-use consumption data on electricity for the *sub-sectors* under Industry is a major data gap in the existing energy-statistics database of India. Since as per CEA, the DISCOMs *'do not maintain such disaggregated data within Industry category/Sector'*, the Expert Committee explored the alternative data-sources like *Annual Survey of Industries (ASI)*, and *PAT* scheme, where *industry-wise consumption of electricity* has been made available. The *Prayas, NGO* made a close examination of both the datasets and came-up with a comprehensive report (refer ***Annexure VII***). The report made the following observations:

- The ASI data on the trend of consumption of electricity comes with a lag of 2 years. The Committee recommends to use the moving average of 5 years to overcome this limitation and capture the trend of the consumption pattern.
- Until more comprehensive PAT data is available, the methodology proposed by ESD could be used, with some modifications as suggested such as, distinguishing energy consumption between iron & steel and non-ferrous metals.

2.2.17 Accordingly, the Committee made an exercise with the ASI data and came-up with the following findings,

Table 11: Proposed sub-sectoral end-use consumption of electricity under Industry using ASI data

All units in GWh

Financial Year / Sectors	2021-21	2022-23	2023-24
Consumption of Electricity against the sector-Industry (as available from CEA)	**5,56,481**	**5,93,895**	**6,40,626**
Bifurcation into different sub-sectors under Industry using ASI Data			
Iron and steel	1,52,359	1,62,075	1,74,481
Chemical and petrochemical	76,584	88,917	99,918
Non-ferrous metals	33,781	34,863	36,859
Non-metallic minerals	50,270	54,123	59,968
Transport equipment	27,379	29,079	31,024
Machinery	39,436	41,287	44,492
Mining & Quarrying	150	144	165
Food, beverages and tobacco	51,304	54,122	58,707
Paper, pulp and print	15,749	16,363	17,440
Wood and Wood Products	2,359	2,503	2,723
Textile and leather	72,855	73,735	74,887
Non-specified	34,253	36,683	39,961
Total	**5,56,481**	**5,93,895**	**6,40,626**

The final recommendations of the Committee are given as below,

2.2.18 ***Recommendations:***

i. The committee recommended that until more comprehensive PAT data is available, methodology developed by MoSPI on estimating the sectoral end use consumption of electricity using the ASI data (refer: ***Annexure III***), may be used in the annual publication of Energy Statistics India by MoSPI.

(Action: MoSPI)

ii. Further, the committee also recommended that as a long-term solution, CEA may collect end use consumption of electricity in industry according to the *sub-sectors mentioned under Table 11*, either through DISCOM or through conducting regular surveys.

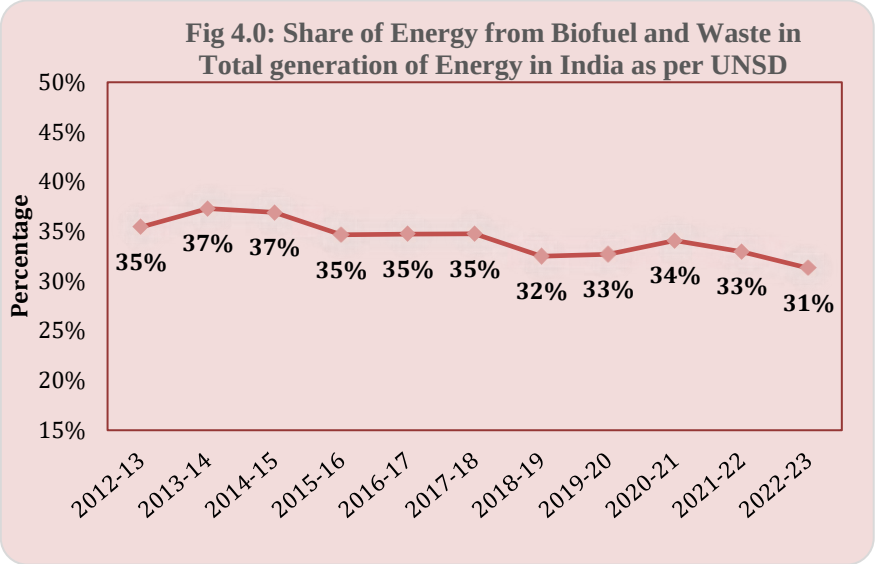
(Action: CEA)

- ***Incorporating the component of Bio-fuel:***

2.2.19 Use of non-fossil fuels has become a priority in India owing to its commitments on different international forums like COP 26 to UNFCCC to achieve the Net-Zero emission by 2070. By blending biofuels with conventional fossil fuels, India has the potential to reduce its reliance on oil imports, thereby enhancing energy security and promoting environmental sustainability. Their production and integration could play a pivotal role in realizing ambitious national objectives, such as reducing import dependency and converting waste into wealth. Data on biofuels are needed to track our commitment to Net-Zero emissions and also to complete the *Energy Balance* table of India, depicting the energy-profile of the nation.

2.2.20 According to the IEA, Biofuel includes fuels derived directly or indirectly from biomass (like *Baggase*, *cow-dung*, *fuel-wood* etc.) and serve as alternatives to fossil-fuels for generation of energy. In India, unlike the fossil-fuels, there is no dedicated institution/body vested with responsibility of systematic collation of data on all the *Bio-fuels*. Further, unlike other fossil fuels there are no large companies that trade biofuels and report physical quantities, turnovers; biofuels often have distributed markets and are also often in the informal sector. Hence their estimation methodologies are important. There are significant uncertainties in the biofuel quantities. Therefore, due to non-availability of any consolidated and systematic data in this field, the Energy Balance table of India prepared by MoSPI doesn't cover Bio-fuel and waste.

2.2.21 As per the UNSD annual publication of *World Energy Balance*, providing *Energy Balance tables* for 216 countries, the *Bio-fuel and waste* constitute around 31-34% of the total generation of Energy in India over the past few years (Figure 4.0).



2.2.22 In this context, the various types of bio-fuels relevant for inclusion in India's energy profile are listed below:

Table 12: Types of Bio-fuels

Solid Biofuels	Liquid biofuels	Biogases
Fuelwood, wood residues and by-products	Bio-gasoline Example: Bio-ethanol, Bio-methanol	Biogases from anaerobic fermentation-methane and carbon dioxide
Bagasse	Biodiesels	Biogases from thermal processes-hydrogen and carbon monoxide
Animal waste	Bio jet kerosene	-
Charcoal	Other liquid biofuels	-

2.2.23 Upon request of the Expert Committee, the M/o New and Renewable Energy (MNRE) and The Energy and Resource Institute (TERI) jointly prepared a study on Biofuel, titled-*'Report on Methodology on Inclusion of Biofuel in the annual publication -Energy Statistics of MoSPI'* (refer: ***Annexure VIII***.).

2.2.24 The study made the following observations:

i) Some biofuels are already included in the national energy balance through their blending with conventional fuels such as, Ethanol is blended with petrol, biodiesel is blended with diesel and Compressed biogas (CBG) is blended with natural gas. To avoid double counting, their ***quantities must first be deducted from the corresponding conventional fuel totals*** in order to estimate the consumption correctly. Then remaining quantities should be converted to energy terms.

ii) For other biofuels such as *Firewood, Bagasse, Dung cake, Biomass-based power plant, Biomass Pellets, Black liquor, MSW/RDF used for electricity, Biogas, and Charcoal*, the data

sources, estimation procedure, conversion factor and the respective treatment of each within the energy balance has been specified in ***Annexure VIII***.

iii) In the energy balance, under the production category of "solar, wind, others", the energy term corresponding to "others" may be deleted to avoid duplication of electricity from bio-power, as the corresponding electricity has already been appropriately accounted for through the conversion of biomass inputs such as biomass, bagasse, and municipal solid waste. On incorporating the bio fuels in energy database, the following recommendations are made.

2.2.25 ***Recommendation:***

i. The Committee recommended that, the entire data on biofuel ought to be captured systematically using the proposed methodology of the report submitted by the MNRE and TERI. While preparing the *energy-profile at National level MoSPI* should include Biofuels in the Energy Balance / Energy Account tables of India.

(Action: MNRE, TERI and MoSPI)

- ***Capturing the Demand side consumption of Energy statistics***

2.2.26 Economics theory states that, *a market is in equilibrium only when demand meets supply*. This is true for every commodity or service, including Energy commodities. An energy database consisting of both demand side and supply side data is important to better understand the flow of different forms of energy and generate future trends on energy generation and consumption. Both supply as well as demand side data on energy use also facilitate improved efficiency, greater output at lower cost; better clarity to investors and business; and addressing climate change through identification of cost-effective actions.

In India, where we have dedicated energy Ministries entrusted with the onus of systematic dissemination of the energy-Statistics on supply-side; capturing the demand side of data is a daunting task, simply because of the vastness of the country. At present, no dedicated survey or mechanism exists to track the specific demand for various energy resources like electricity, LPG, coal, etc. at the household or individual consumer level.

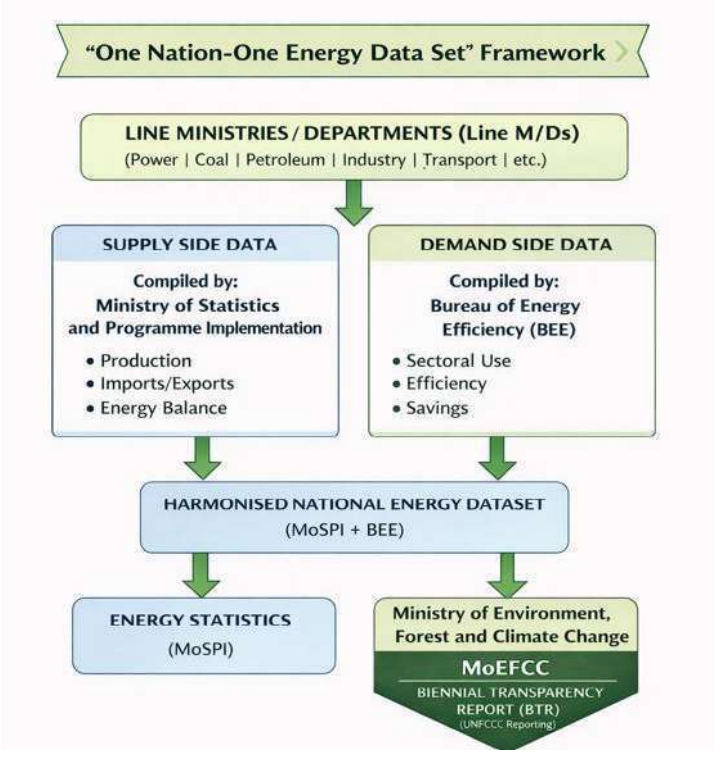
2.2.27 Under the *Annual Survey of Industry (ASI)* and some of the survey's conducted by NSSO, MoSPI, there are certain information on consumption of different energy-commodities over a period

of time but a comprehensive and consistent flow of information to identify the pattern, behaviour, actual need of energy in India, is yet to be formulated.

2.2.28 The Expert Committee took up the matter and discussed in detailed the potential challenges in data collection of demand side of the energy-data and way forward. The AEEE was requested to provide a comprehensive report on feasibility of implementation of the Demand Side of Energy data. In the report submitted by BEE and AEEE (refer ***Annexure – IX***), the following observations have been made:

i) **Clear Functional Demarcation**: In order to avoid duplication of works among the GoI machinery and improve efficiency, a coordinated institutional framework needs to be established with clear demarcation of deliverables by Line MDOs. Where the supply-side of data energy Statistics database may be compiled by ESD, MoSPI and the Demand-side data (sectoral consumption, energy efficiency performance, savings estimates, policy impact assessment) may be compiled and analysed by Bureau of Energy Efficiency (BEE), MoP, given its domain expertise in end-use sectors and policy-driven interventions.

ii) Single Integrated Energy Statistics Database: ESD, MoSPI and BEE, MoP may jointly reconcile supply–demand datasets, this reconciled dataset may be published by MOSPI in its annual Energy Statistics report, which can be further used by MoEFCC for preparation of the **Biennial Transparency Report (BTR).**



iii) Framework Overview: In order to effectively implement the envisaged integrated structured energy-Statistics database in India, a systematic framework proposed in the report emphasized separate approaches for each of the sectors like **industry, buildings, transport, agriculture and biomass;** with each sector adopting a tailored data strategy reflecting its structural characteristics and existing data maturity.

- In the *short term (0–2 years)*, BEE, in collaboration with Indian Statistics Institute (ISI), will develop the survey instruments, methodological framework, and a detailed implementation roadmap to establish a robust demand-side data architecture.
- In the *medium term (2–6 years)*, surveys will be operationalized with institutional support from MoSPI, leveraging NSSO and ASI mechanisms to ensure statistical rigour and national coverage.
- In the *long term (6–10 years)*, these surveys could be completely aligned with NSSO and ASI surveys for better harmonization.

Based on the comprehensive framework developed by BEE and AEEE, the following recommendations are made.

2.2.29 ***Recommendation:***

i. The committee recommended that Ministry of Power along with MoSPI and other line energy-Ministries needs to implement the framework for capturing the demand side of Energy Statistics.

(Action: MoP, MOSPI)

- ***Incorporating the Bunker Data in the Energy Balance table of India:***

2.2.30 International bunker data is bifurcated into *International Marine Bunker* and *International Aviation Bunker.* As per IEA, the definitions are given as below,

International Marine Bunker: Includes quantities "*delivered to ships of all flags that are engaged in international navigation*"

International Aviation Bunker: Includes "*the amount of fuel consumed by the aircrafts for International travel*".

2.2.31 The Statistics on *Bunker* is an integrated part for compilation of the *Total Primary Energy Supply (TPES)* of a nation. Presently, the Energy balance table of India, prepared by MoSPI doesn't include the International Bunker data (both International Marine bunkers and International Aviation bunkers) while computing the TPES at national level which is deviation from international practices,

whereas international Organizations such as UNSD and IEA systematically incorporates the statistics on the *International Aviation and Marine Bunker* while determining the Total Primary Energy Supply (TPES) of India.

2.2.32 The statistics on International aviation and marine bunker, as available in the *Table V8* and *Table V14* of IPNG Statistics is given below,

V.8: Deliveries made to International/Coastal Bunkers (Figures in TMT)							
Items	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**% of Total Cons. 2022-23**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
International Bunkers							
1. F.O/LSHS	248	247	319	555	659	907	44.0
2. H.S.D	27	35	55	53	43	50	2.4
3. L.D.O	0	0	0	0	0	0	0.0
Total (1 to 3)	**275**	**282**	**374**	**609**	**702**	**956**	**46.4**
Coastal Bunkers							
4. F.O/LSHS	330	422	401	313	351	449	21.8
5. H.S.D	502	635	701	558	542	649	31.5
6. L.D.O	4	5	2	2	4	6	0.3
Total (4 to 6)	**836**	**1062**	**1104**	**873**	**896**	**1104**	**53.6**
Total Bunkers							
7. F.O/LSHS	578	669	721	869	1010	1356	65.8
8. H.S.D	528	670	756	611	585	699	33.9
9. L.D.O	4	5	2	2	4	6	0.3
Total (7 to 9)	**1110**	**1343**	**1479**	**1482**	**1598**	**2060**	**100.0**

V.14: Sector-wise/State-wise Consumption (end use) of Aviation Turbine Fuel (ATF) (Figures in TMT)							
Sector & State/UT	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**% of Total Cons. 2022-23**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Sector-wise consumption (end use) of ATF							
1. Foreign airlines	1524.5	1815.8	1853.4	733.3	994.3	1745.9	23.7
2. Indian airlines	4768.7	6216.2	6136.1	2955.3	4002.1	5583.4	75.8
3. Others	1041.6	11.3	9.1	8.3	10.7	35.5	0.5
Total Sales (1 to 3)	**7334.8**	**8043.3**	**7998.6**	**3696.9**	**5007.1**	**7364.8**	**100.0**
4. Pvt Imports	300.1	258.8	0.0	0.9	0.9	1.3	0.02
Total Consumption	**7634.9**	**8302.1**	**7998.6**	**3697.8**	**5008.0**	**7366.1**	**100.0**

2.2.33 The Committee expressed their opinion to capitalize these statistics during generation of the energy-profile at national level and accordingly made the following recommendation,

2.2.34 ***Recommendation:***

The Committee recommended that the statistics on *International Marine bunker* and *International Aviation bunker* as available under the *Table V.8 and Table V.14 of the IPNG Statistics*, which should be incorporated appropriately while finalizing the TPES at national level.

(Action: MoSPI)

- ***Estimation of Off-grid energy consumption:***

2.2.35 In view of the rapid expansion of small, decentralized renewable energy systems in India, the Expert Committee emphasized the importance of capturing consumption of electricity via off-grid mode within the national energy statistical framework of India. A wide range of such systems including home lighting panels, waste-to-energy plants, solar pumps installed under the PM-KUSUM scheme, and rooftop solar installations are being deployed across the country. While MNRE currently provides data on the number of installations, the actual electricity generated and consumed from these systems remains largely uncaptured. This limitation underestimates the total demand and consumption of electricity in India.

2.2.36 It was proposed that a report may be prepared jointly by a *Task-Team* under the leadership of Shri Srihari Dukkipati from Prayas along with representatives from TERI and Shri Pratik Joshi (Phd Scholar from IIT-Bombay), with an attempt to develop some methodology for estimating the consumption of electricity from each of the off-grid renewable sources. The team also needs to highlight the limitations, scopes for improvement along with a 1st cut of estimation of amount of 'electricity consumption from off-grid mode'. The group will also suggest future ways to refine the methodology in line with the best practices followed at International level.

2.2.37 Accordingly, a report was prepared by Prayas and his team (refer ***Annexure – X***) containing the following key observations:

a) The estimation of the *consumption of electricity via Off-grid* mode is indispensable for having an accurate figure of the per-capita energy consumption of India. Due to significant data-gaps which has been observed by the *Task-Team*, the initial estimates which has been made in this report are subject to review and may be revised based on the improved availability of data.

b) The *Task-Team* has proposed some methodology which are based on the following key aspects:

N= Number of systems

InUseShare= % of operational systems

AvgLoadW= average load in Watts of the appliances connected to the systems

AvgHrs= average number of hours per day for which the appliances can be operated

CapacityMW= Installed Capacity in MW

SelfConsShare= Self-consumption share of generation

SpecificYield= average expected yield (the energy produced (kWh) per unit of installed capacity (kWp))

AvgCUF= Average annual capacity factor

A glimpse of the findings is given below:

Electricity Generation System	**Methodology for deriving estimated annual consumption (in GWh)**	**Capacity (MW)/No. of systems as on 31-Mar-25**	***InUseShare***	***AvgLoadW/AvgAnnualConskWh/SpecificYield***	**AvgHrs**	**Lower Limit**	**Upper Limit**
Home solar lighting systems and Solar lanterns	*HSLS_SL_GWh = (N * InUseShare *AvgLoadW * AvgHrs * 365)/10^9*	17,23,479 nos.	20% to 60%	*AvgLoadW* = 10 Watt	4 hours/day	**29.7 GWh**	**89.2 GWh**
Street lighting systems	*SLS_GWh = (N * InUseShare * AvgLoadW * AvgHrs * 365)/10^9*	9,44,802 nos.	30% to 60%	*AvgLoadW* = 50 Watt	12 hours (tentatively from 6 PM to 6 AM)	**62 GWh**	**124 GWh**
Agri solar pumps (KUSUM-B)	*SP_GWh = (N * InUseShare * AvgAnnualConskWh)/10^6*	10,86,333 nos.	50% to 75%	*AvgAnnualConskWh* = 10,000 kWh	NA	**5,432 GWh**	**8,148 GWh**
Rooftop Solar PV (off-grid)	*RTPV_**Offgrid**_GWh = (CapacityMW * InUseShare * SpecificYield)/10^3*	316.816 MW	30% to 50%	*SpecificYield* = 1,400 kWh/kWp	NA	**133 GWh**	**222 GWh**

2.2.38 ***Recommendations:***

1. The Expert Committee recommends that, a committee may be constituted under MoSPI along with representations from CEA, MNRE and research bodies to look into the concepts and methodology proposed under the report. In the forthcoming edition of the Energy Statistics publication, a separate Chapter may be introduced containing the estimated figure on 'off-grid consumption of electricity' in India along with its' methodologies, limitations and way-forward, after due refinement of the existing report and concurrence of the line energy-Ministries.

(Action: MoSPI, MNRE and CEA)

- ***The Electricity Demand in Electric Vehicles (EVs) in India:***

2.2.39 India is presently witnessing a transition phase of the mode operation of the road-transport vehicles since its' post-independence era. In order to visualize the dream of 30% of EV penetration by 2030 (EV30@ 30 target), multiple schemes haves been undertaken by GoI and different State-govts. to generate the required thrust in the domestic sector of EV market for a rapid expansion. The annual electric vehicle (EV) sales have grown from an approximate figure of 50,000 units during 2016 to over 2.3 million units in 2025, representing roughly 8% of total new-vehicle registrations. This increasing penetration of EVs in the total fleet of domestic vehicles demands additional electricity in the national grid system, making it essential for category-wise consumption of electricity for future planning.

2.2.40 In order to assess the existing electricity-demand scenario over the different segments of the EVs, the envisaged estimated load on the national grid by 2030, a report has been prepared by Dr. B.K.Panigrah, professor of IIT-Delhi (refer ***Annexure – XI***) having the following key observations:

a) The electricity demand of an EV has been measured using the following formula:

$$E_{cat} = N_{veh} \times P_{EV} \times D \times e$$

Where,

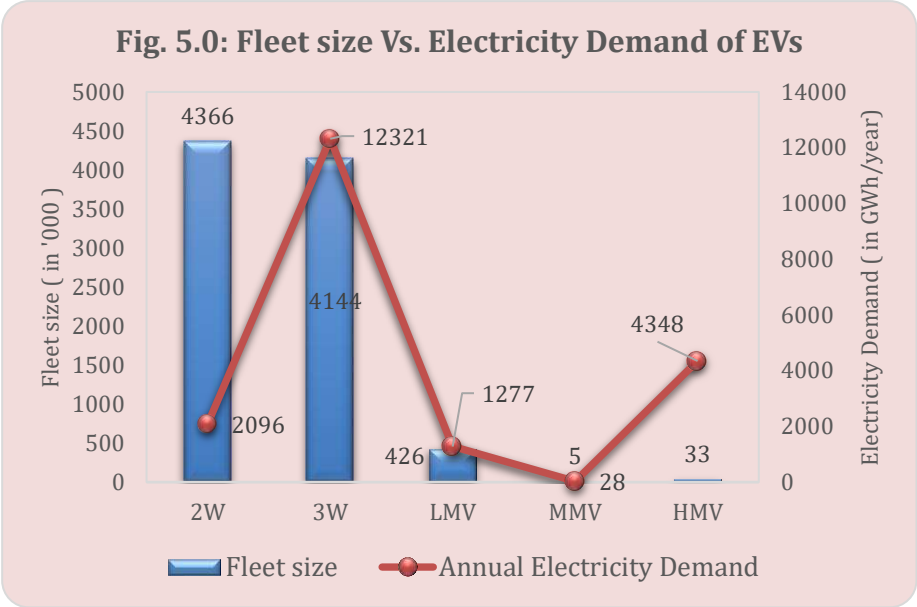
N_{veh} = National vehicle fleet size;

P_{EV} = EV penetration rate

D = Average annual distance travelled

e = Specific energy consumption (kWh/km)

b) It has been observed that, India's EV transition is segment-led, not uniform. Three-wheelers and two-wheelers have crossed mainstream adoption thresholds, while passenger cars are early-mainstream and heavy-duty vehicles remain nascent. The corresponding electricity demand profile is highly skewed: a relatively small commercial fleet drives the bulk of grid load because per-vehicle utilisation differs by an order of magnitude across segments. A summary of the same has been depicted in Fig. 5.0.



c) The report suggests that the present load of electricity on Grid due to EVs which is around 20.07 Twh/year, which is around 1.1 % of the total generation of electricity in India; the same may reach around 100 TWh – 640 TWh/year by 2030, as per estimates from NITI Aayog; whereas the existing fleet of 2.3 Million may reach upto 17 Million by 2030 (considering 30% share of EVS in total registered vehicle). The report has also highlighted dimensions like, *increased charging stations for EVs, sustained battery recycling mechanism, enhanced pick-load capacity by DISCOM* etc. to achieve the dream of EV30@30.

2.2.41 ***Recommendations:***

1. The Expert Committee recommends that, the key challenges which have been highlighted under the report ought to be further deliberated along with CEA and DISCOM. The MoSPI and MoP needs to work at harmony for systematic monitoring of the same for effective implementation of the envisaged target.

(Action: MoSPI, MoP)

2.3 Resolving inconsistencies across energy statistics datasets

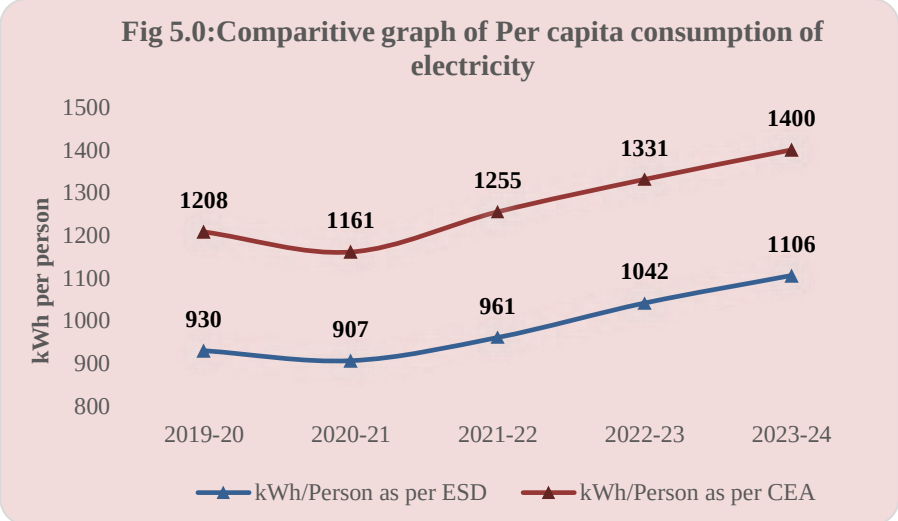
In India, energy data is generated and maintained by multiple Ministries/Departments serving with distinct administrative and operational objectives. While this decentralized data ecosystem enables sector-specific monitoring, there exist inconsistencies across datasets in terms of definitions, coverage, methodologies, periodicity and sectoral classifications.

In the process of generation of the energy-profile at country level, MoSPI brought out the following major discrepancies which needed to be resolved in consultation with the concerned stakeholders.

- ***Mis-match of "Per Capital Electricity Consumption of India" published by CEA and MoSPI***

2.3.1 Per capita Electricity Consumption, measured as the ratio of the *total electricity consumption during the year* to *the mid-year population of that year*, is a key indicator of economic development, living standards and energy sustainability. The time-series data of this indicator enable a clearer understanding of emerging demand patterns in a rapidly growing economy and thereby supporting the evidence-based policy formulation.

2.3.2 Presently, both MoSPI and CEA, compile and publish this indicator in their respective publications of *Energy Statistics India* and *All India Electricity Statistics- General Review publication*. Fig 5.0, depicts a comparative trend of the *Per Capita Electricity Consumption* computed by MoSPI and CEA, respectively.



Source: *Table 1.0 of All India Electricity Statistics: General Review 2025 and Table 8.4 of ES 2025*

2.3.3 It can be observed that, both the agencies data reflect similar pattern of trend over the years; yet the values compiled by CEA are consistently on the higher side than those of MoSPI.

2.3.4 The technical deliberations revealed that the, difference between the two datasets is mainly on account of conceptual understanding of generation and consumption of electricity as reported below:

- ***Methodology adopted by MoSPI:***

Following the International Guideline[2], MoSPI calculates the *per capita electricity consumption* using the following formula:

$$\frac{Total\ Consumption\ of\ Electricity\ over\ the\ year}{Mid-year\ population}$$

- ***Methodology adopted by CEA:***

CEA uses the *total available/supply of electricity* as the *numerator* for the compilation of the Indicator (since *the total electricity is generated for the consumption only*), including components like, T & D losses etc. while computing the *'per capita electricity consumption of India'* i.e.,

$$\frac{Total\ Generation\ of\ Electricity\ over\ the\ year}{Mid-year\ population}$$

2.3.5 ***Recommendations:***

1. The Committee recommended that MoSPI and CEA should compile the *Indicator* using both the *Consumption* and *Generation* side of data in their annual publications, with a footnote explicitly mentioning the inputs used in calculation of the indicators using both the approaches, i.e.

Per capita electricity generation: $\frac{Total\ Generation\ of\ Electricity\ over\ the\ year}{Mid-year\ population}$

Per capita electricity consumption: $\frac{Total\ Consumption\ of\ Electricity\ over\ the\ year}{Mid-year\ population}$

(Action: CEA and MoSPI)

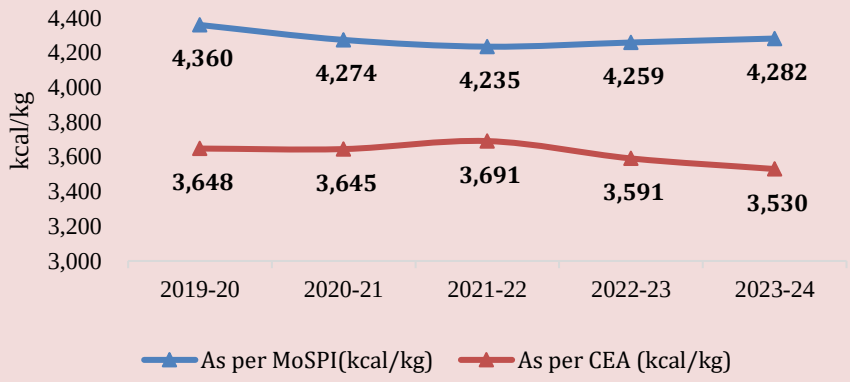
[2] *Energy Indicators for Sustainable Development: Guidelines and Methodologies* by IAEA, IEA,

- ***Methodological difference of "Average calorific value" of Coal used in Power Station between CEA and MoSPI:***

2.3.6 The calorific value is the measurement of heat or energy produced and is usually measured either as Gross Calorific Value (GCV) or Net Calorific Value (NCV). The GCV/NCV, also called as the "*conversion factors"*, has a significant role in the generation of energy-profile. In the annual publication of *Energy Statistics India,* the MoSPI comes out with the representative calorific values of Coal dispatched to Power Sector, by capitalizing information from different sources and adopting some methodology.

2.3.7 Similarly, in the annual publication of *All India Electricity Statistics, General Review*, the CEA, MoP, comes-out with the statistics on *Average Calorific Values* of Coal/Lignite dispatched to the power plants.

Fig 6.0 :Comparative study of Average GCV of Coal dispatched to power sector



2.3.8 A comparison of the two sets of figures generated by MoSPI and CEA, MoP (*Fig. 6.0)* shows significant difference in *Average GCV* used by both the Ministries. MoSPI is using a *consistently higher average GCV* value of Coal dispatched to the power sector over MoP, for the purpose of generating the Energy Balance table of India. A detailed technical discussion revealed that, discrepancies between the two sets of figures is on account of the following conceptual/methodological reasons:

- ***Difference due to different 'data-sources':***

  MoSPI takes inputs from three (3) sources of Ministry of Coal

  a. Grade-wise dispatch of '*quantity and GCV*' of Non-Coking coal dispatched to Power sector from the Marketing division of CIL and SCCL;
  b. Dispatch of *quantity* of Imported coal to power sector from the *All India Electricity Statistics, General Review 2024* by CEA, MoP, under the *Table 7.7* of CEA;
  c. The representative average GCV of Imported Coal, received from M/o Coal;

  On the other hand, CEA receives the *GCV of Coal consumed* directly from the *Power Plants* which are further combined and averaged-out to get a final GCV value.

- ***Difference in point of assessment of coal grades:***

  a) The Ministry of Coal captures the GCV of Coal at '*dispatch points or loading point'* of the *Coal transaction*.

  b) Whereas the Power Plants capture the information on *GCV of Coal* at "*receiving point or un-loading point"* of the *Coal transaction*.

  There are differences of grades between 'loading' and 'unloading point' of coal due to factors like, moister loss, transition and prolonged storage of coal prior to unloading.

Due to above two reasons the GCV values of Coal dispatched to power sector/power plant varies significantly which consequences into a notable variation of average GCV of Coal as highlighted under Fig. 6.0.

2.3.9 After a detailed discussion the Expert Committee made the opinion that, the *GCV* of Coal *at the dispatch/loading point* may be considered as the *official figures* of the Coal dispatched to power sector in India for the following two (2) reasons,

i) the assessment of Coal grades at *loading/dispatch point* is carried out in accordance to the *standard laid-down procedure*, by MoC. The process also involves active role of the line energy Ministry which is M/o Coal whereas the same doesn't hold true for the Coal which is graded at *unloading/receiving point*.

ii) The financial settlements between the Coal Producing companies (CIL/SCCL) and Coal consuming Companies (NTPC, Adani etc.) are linked to the grades determined at the *loading/dispatched point of the Coal-transaction* and not with the evaluated grades/GCV values of Coal at *un-loading/receiving point*.

Accordingly, the Expert Committee made the following recommendation,

2.3.10 ***Recommendations:***

1. The MoSPI may continue to use their existing practice for computation of average GCV of Coal dispatched to power sector. The CEA, MoP may be requested to adopt the same figures to ensure the consistency of the figures between the two Ministries.

(Action: CEA and MoSPI)

- ***Filling-up the Annual Questionnaire of Energy Statistics (AQES) of the UNSD (United Nation Statistical Division)***

2.3.11 The Annual Questionnaire on Energy Statistics (AQES) is part of the regular UNSD data collection programme that covers statistics such as production, trade, transformation and use of energy products in an excel file (named *AQES*) shared by UNSD with MoSPI. MoSPI in turn shares the excel sheet with all the line energy-Ministries to collect the required information. Based on the country level data, UNSD comes-up with different annual publications like, *World Energy Balance, Energy Statistics yearbook, Electricity profile* etc., containing *country-level energy-profile* of countries including India. In the India related data, it was observed that, while for some data-points, discrepancies existed between the 2 data-sources, for some data-points the corresponding data-sources from GoI could not be identified.

2.3.12 Considering the mismatch of official data with the data reflected in International Publications, a one-to-one meeting is necessary with UNSD and the line Ministries to understand these discrepancies. Accordingly, the following is recommended:

2.3.13 ***Recommendations:***

The Committee recommended MoSPI that the matter may be resolved based on a discussion with the line-energy Ministries and the UNSD to clearly identify the *source of discrepancies and possible remedies.*

(Action: MoSPI and all the line energy-Ministries)

2.4 Implementation of Energy Statistics database at Sub-national level

2.4.1 At present, a consolidated and comprehensive Energy Statistics are being collected and disseminated at national level only whereas a similar data collection system at sub-national level is yet to be developed. There is growing demand for granular energy statistics in the States/UTs. to fully harness the regional strengths, understanding the demand-consumption pattern of energy at state-level using local resources. State-level energy statistics will enable policymakers to identify local potential, design targeted interventions and replicate successful innovations across states, for balancing energy demand and supply situation.

2.4.2 Each state is planning its own development and projecting its growth trajectory. Under the federal structure of India, in order to visualise the dream of *Vikshit Bharat 2047* including the commitment to attains *Net-Zero emission* by 2070, the energy, sustainability and climate trajectory of the Union of India depends immensely upon the initiatives taken by the State/UTs. Hence it is of paramount importance that all the States/UTs to be encouraged to create an energy-statistic database of their own for continuous monitoring and shaping their policies accordingly. Union Ministries like MoSPI, Ministry of Power, Niti Aayog must help all the States/UTs in this process.

2.4.3 Considering the requirement of developing and strengthening the state statistical system to generate energy statistics for their use, following way forward is suggested.

2.4.4 ***Recommendations:***

1. State level nodal offices may be identified which will be responsible for production of energy statistics for their State/UT.
2. MoSPI together with M/o Power, Niti Aayog may provide the capacity building and technical backstopping to enable States/UTs to collect and compile energy statistics on an annual basis to start with.

(Action: MOSPI, M/o Power, Niti Aayog)

2.5 Improvement of the Energy Statistics publication of MoSPI

- ***World Energy Statistics and Credit Flow to Energy Sector:***

2.5.1 To capture the global energy trends and place India's energy trajectory within a global context, the Expert Committee members recognised the need for a dedicated *chapter on World Energy Statistics* in the annual publication of *Energy Statistics India*. Such comparison is essential to evaluate India's performance meaningfully and to align domestic energy planning with the global trends. Further, the Committee also felt that, the institutional financial support which has been rendered over the years to the Power sectors of India, ought to be included in the publication. The committee recommends MoSPI to incorporate data on *World Energy Statistics and Credit Flow to Energy Sector* for having a more comparative and comprehensive review of the existing energy-Statistics scenario,

- ***World Energy Statistics:***

The required statistics on *world energy* has been obtained from the official website of International Energy Agency (IEA). The section may contain the following aspects:

i. Total Primary Energy Supply (TPES) from Non-renewable and Renewable Sources:

The Global TPES of major renewable and non-renewable sources from the period 1990 to 2023 is shown along with the segregation of TPES from various sources like coal, natural gas, oil products, solar etc.

ii. Energy Consumption from Non-renewable and Renewable Sources:

Similar to TPES, Global energy consumption of major renewable and renewable sources from the period 1990 to 2023 is also shown along with the segregation of energy consumption from various sources like coal, natural gas, oil products, solar etc.

iii. India v/s Selected countries: A Comparative Study of Energy Trends on:

India's performance vis-a-vis other economies helps highlight both our challenges and our strategic advantages in shaping the future of global energy. The chapter provides a comparative analysis of 5 countries viz. India, China, Japan, Brazil and USA on some of the energy-parameters like,

a. Total Energy Supply and Total Energy Consumption figures across different years.

b. Sustainable Indicators: The chapter highlights the performance of the global energy sector using sustainable indicators such as Per Capita Electricity Consumption, Global CO2 emissions by energy source and CO2 emission by Capita.

- ***Credit Flow to Energy Sector:***

i. A dedicated sector on *Credit flow to the energy sector* is important for tracking the banking system's responsiveness to energy transition objectives, and long-term infrastructure investment needs.

ii. The following data available from Reserve Bank of India (RBI) is incorporated in this section:

a. Credit flow to Petroleum, Coal Products & Nuclear Fuels

b. Credit flow to Power sector

c. Credit flow to Renewable Energy Sector

The Committee agreed to the suggestion to incorporate this chapter in the *Energy Statistics India* with the following recommendation:

2.5.2 ***Recommendation:***

The Committee recommends, that in the forthcoming edition of the Energy Statistics India publication by MoSPI, separate section should be introduced containing data on World Energy Statistics and Credit Flow to Energy Sector. The same intends to transcend the coverage and acceptability of the publication.

(Action: MoSPI)

- ***Other recommendations***

2.5.3 As different energy-Ministries are coming up with their respective publications/reports over time, the committee advised that there should to be acknowledgement/reference of the original sources/publication from where the data has been taken.

2.5.4 There is a need to explicitly mention the duration of the statistics published as calendar year or financial year in order to avoid confusions among the reader community. Further, MoSPI should explore the feasibility of expert-review of its' Energy Statistics India publication and suitably incorporate those feedbacks prior to release, line with the practices followed by IEA and UNSC.

(Action: MoSPI)

Team Associated

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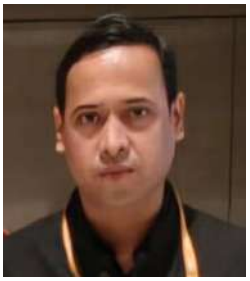

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Junior Statistical
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Annexure- 1

भारत सरकार / Government of India
सांख्यिकी और कार्यक्रम कार्यान्वयन मंत्रालय
Ministry of Statistics and Programme Implementation
राष्ट्रीय सांख्यिकी कार्यालय / National Statistics Office
(आर्थिक सांख्यिकी प्रभाग/ Economic Statistics Division)

K.L. Bhawan
Janpath, New Delhi-110001
Dated: 16-June-2025

OFFICE MEMORANDUM

Subject: Constitution of Expert Committee of Energy Statistics of India-reg.

In order to review the *Energy Statistics of India* publication and associated energy database with a view to improving its quality, relevance and effectiveness, an Expert Committee on Energy Statistics has been constituted with the approval of the Competent Authority to provide guidance for extending the scope, coverage, use of standardised concepts, definitions and terminology as per international guidelines, across all the energy sectors.

2. The Composition, Terms of References (ToR) and the tenure of the committee are as under:

Composition:

Sl.no.	Name and position	Category
1	Prof. Rangan Banerjee - Director, IIT Delhi	Chairperson
2	Dr. Madan Sabnavis, Chief Economist, Bank of Baroda	Official Member
3	Mr. Girish Sethi - Senior Director, Energy – TERI	Official Member
4	Dr. Satish Kumar - President and Executive Director of the Alliance for an Energy Efficient Economy (AEEE)	Non-Official Member
5	Additional Director General, Economics Statistics Division	Official member
6	Representative from Indian Renewable Energy Development Agency (IREDA)	Official Member
7	Representative from Niti Aayog	Official Member
8	Representative from Ministry of Coal	Official Member
9	Representative from Central Mine Planning and Design Institute Limited (CMPDIL)	Official Member
10	Representative from Ministry of New & Renewable Energy (MNRE)	Official Member

11	Representative from Ministry of Petroleum and Natural Gas (MoPNG)	Official Member
12	Representative from Ministry of Environment Forest and Climate Change (MoEFCC)	Official Member
13	Representative from Department of Atomic Energy	Official Member
14	Representative from Central Electricity Authority (CEA), Ministry of Power (MoP)	Official Member
15	Representative from Bureau of Energy Efficiency (BEE), Ministry of Power	Official Member
16	Dy. Director General, ESD, MoSPI	Member Secretary

A suitable officer not below the rank of Director may kindly be nominated to represent the Ministry/Department/agency in the committee.

3. Terms of Reference:

The Terms of Reference (ToRs) of the Committee would be as under:

i. Review of International best practices on capturing the Energy Statistics vis-a-via Indian database.

ii. Review of availability of energy-data in India and accessing the data-gaps across all the energy sector.

iii. Improvement in the Energy Statistics database of India, including extending the scope, coverage, use of standardised concepts, definitions and terminology as per international guidelines, across all the energy sectors.

iv. Recommendation on the development of domestic conversion factors of India, against all the energy commodities.

v. Any other related issues with the permission of the Chair.

4. The tenure of the committee will be six months from the date of issue of this OM.

5. The committee may Co-opt/ invite subject experts in the meeting as special invitee, if necessary, in order to meet specific requirements.

6. The Sitting Fees and the TA/DA against all the Non-Official Members will be governed by the following OMs:

a) OM No. 19047/10/2016-E-IV dated 12-04-2017 by Dept. of Expenditure, Ministry of Finance (as revised from time to time).

b) OM No. 19047/1/2016-E-IV dated 14-09-2017 by Dept. of Expenditure, Ministry of Finance (as revised from time to time).

7. The Code of Professional Ethics as notified vide Gazette Notification No. Y 18020/3/2019-CAP dated19th July 2019 shall be binding on the Chairman and Members (both Official and Non-official) of the committee.

8. The expenditure on conducting the meetings of the committee and on payments/ reimbursements to be made to the Non-Official Members will be borne by the Ministry of Statistics and Programme Implementation, New Delhi under 3454-Census, Survey and Statistics (Major Head), 02-Survey and Statistics (Sub Major Head), 02.204- Central Statistics Office (Minor Head), 19- Capacity Development (Capacity Development of CSO and Institutional Development & Capacity Building)

9. The Secretariat support to the Committee will be provided by the Economic Statistics Division (ESD) of MoSPI.

10. This issue with the approval of Secretary, M/o Statistics & PI.

16/06/25

(Indradeep Roy Chowdhury)
Director

Copy To,

1. Dr. Rangan Banerjee, Director, IIT Delhi, the *Chairperson* of the Expert Committee on Energy Statistics;
2. Dr. Madan Sabnavis, Chief Economist, Bank of Baroda;
3. Dr. Satish Kumar, President and Executive Director of the Alliance for an Energy Efficient Economy (AEEE).
4. Mr. Girish Sethi, Senior Director, The Energy Research Institute (TERI).

The Secretaries of the following Ministries, with the request to nominate a suitable officer not below the rank of Director/DS,

5. The Secretary, Ministry of Petroleum and Natural Gas, Govt. of India;
6. The Secretary, Ministry of New and Renewable Energy, Govt. of India (request to nominate officers from Ministry proper and IREDA);
7. The Secretary, Ministry of Coal, Govt. of India (request to nominate officers from Ministry proper and CMPDIL);
8. The Secretary, Ministry of Power, Govt. of India (request to nominate officers from BEE and CEA);
9. The Secretary, Department of Atomic Energy, Govt. of India;
10. The Secretary, Ministry of Environment Forest and Climate Change, Govt. of India;
11. CEO, Niti Aayog with the request to nominate one suitable officer not below the rank of Director/DS.

12. Chairman cum Managing Director of IREDA with the request to nominate one suitable representative.

Copy for information:

1) Sr. PPS to Secretary, MoSPI
2) PPS to Director General (CS), MoSPI
3) PPS to Director General (DG), MoSPI
4) PPS to Director General (NSS), MoSPI
5) Sr. PPS to Additional DG (ESD), MoSPI

16/06/2025

(Indradeep Roy Chowdhury)
Director

E-23956

File No.:P-11012/5/2019-(ES)ESD
भारत सरकार / Government of India
सांख्यिकी और कार्यक्रम कार्यान्वयन मंत्रालय
Ministry of Statistics and Programme Implementation
राष्ट्रीय सांख्यिकी कार्यालय / National Statistics Office
(आर्थिक सांख्यिकी प्रभाग/ Economic Statistics Division)

K.L. Bhawan
Janpath, New Delhi-110001
Dated: 01-Aug-2025

CORRIGENDUM

Subject: Constitution of Expert Committee of Energy Statistics of India-reg.

In partial modification to the earlier OM of even number dated 16-June-25 having the subject mentioned as above, the following updation in the Composition of the Committee may be read as below,

Sr. No.	Before	Now
1.	Dr. Madan Sabnabis, Chief Economist, Bank of Baroda	Chief Economist, Bank of Baroda
2	Dr. Girish Sethi, Senior Director, TERI as an Official Member	Director, Centre for Integrated Assessment and Modelling – TERI as a Non-official member
3	Dr. Satish Kumar, President and Executive Director of the Alliance for an Energy Efficient Economy (AEEE)	President and Executive Director of the Alliance for an Energy Efficient Economy (AEEE)

2. All other contents of the OM dated 16-June-25 shall remain same.

01/08/25

(Indradeep Roy Chowdhury)
Director

To,

1. The Chairman of the Expert Committee on Energy Statistics.
2. All members of the Expert Committee on Energy Statistics.

E-23956

File No.:P-11012/5/2019-(ES)ESD
भारत सरकार / **Government of India**
सांख्यिकी और कार्यक्रम कार्यान्वयन मंत्रालय
Ministry of Statistics and Programme Implementation
राष्ट्रीय सांख्यिकी कार्यालय / **National Statistics Office**
(आर्थिक सांख्यिकी प्रभाग/ **Economic Statistics Division)**

K.L. Bhawan
Janpath, New Delhi-110001
Dated: 17-Nov-2025

Office Memorandum

Subject: Constitution of Expert Committee of Energy Statistics of India-reg.

In accordance with **point no. 5** of the Office Memorandum(OM) of even number dated **16th June, 2025**, which states that,

"The Committee may co-opt/invite subject experts in the meeting as special invitee, if necessary, in order to meet specific requirements",

As recommended by the Chairperson of the Expert Committee, following expert is proposed to be invited as a **special invitee,** considering the relevance of the subject matter and the specific expertise in the subject matter.

Sr. No.	Name and Position
1.	Shri Srihari Dukkipati, Research Fellow-Prayas

2. All other contents of the OM dated 16-June-25 shall remain same.

17/11/25

(Indradeep Roy Chowdhury)
Director

To,

1. Shri Srihari Dukkipati, Research Fellow-Prayas.

Copy for information:

2. The Chairman of the Expert Committee on Energy Statistics.
3. All other members of the Expert Committee on Energy Statistics

Minutes of the 1st Meeting of Expert Committee on Energy Statistics

1. The 1st meeting of the Expert Committee on Energy Statistics was convened on 18.07.2025 at 10:30AM under the chairmanship of Prof. Rangan Banerjee, Director, IIT Delhi in the Conference Room (Room No. – 201) of Khurshid Lal Bhawan, MoSPI. The list of participants for the meeting is placed at Annexure-I.

2. At the onset, DDG, ESD welcomed the Chairman and all the other members of the Committee. She emphasized the need and importance of constituting an expert committee in MoSPI to review and strengthen the Energy Statistics database of India, aligning it with the international standards and enhancing its' relevance and usability.

3. The Secretary, MoSPI highlighted that MoSPI brings out the Energy Statistics publication every year with the objective of providing a concise overview of the energy scenario in India. However, if any data points may be missing, efforts will be made through the support and collaboration of all committee members to capture all available information, in alignment with MoSPI's tagline: '*Data for Development*'. Further, through this committee MoSPI aims to bridge existing data gaps particularly on the demand side of the energy-scenario and to enhance the user-friendliness of the publication.

4. The Chairman extended his thanks to MoSPI for inviting him and highlighted that, one of the main aims of the committee should be to improve the readability, use-ability and searchability of Energy Statistics. All Ministries may coordinate and help in streamlining the data formats to ensure consistency and accuracy in the Energy Balance data of India. Sub-groups, consisting of members of the Committee, may be formed to resolve different technical issues in a timely and efficient manner. Further, discussion may not be limited to the agenda-items specified and circulated for the 1st meeting of the Expert Committee.

5. Director, ESD made a presentation covering the energy-statistics scenario in India, the usefulness of Energy-Statistics publication of MoSPI and the four(4) main items which have been circulated by the Division. After a detailed technical discussion, the following recommendations were made by the committee:

i. **Agenda I(a)- 'Use of sectoral-end-use consumption of energy-commodities as per latest revision of ISIC'.**

- MoSPI will share the Standard end-use consuming sectors, as per ISIC Rev. 4, with all the energy-Ministries for incorporating those in their respective publications. The line energy-Ministries are requested to provide their comments/observations on implementing this classification and the time-line by which it would be possible to provide data according to this classification.

(Action: MoSPI and all the line energy- Ministries)

ii. **Agenda I (b)- 'Use of International concepts and definition under SIEC in the domestic energy-commodities (especially for Coal)'-**

- The questionnaire on SIEC Rev 2.0 which has been shared by UNSD to MoSPI, under Global Consultation, will be circulated by MoSPI to all the concerned Ministries for their views/comments latest by 8th August (Friday).

(Action: MoSPI all the line energy- Ministries)

- For the development of concordance among the various classifications of products in use, especially for Coal, MoSPI may organize a separate discussion with the representatives of M/o Coal, CMPDIL, BIS and GSI.

(Action: MoSPI, BIS, CMPDIL, GSI, M/o Coal)

iii. **Agenda I (c)- 'Re-looking the Conversion Factors of all the energy-commodities of India'-**

- MoSPI will share the methodology adopted for deriving the representative calorific values of Coal with all the line energy-Ministries for their views/opinions.
- For conversion rates on nuclear energy, Dept of Atomic Energy (DEA) may assist MoSPI and provide a comprehensive note on the conversion factors used by the Department.

(Action: MoSPI, all energy-Ministries, Dept of Atomic energy)

iv. **Agenda II (a)- 'In case of Coal, the end-use sector "Others" has a share of around 65-70%, out of the total dispatch to non-power/Industry sector, in a financial year'-**

- MoSPI may organize a separate consultation with the representatives from M/o Coal, CIL, AEEE, BEE to look at the formats in use and suggest for modifications to improve the *end use sector* information.

(Action: MoSPI, CIL, BEE, AEEE, M/o Coal)

v. **Agenda II (b)- 'The end-use dispatch of Imported coal (which accounts to nearly 20% of the total availability of Coal in a FY) is not captured'-**

- A separate discussion with representatives from TERI, M/o Coal, CEA, M/o Steel and MoSPI to explore and improve the availability of disaggregated data on Imported Coal.

(Action: TERI, M/o Coal, CEA, M/o Steel and MoSPI)

vi. **Agenda II (c) -'Under MoPNG, in case of High-Speed Diesel (HSD), which accounts for close to 40% of the total petroleum products, a dominant share (around 85-88%) of consumption has been depicted against the sector Retail/Reseller'-**

- PPAC has so far conducted two surveys-'All India Study on Sectoral Demand of Diesel & Petrol' by CRISIL and another by Nielsen to assess the sectoral end-use consumption of HSD under Retail/Reseller.
- MoPNG may be requested to prepare a comprehensive plan to conduct such surveys at a more regular interval and submit the same to the Committee.
- MoPNG may also develop a template for the 'Retail/Reseller' to provide the required data to PPAC, at a suitable interval.

(Action: PPAC, MoPNG and MoSPI)

vii. **Agenda II (d)- 'In case of CEA under MoP, the entire consumption of electricity against all sectors of 'Industries' have been clubbed together and placed as a 'single value'-**

- Considering the user requirements, the CEA and BEE may explore the feasibility of generating more dis-aggregated level data, atleast for major Industries.

(Action: MoSPI, CEA and BEE)

viii. **Agenda II (e) 'Incorporating the component of Bio-fuel' —**

- A sub-committee may be constituted with representatives from TERI, MNRE, Niti Aayog and MoSPI to look into the matter and come-up with their observation/findings.

(Action: TERI, MNRE, Niti Aayog and MoSPI)

ix. **Agenda II (f)- 'Incorporating the Bunker Data in the Energy Balance table of India'-**

- MoSPI and MoPNG may analyse the data and methodology for effective implementation of the same in the energy-balance table of India.

(Action: MoSPI and MoPNG)

x. **Agenda III (a)- 'Filling-up the Annual Questionnaire of Energy Statistics (AQES) excel file from the UNSD (United Nation Statistical Division)'-**

- A comparative analysis for each of the energy-statistics data-points may be prepared by ESD, MoSPI which will be shared with all the line energy-Ministries.
- All the energy-Ministries will be requested to come-up with their statement/observations to this Committee for having a review and discussion.

(Action: MoSPI and all energy- Ministries)

xi. **Agenda III (b)- 'Mis-match of "Per Capital Electricity Consumption of India" between CEA under MoP and ESD under MoSPI'-**

- A meeting between MoSPI and CEA may be organized to clarify the definition used, methodology adopted and the population estimates used for compiling the indicator.

(Action: MoSPI and CEA)

xii. **Agenda III (c)- 'Mismatches of "Average calorific value" of Coal used in Power Station between CEA under MoP and ESD, MoSPI'-**

- A meeting between MoSPI and CEA may be undertaken to resolve the issue.

(Action: MoSPI and CEA)

6. The Committee further opined that,

i. A study needs to be undertaken to look into the following aspects:

- How the Energy Statistics publication framework differ from the reports of International organizations and other countries like EU, USA, IEA etc.-A note on such differences and recommendations may be prepared.

(Action: AEEE, TERI)

- A feedback form, in consultation with TERI and AEEE, may be developed and hosted in the official website of MoSPI, for capturing the views of the users of the Energy Statistics publication.

(Action: MoSPI, TERI and AEEE)

ii. As different energy-Ministries are coming-up with their respective publications/reports over time, the Committee advised that there ought to be acknowledgment/reference of the original sources/ publications from where the data has been taken.

(Action: All energy-Ministries and MoSPI)

iii. Dr. Ritu Mathur, Director, TERI mentioned about the inconsistencies among different reports/publications of GoI (like inconsistency of consumption of Coal in Household sectors in BUR of MoEFCC vis-a-via statistics available in the Energy Statistics India publication of MoSPI). TERI has been requested to provide a comprehensive note of all such cases to this Committee for further deliberations.

(Action: TERI)

iv. GoI need to explore the compilation of energy-statistics at the sub-national level. MoSPI may write to all the States/UTs with the request to share their views/comments on compilation of the Energy Statistics at State/District level.

(Action: ESD, MoSPI)

v. Keeping in view the mandates of the Energy Data Management Unit (EDMU), Ministry of Power; the MoSPI may take up the matter with Secretary, Ministry of Power to avoid any possible duplication of work.

(Action: ESD, MoSPI)

vi. Dr. Satish Kumar from AEEE suggested for improvements in aspects like, consistency of the statistics published by different energy-Ministries, involvement of more IT in the energy-domain, the data-lag of the energy-statistics etc. AEEE has been requested to submit a comprehensive note on the issues to the Committee, for further deliberation.

(Action: AEEE)

vii. Dr. Madan Sabnavis, Chief Economist from Bank of Baroda expressed his views on dimensions like, coverage of global statistics on Energy-aspects, flow-of-credit in the field of energy, performance of the companies under this sector etc. and suggested for incorporating such information in the upcoming edition of Energy Statistics. The Committee requested TERI, AEEE for further deliberation in this aspect along with Dr. Sabnavis, to specify data-items along with their sources, for consideration of the Committee.

(Action: TERI, AEEE and Dr. Madan Sabnavis)

viii. The Chair highlighted the need to explicitly mention the duration of the statistics published as 'calendar year' or 'financial year' in order to avoid confusions among the reader community.

(Action: All energy-Ministries, MoSPI)

ix. Niti Aayog, highlighted dimensions like, inclusion of green Hydrogen, energy-consumptions in the field of EVs, the use of 'population number' for deriving Indicators like 'per-capita energy-consumption' etc. The CEA and energy-Ministries may be requested to suggest the availability of

reliable/authentic statistics in these fields and hence inclusion of such data-items in the upcoming edition of the Energy Statistics publication.

(Action: All energy-Ministries, Niti Aayog, MoSPI)

x. Mr. Arijit Sengupta from BEE, suggested that EDMU under MoP has already conducted two surveys to collect data on demand side of Energy-statistics. He further highlighted that, EDMU has earlier reached out to MoSPI in matters related to capturing demand-side of the energy-data. BEE may be requested to share methodologies/reports/findings of the demand-side surveys conducted by BEE, with the Committee, for its' review and discussion.

(Action: BEE)

Annexure-I

List of Participants

S.No.	Ministry/ Organisation/ Department	Nominated officer	Designation
1.	IIT Delhi	Prof. Rangan Banerjee	Director, IIT Delhi, In-Chair
2.	MOSPI	Dr. Saurabh Garg	Secretary, MoSPI
2.	ESD, MoSPI	Dr. Dalip Singh	ADG, ESD
3.	Bank of Baroda (Online mode)	Dr. Madan Sabnavis	Chief Economist
4.	TERI	Dr Ritu Mathur	Director
5.	AEEE	Dr. Satish Kumar	President and ED
6.	M/o Coal	Smt. Chetna Shukla	DDG(Stats)
7.		Shri Ankit Kumar Jain	DD
8.	CMPDIL	Shri R.K. Singh	General Manager (Exploration)
9.	MNRE	Smt. Mini Prasannakumar	DDG(Stats)
10.	MoPNG	Ms. Manisha	AD
11.	Dept. of Atomic Energy	Shri Mahender Singh	Scientific Officer(F)
12.	CEA, MoP	Ms. Kiran Meena	Director, PDM&LF Division
13.	BEE, MoP	Shri Arijit Sengupta	Director, BEE
14.		Shri Abhishek	Sr. Sector Expert
15.	ESD, MoSPI	Ms. Ankita Singh	DDG, ESD
16.		Shri Indradeep Roy Chowdhury	Director, ESD
17.	Niti Aayog	Shri Venugopal Mothkoor	Sr. Specialist
18.	MoEFCC	Neha Singh	Consultant

Minutes of the 2nd Meeting of Expert Committee on Energy Statistics

1. The 2nd meeting of the Expert Committee on Energy Statistics was convened on 06th -Nov-2025 at 10:30AM under the chairmanship of Prof. Rangan Banerjee, Director, IIT Delhi in the Conference Room (Room No. – 201) of Khurshid Lal Bhawan, MoSPI. The meeting was also graced by Secretary, MoSPI with his august presence. The list of participants in the meeting is placed at Annexure-I.
2. At the onset, DDG, ESD welcomed the Chairman and all the other members of the Committee. She mentioned that the agenda of the meeting is to review the actionable points which emerged subsequent to the 1st meeting of the Expert Committee on Energy Statistics. The committee was informed that the division has conducted rounds of meetings/deliberations with all the line MDOs of GoI along with research bodies to address those issues. The second meeting intends to consolidate the initiatives taken by the Division and way forward.
3. The Secretary, MoSPI appreciated the developments made by the Committee on different technical aspects and requested the Chairman to recommend some indicative path for all such issues which couldn't possibly be resolved during the tenure of the Committee and which the Ministry can continue to pursue with stakeholders to resolve them over the coming year.
4. The Chairman highlighted that there should be an alignment between the data published by various Ministries under the GoI. All the different energy-Ministries under GoI need to work in close coordination to ensure the inter-consistency of the data, since statistics/data is the base for decision making. Further, keeping in view the diversity of technical issues still to be worked upon for suggesting a way forward, the Chairman expressed to bring our an interim report by Dec 2025 and the need of extension of the tenure of the Committee upto 31st January 2026, to submit the final report.
5. The representative from MoPNG and PPAC expressed concern over the mandates available under GoI to comply the statistical-units to provide the required data to the concerned Ministries. The Secretary and the Chairman highlighted that, the commercial information related to any company/industry might be a sensitive one but other information should be made available using existing GoI acts/rules like Collection of Statistics Act.

6. Thereafter, a presentation was made by ADG, ESD. The progress made over the 29 issues/actionable points which came out of the feedbacks/inputs received from the different

members of the Committee after the 1st meeting of the Expert Committee on Energy Statistics. The presentation witnessed a spontaneous and active participation of all the members who were present, both physically and over VC. The technical deliberation on the *actionable points on each agenda item* culminated into the following suggestions and way forward:

I. ***Agenda I(a):'Use of sectoral-end-use consumption of energy-commodities as per latest revision of ISIC'***

This agenda has overlaps with Agenda II{(a), (b),(c) and (d)} and was accordingly discussed with these items.

i. ***Agenda II (a) : In case of Coal, the end-use sector "Others" has a share of around 65-70%, out of the total dispatch to non-power/Industry sector, in a financial year'***
ii. ***Agenda II (b): The end-use dispatch of Imported coal (which accounts to nearly 20% of the total availability of Coal in a FY) is not captured***
iii. ***Agenda II(d) : In case of CEA under MoP, the entire consumption of electricity against all sectors of 'Industries' have been clubbed together and placed as a 'single value'***
iv. ***Agenda II(c): Dis-aggregated level data of the 'Retail/Reseller' sector for HSD***

Deliberations and Recommendations:

i. ***Agenda II (a):*** **In case of Coal, the end-use sector "Others" has a share of around 65-70%, out of the total dispatch to non-power/Industry sector, in a financial year' and**
ii. ***Agenda II (b*****): The end-use dispatch of Imported coal (which accounts to nearly 20% of the total availability of Coal in a FY) is not captured**

- It was observed that the ASI data, published by the NSS, MoSPI is a survey-based database whereas the statistics comes out of the PAT (Perform, Achieve and Trade) scheme is under the National Mission for Enhanced Energy Efficiency (NMEEE) initiatives by BEE, MoP which intends to mandate the reduction Specific Energy Consumption (SEC) among all the major energy-intensive industries. The PAT scheme may have a larger coverage of major energy-intensive Industries than ASI data and information available under PAT scheme should be used to frame the methodology for determining the of Coal consumption pattern in India.
- The Chairman proposed a comparative study between the statistics available under PAT scheme and ASI data to come-up with conclusive statement. It was proposed that, the figures of large sectors can be taken from PAT scheme and for small sectors ASI may be used.

- For ascertaining the methodology and final findings a team consists of representatives from BEE, TERI, MoC, MoSPI, and Prayas may be constituted. A report may be prepared and submitted to the Committee.

(Action: BEE, TERI, MoC, MoSPI, Prayas)

Status: Under process.

iii. Agenda II(d): In case of CEA under MoP, the entire consumption of electricity against all sectors of 'Industries' have been clubbed together and placed as a 'single value'.

- The representative from CEA reaffirmed that since the *DisCom* doesn't have any existing mechanism to capture the dis-aggregated data on *Industries* hence such information is not possible to provide by the CEA under present circumstances. However, if the Committee comes-out with certain recommendations along with a template to capture such information by CEA, the matter may be taken up by CEA at appropriate level.
- The Chairman suggested that, in case of electricity also the information available under PAT scheme may be explored alongside the information available from the ASI data. Representative from CEA also submitted that under the *Chapter 5(Table 5.5)* of the annual publication of All *India Electricity Statistics, General Review,* from CEA, information of Industry-wise generation and consumption of electricity by *Captive Power Plants (CPP)* have been provided.
- A study on the approach to capture the dis-aggregated level data of Industry in electricity consumption and further segregation of the same into captive and non-captive category can be made by a team consists of representatives from TERI, CEA and BEE. A comprehensive report may be prepared in this regard and to be submitted to the Committee.

(Action: TERI, CEA, BEE and MoSPI)

Status: Under process.

iv. Agenda II(c): Dis-aggregated level data of the 'Retail/Reseller' sector for HSD

- PPAC mentioned that the report *All-India study on sectoral demand for petrol and diesel*' by CRISIL used for the segregation of retail/reseller data of HSD was prepared during the COVID-19 pandemic. For fetching the data of transport sector, PPAC shall provide data from the VAHAN Portal.

- Representative from TERI and Prayas mentioned that a wide variation has been observed in data fetched from VAHAN portal because of different assumptions taken on occupancy and utilisation.
- It was recommended that for the time being, the figures from *All-India study on sectoral demand for petrol and diesel*' report by CRISIL can be used as an estimate to bifurcate the *retail/Reseller* data of HSD data, to which PPAC also conveyed their approval.
- The Committee further recommended that TERI and Prayas may conduct a study to recheck the numbers based on the different existing reports/research works available in this matter.

(Action: TERI, Prayas and MoSPI)

Status: Closed

v. *Agenda III (b): Mis-match of "Per Capital Electricity Consumption of India" between CEA under MoP and ESD under MoSPI*

- The Energy Statistics India publication may incorporate both figures on per capita electricity availability/generation (which is as per CEA) and per capita electricity consumption calculated by MoSPI. An explanatory note may be also be incorporated with it and the same may be checked with CEA.

(Action: MoSPI)

Status: Closed

vi. *Agenda I (c): Re-looking the Conversion Factors of all the energy-commodities of India*

The matter was dealt along with the following agenda,

Agenda III(a): Mismatch of Average calorific value of Coal used in Power Station between CEA under MoP and ESD, MoSPI.

- It was observed that, since the existing methodology for compiling the *representative calorific values of Coal dispatched to Power Sector* is a proven one and developed by joint initiatives from MoSPI, MoC and NITI Aayog hence the matter may be discussed in detailed by forming a team consists of representatives from CEA, MoC, Niti Aayog, Prayas and MoSPI. A comprehensive study may be made and a report may be prepared accordingly.
- The representative from Prayas submitted that, they will provide a report based on some study conducted by them in this issue. The CEA has also been requested to provide the similar *representative calorific values of Lignite* to the Committee.

(Action: MoC, CEA, Niti Aayog, Prayas)

Status: Under process.

vii. Agenda II (e): Incorporating the component of Bio-fuel

- Representative from TERI stated that they are currently working on capturing the supply side and demand side statistics of Biofuel, and refining the methodologies used earlier.
- PPAC has agreed to provide data of the following types of biofules: Bio-gasoline (Bio-ethanol, Bio-methanol), Biodiesels, Bio jet kerosene, Other liquid biofuels, Biogases from anaerobic fermentation, and Biogases from thermal processes.
- Further deliberation among the representative of MNRE, TERI, PPAC, MoEFCC and Niti Aayog is indispensable to frame a consolidated view of future roadmap. A comprehensive report, exploring all the dimensions of incorporating the each of the Bio-fuel in the Energy Balance table of India, may be prepared and to be submitted to this Committee.

(Action: TERI, MNRE, and Niti Aayog)

Status: Under process.

viii. Agenda I(b): 'Use of International concepts and definition under SIEC in the domestic energy-commodities (especially for Coal)'

- It was observed that considering the varying testing criteria, a direct concordance between the domestic coal with SIEC is not simple; the concerned Sub-Committee under the Chairmanship of *Prof. R.M.Bhattacharjee* of ISM Dhanbad may be requested to come-up with their suggestions within their stipulated timeline.
- It was informed to the Chair that the first meeting of the Sub-Committee on Coal has already been conducted on 31st-Oct and the Sub-Committee is in the process of conducting the second meeting soon, preferable a physical one.

(Action: The Sub-Committee on Coal)

Status: Under process

ix. Agenda III(a) : Filling-up the Annual Questionnaire of Energy Statistics (AQES) excel file from the UNSD (United Nation Statistical Division)

- The committee agreed on taking up the matter separately by MoSPI with each of the line energy-Ministries for a detailed technical discussion on reconciliation.

(Action: The Sub-Committee on Coal)

Status: Closed

x. Reviewing developments made on the other recommendations of the Committee

a) ***A study needs to be undertaken to look into the following aspects:***

How the Energy Statistics publication framework differ from the reports of International organizations and other countries like EU, USA, IEA etc.-A note on such differences and recommendations may be prepared.

- Representative from AEEE made a presentation on the roadmap prepared by AEE to capture the demand side data of energy consumption.
- Chairman recommended that AEEE may submit such a report along with clarifications regarding who will collect the data, type of data to be collected, how much data is readily available with various Ministries on the same, overall practical way to incorporate such data. Such a report may be added as an annexure to the final report of the committee.

(Action: AEEE)

- The request which was received by MoSPI from BEE, MoP to examines by the ESD to come-out their views and observation.

(Action: MoSPI and BEE)

- The representative from BEE submitted that the demand side survey on electricity consumption of *Residential and Commercial* building is still under consideration by the MoP. The same will be shared with the Committee members once it is approved by the Competent Authority.

(Action: BEE)

Status: Under process.

b) *Dr. Madan Sabnavis, Chief Economist from Bank of Baroda expressed his views on dimensions like, coverage of global statistics on Energy-aspects, flow-of-credit in the field of energy, performance of the companies under this sector etc. and suggested for incorporating such information in the upcoming edition of Energy Statistics. The Committee requested TERI, AEEE for further deliberation in this aspect along with Dr. Sabnavis, to specify data-items along with their sources, for consideration of the Committee.*

- The draft version of the *Chapter-10: World Energy Statistics* was briefed to the Chair. The Chair recommended to convert the figures into Peta Joule from Tera Joule. Further an official communication may be made by MoSPI to IEA prior to quoting their statistics in the official publication of MoSPI.

- The ADG, ESD pointed out that a comparison between the International Statistics and India should be incorporated to make it more comprehensive. Dr. Madan Sabnavis highlighted that since all the other chapters of Energy Statistics Publication are pertaining to India only, this chapter should stick only to International Statistics only.
- For including statistics on credit-flow-in energy-sector, a technical deliberation with MoSPI, Dr. Madan Sabnavis and the Statistics Department of RBI may be undertaken.

(Action: MoSPI)

Status: Under process.

c) *Dr. Ritu Mathur, Director, TERI mentioned about the inconsistencies among different reports/publications of GoI (like inconsistency of consumption of Coal in Household sectors in BUR of MoEFCC vis-a-via statistics available in the Energy Statistics India publication of MoSPI). TERI was requested to provide a comprehensive note of all such cases to this Committee for further deliberations.*

- The Chair highlighted that since at International level, the matter of *inconsistencies of energy-Statistics between the two publications of India* is not desirable; the matter may be taken up at higher level for an amicable solution. A communication from Secretary (MoSPI) to Secretary (MoEFCC) may be made to expedite the issue. A detailed technical discussion along with TERI and Prayas may be made to look into the matter.
- For most of the other issues the division has taken some initiatives.

(Action: MoSPI, TERI,Prayas and MoEFCC)

Status: Under process.

d) *GoI need to explore the compilation of energy-statistics at the sub-national level. MoSPI to write to all the States/UTs with the request to share their views/comments on compilation of the Energy Statistics at State/District level.*

- The Chair suggested that communication may be made at Secretary, MoSPI level with a top performing state (using the statistics available under State Energy Efficiency Index (SEEI) publication from AEEE) with the request to seek their active participation.
- PPAC pointed out that the portals like, *India Energy Climate Dashboard* under Niti Aayog contains useful information in this regard.

(Action: MoSPI and AEEE)

Status: Under process.

e) *Niti Aayog, highlighted dimensions like, inclusion of green Hydrogen, energy-consumptions in the field of EVs, the use of 'population number' for deriving Indicators like 'per-capita energy-consumption' etc. The CEA and energy-Ministries may be requested to suggest the availability of reliable/authentic statistics in these fields and hence inclusion of such data-items in the upcoming edition of the Energy Statistics publication.*

- The representatives from PPAC informed that the number of registered EVs can be extracted from the VAHN portal, the same can be used to come-out with some findings in this regard. The PPAC and Niti Aayog are currently in the process of preparing a study on the matter and the report shall be prepared by January end.

(Action: PPAC and Niti Aayog)

Status: Under process

Issues which are deemed Closed:

xi. ***Agenda II (f): Incorporating the Bunker Data in the Energy Balance table of India***

xii. ***Agenda I (c): Re-looking the Conversion Factors of all the energy-commodities of India (regarding the conversion factor used in Nuclear Energy)***

xiii. ***Agenda I (b): Use of International concepts and definition under SIEC in the domestic energy-commodities (especially for Coal)- SIEC Rev 2.0 Questionnaire matter***

xiv. ***As different energy-Ministries are coming-up with their respective publications/reports over time, the Committee advised that there ought to be acknowledgment/reference of the original sources/ publications from where the data has been taken.***

xv. ***The Chair highlighted the need to explicitly mention the duration of the statistics published as 'calendar year' or 'financial year' in order to avoid confusions among the reader community.***

Closing Remark by Chairman:

Chairman suggested that the Committee should come-up with a draft version of *Interim Report* latest by *15th December 2025*, which shall be shared with all Committee members for their feedback/opinion. The Interim report shall consist of the summary of the minutes of the meeting along with all the findings and recommendations made by the committee.

Considering the multi-faceted and critical issues which have been raised by this Committee, the Committee may request Secretary MoSPI with the request to extend the tenure of the committee up to 31st January 2026.

The meeting ended with a vote of Thanks to the Chair.

Annexure-I

List of Participants in the 2nd meeting held on 06.11.2025

S.No.	Ministry/ Organisation/ Department	Nominated officer	Designation
1.	IIT Delhi	Prof. Rangan Banerjee	Director, IIT Delhi, In-Chair
2.	MOSPI	Dr. Saurabh Garg	Secretary, MoSPI
2.	ESD, MoSPI	Dr. Dalip Singh	ADG, ESD
3.	Bank of Baroda (Online mode)	Dr. Madan Sabnavis	Chief Economist
4.	TERI (Online mode)	Dr Ritu Mathur	Director
5.	TERI	Shri Pratham Saraf	Project Associate
6.	AEEE (Online mode)	Dr. Satish Kumar	President and ED
7.	AEEE	Ms. Ranjana Kumari	Senior Research Associate
8.		Ms. Vidyotma Singh	Research Associate
6.	M/o Coal	Smt. Chetna Shukla	DDG(Stats)
7.		Shri Ankit Kumar Jain	DD
8.	CMPDIL	Shri Saurabh Singh	Sr. Manager (Geology)
9.	MNRE	Smt. Mini Prasannakumar	DDG(Stats)
10.	MoPNG	Shri DK Ojha	DDG(Stats)
11.	PPAC	Shri Vijay Kansal	Addl. Director (D&ES)
12.	Dept. of Atomic Energy	Shri Mahender Singh	Scientific Officer(F)
13.	CEA, MoP	Ms. Kiran Meena	Director, PDM&LF Division
14.	BEE, MoP	Shri Arijit Sengupta	Director, BEE
15.		Shri Abhishek	Sr. Sector Expert
16.	MoEFCC	Shri Singray Murmu	AD
17.	Prayas (Online mode)	Shri Srihari Dukkipati	Research Fellow
17.	ESD, MoSPI	Ms. Ankita Singh	DDG, ESD
18.		Shri Indradeep Roy Chowdhury	Director, ESD

Minutes of the 3rd Meeting of Expert Committee on Energy Statistics

1. The 3rd meeting of the Expert Committee on Energy Statistics was convened on 28th -Jan-2026 at 10:30AM under the chairmanship of Prof. Rangan Banerjee, Director, IIT Delhi in the Conference Room (Room No. – 201) of Khurshid Lal Bhawan, MoSPI. The meeting was also graced by Secretary, MoSPI with his august presence. The list of participants in the meeting is placed at Annexure-I.
2. At the onset, DDG, ESD welcomed the Chairman, Expert Committee, Secretary, MoSPI and all members of the Committee. DDG(ESD)informed that the draft Report of the Committee was circulated to members for their comments and observations and the meeting is to review the draft and the final recommendations of the Expert Committee.
3. The Secretary, MoSPI thanked the Chairman and other members of the Committee for their contribution in shaping the draft form of the report. He emphasized the importance of a structured Energy Statistics database of India and expressed that, the recommendations of this Expert Committee will enable a better institutional setup for collecting and reconciling Energy Statistics and filing up data-gaps.
4. In his opening remarks, the Chairman highlighted that the draft report contains all the material required but requires changes in method of presentation to be discussed in the meeting. The meeting may focus on the structure to the draft report, unambiguous recommendations and a clear roadmap for issues that could not be resolved. The recommendations should be assigned against the line Energy Ministries, for effective follow-up and implementation.
5. Director, ESD made a presentation on the recommendations of the Committee. which culminated into the following suggestions:

I. Agenda I(a): 'Use of sectoral-end-use consumption of energy-commodities as per latest revision of ISIC'

i) The Secretary, MoSPI suggested to retain the sub-sectors on the sectoral end-use within broad sectors category (like information on consumption of coal/lignite etc. against industries like Bricks, Cement, Glass, Ceramics & Refractories under the sector Non-Metallic Minerals) to avoid any loss of information.

ii) More clarity be provided about the sectors which have been clubbed under Others/Miscellaneous by different energy-Ministries.

iii) The end-use sectors, as mentioned under the latest IPCC guidelines for National Greenhouse Gas Inventories may also be examined for its conformity with sectoral end-use consumption categories as per ISIC.

iv) A format for capturing the sectoral end-use consumption of energy commodities, to be devised, placed in the report and shared with all the line energy-Ministries for its uniform application;

(Action: MoSPI)

II. Agenda I(b): 'Use of International concepts and definition under SIEC in the domestic energy-commodities (especially for Coal)'

i) On the recommendation of the Sub-Committee on Coal that "the attempt of one-to-one mapping of different classes of coal & lignite between the Domestic and International Classification standards may be too simplistic" the Chair advised the sub-committee that if not one to one mapping, broad concordance between the existing Domestic and International classification of Coal may be developed and submitted to the committee.

(Action: The Sub-Committee on Coal and MoSPI)

III. Agenda I (c): Re-looking the Conversion Factors of all the energy-commodities of India

i) The methodology for deriving the existing conversation factors (especially for Coal) to be included in the report.

ii) The other energy-Ministries to make use of the same conversion factors in their respective purposes to ensure the uniformity of the same.

(Action: MoSPI)

IV. Agenda II (a): In case of Coal, the end-use sector "Others" has a share of around 65-70%, out of the total dispatch to non-power/Industry sector, in a financial year' and

V. Agenda II (b): The end-use dispatch of Imported coal (which accounts to nearly 20% of the total availability of Coal in a FY) is not captured

i) On the use of ASI data, it was mentioned that, the ASI data comes with a lag of 2 years and also doesn't include the separate information on Coal consumed under Captive plants and not bifurcated according to Coking/Non-Coking Coal.

ii) The coal despatch under PAT scheme of BEE, MoP, has limited information and covers only a meager proportion of the total consumption of Coal.

iii) The recommendation of the Expert Committee was to include the use of PAT data for energy intensive large industries and use of ASI data for the remaining sectors.

iv) The MoC ought to come-up with bifurcated and detailed information in their annual publication. The data on coal consumption, including different grades/types across different sectors (consistent with IPCC categories) shall be collected.

(Status: Closed)

VI) Agenda II(c): Dis-aggregated level data of the 'Retail/Reseller' sector for HSD

i) The recommendation of the Expert Committee was to include the figures available under the survey report of CRISIL for determining final end use consumption of HSD under the Retail/Reseller sector, as mentioned by MoPNG.

ii) PPAC, MoPNG may be requested to explore the feasibility of conducting such surveys in a Biennial manner to capture the latest trend of consumption of HSD. Further, in order to seek for a long-term resolution, the provision of collecting the sales data directly to be explored by the MoPNG.

(Status: Closed)

VII) Agenda II(d): In case of CEA under MoP, the entire consumption of electricity against all sectors of 'Industries' have been clubbed together and placed as a 'single value'

i) On the lines mentioned against Agenda Item II(a) and II(b), it was recommended that, the methodology developed using the ASI data may be used in determining the sectoral end use consumption of coal.

ii) DISCOM may be requested to evolve their system and collate such detailed data on sectoral end-use consumption of electricity to ensure the plugging of the data-gap in consumption of electricity.

iii) Systematic surveys may also be conducted by CEA, MoP to identify the demand-centric industries of the countries.

(Status: Closed)

VIII) Agenda II (e): Incorporating the component of Bio-fuel

A comprehensive report was submitted by MNRE and TERI proposing roadmap for incorporating the Bio-fuel in the energy-profile of the country was discussed and the Committee recommended its implementation in close consultation with the line MDOs. Biomasss consumption data for all sectors may also be collected.

(Status: Closed)

IX) Agenda II (f): Incorporating the Bunker Data in the Energy Balance table of India

The Committee agreed with the findings and the recommendations to incorporate it in the energy statistics publication.

(Status: Closed)

X) Agenda III (a): Mis-match of "Per Capital Electricity Consumption of India" between CEA under MoP and ESD under MoSPI

i) The committee recommended dissemination of both the figures based on generation and consumption of electricity as indicated in the draft report.

ii) Further, an exercise on estimating the consumption of electricity via off-grid mechanism particularly from renewable and captive power plants (by using SL (Solar Panel), HLS (Home Lighting System) etc.) may be made to understand the amount of under-estimation of the total consumption of electricity in India.

(Action: TERI, Prayas)

XI) Agenda III(b): Mismatch of Average calorific value of Coal used in Power Station between CEA under MoP and ESD, MoSPI.

iii) The first recommendations of the draft report may be removed.

iv) The percentage difference of GCV between "as dispatched" and "as received" may be highlighted in the report.

XII) Agenda III(a): Filling-up the Annual Questionnaire of Energy Statistics (AQES) excel file from the UNSD (United Nation Statistical Division)

The committee agrees with the recommendations proposed under the draft report.

(Status: Closed)

XIII) Other recommendations: Implementation of Energy Statistics at Sub National Level:

The issue may be put as a *way forward* along with recommendations of the committee.

(Status: Closed)

XIV) Other recommendations: Inconsistencies between 4th edition of BUR and ES 2025:

MoEFCC informed that the fourth Biennial Update Report (BUR-4) uses only the data provided by the respective sectoral ministries/departments for estimating the GHG emissions and the BUR-4 report has already been submitted to the UNFCCC with the due approval of the government.

MoEFCC suggested that, considering the sensitivity of the data, this item may not be considered for further deliberations.

(Status: Closed)

XV) Other recommendations: Capturing the Demand side consumption of Energy:

BEE and AEEE may provide a more specific proposal containing roadmaps for implementation of the same at National level.

(Action: AEEE, BEE)

XVI) Other recommendations: World Energy Statistics and Credit Flow to Energy Sector

The committee agrees with the draft version of the Chapter 10, which has been prepared by the ESD, MoSPI.

(Status: Closed)

XVII) Other recommendations: Inclusion of Green Hydrogen and Electric Vehicles:

PPAC and Niti Aayog may be asked to submit a report for inclusion, and if not, then this may be considered in way forward.

(Action: PPAC, NITI Aayog)

The meeting ended with a vote of thanks to the Chair.

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Annexure-I

List of Participants in the 3rd meeting held on 28.01.2026

S.No.	Ministry/ Organisation/ Department	Nominated officer	Designation
1.	IIT Delhi	Prof. Rangan Banerjee	Director, IIT Delhi, In-Chair
2.	MOSPI	Dr. Saurabh Garg	Secretary, MoSPI
3.	ESD, MoSPI	Dr. Dalip Singh	ADG, ESD
4.	Bank of Baroda (Virtual mode)	Dr. Madan Sabnavis	Chief Economist
5.	TERI	Shri Pratham Saraf	Project Associate
7.		Shri Saswat Choudhary	Senior Fellow
8.	AEEE	Dr. Satish Kumar	President and ED
9.		Ms. Ranjana Kumari	Senior Research Associate
10.	M/o Coal (Virtual mode)	Smt. Chetna Shukla	DDG(Stats)
11.		Smt. Poonam Singhal	Manager
12.	CMPDIL	Shri Saurabh Singh	Sr. Manager (Geology)
13.	MNRE	Smt. Mini Prasannakumar	DDG(Stats)
14.		Dr. Gaurav Mishra	Scientist-F
15.	PPAC	Shri Ravindra Kumar	Joint Director (D&ES)
16.	CEA, MoP	Ms. Meena Hooda	AD, PDM&LF Division
17.	BEE, MoP	Shri Arijit Sengupta	Director, BEE
18.	MoEFCC	Shri Ajay Raghava	Scientist-E, NATCOM Cell
19.		Shri Chitransh Dua	Consultant
20.		Ms. Neha Singh	Consultant
21.	Prayas (Virtual mode)	Shri Srihari Dukkipati	Research Fellow
22.	IIT(ISM) (Virtual mode)	Prof R. M Bhatterjee	Professor
23.	Niti Aayog	Dr. Sunil Sansaniwal	Consultant
24.	CIMFR (Virtual mode)	Dr. Pinaki Sarkar	Scientist -G
25.	BIS	Ms. Aditi Choudhary	Scientist C
26.	ESD, MoSPI	Ms. Ankita Singh	DDG, ESD
27.		Shri Indradeep Roy Chowdhury	Director, ESD

Comprehensive report containing a mapping between the sectors mentioned under IEA/UNSC and different energy-Ministries

Background:

1. The collation, compilation and finally systematic dissemination of Energy Statistics at National level, following the international standards and definitions, is always a daunting task; the practice vary significantly across countries. To assist countries in these activities, role of legal frame works and institutional arrangements in data collection, followed by a discussion of data collection strategies, data sources and data compilation methods is significant. As per IRES Chapter 7, the institutional arrangements in data collection of energy statistics vary from a centralized system to a decentralized system, in which several institutions are involved and are responsible for different parts of the process or different components of energy statistics.

2. In India the system of collection and compilation of Energy statistics is decentralised, wherein different administrative Ministries have been vested with the onus of collating data with respect to a specific group of energy commodities. The MoSPI, acting as the National Statistical Office (NSO), collates and compiles data received from various Energy Ministries dealing with specific energy commodities and depicts the energy flow of the entire country in its Annual publication of- '***Energy Statistics India'*** by following International Standards such as *International Standard Industrial Classification (ISIC)* and *Standard International Energy Product Classification (SIEC)*. Such compiled data is further used by UNSC and IEA to prepare Energy Balance Table of India.

Need for mapping:

3. One of the key-aspects of the *Energy Statistics Publication* is the *Energy Commodity* Balance and *Energy* Balance table of India, depicting the complete and comprehensive flow of energy commodities (and energy) at National level. A vital component of the Energy Balance table is the *end-use consuming sectors* of various energy commodities. In the compilation process, MoSPI has observed that the formats for capturing the *sectoral end-use consumption of energy-data* are not uniform across the energy-Ministries, leading to misalignment with international standards. In order to ensure that the final energy-Commodity balance/energy Balance table are at harmony with the International standards, the Economic Statistics Division (ESD) of MoSPI has to introduce some mapping-of-sectors to make them Internationally comparable.

A uniformity of such formats will help to:

Facilitate cross-country comparisons: Standardized formats enable consistent evaluation of energy consumption patterns and policy impacts across regions and nations.

Enhance policymaking – Reliable and comparable datasets provide a sound evidence base for energy planning, investment decisions and climate commitments.

Support international reporting obligations: Ensures compliance with global standards set by organizations such as the IEA, UNSC, and others.

Provide Accuracy and reliability – Standardized formats reduce duplication, misreporting, and errors in classification.

Since collating the entire energy database at Central level, having diverse variety of sectors is a challenging task, MoSPI through this document has tried to map the end use consumption sectors of various energy commodities (fuels) with the end use sectors of the IEA/UNSC in line with ISIC Rev 4. This will help in bringing some uniformity between the end use sectors of energy commodities of various Ministries with the end use sectors shown in the Energy Balance Table prepared by IEA/UNSC.

Accordingly, the mapping of end use sectors of various energy commodities Ministry-wise is provided below.

1. Ministry of Coal:

In the Annual Publication of M/o Coal-*Coal Directory of India*, under Chapter 4-*Despatch & Off-Take*, the end use consumption sectors of Coal and Lignite are given. The below table maps the end use sectors as per ***Tables 4.19 and 4.34 of Coal Directory of India 2023-24*** to the end use sectors as per *IEA/UNSC.*

1. Coal		
End use sectors as per M/o Coal *(Refer Tables 4.19 and 4.34 of Coal Directory of India 2023-24)*	**End use sector as per IEA/UNSC**	**Description**
Steel & Washery	Iron and steel	*[ISIC Rev. 4 Group 241 and Class 2431]*
Import Coking Coal (Table 4.34)		
Sponge Iron		
Fertilizers & Chemicals	Chemical and petrochemical	*[ISIC Rev. 4 Divisions 20 and 21] Excluding petrochemical feed-stocks.*
Other Basic Metal (Aluminium etc.)	Non-ferrous metals	*[ISIC Rev. 4 Group 242 and Class 2432] Basic industries.*
Cement	Non-metallic minerals	*[ISIC Rev. 4 and NACE Division 23] Report glass, ceramic, cement, and other building material industries.*
Bricks		
Pulp & Paper	Paper, pulp and print	*[ISIC Rev. 4 Divisions 17 and 18]*
Textile & Rayons	Textile and leather	*[ISIC Rev. 4 Divisions 13 to 15]*
Others	Non-specified Industry	*[ISIC Rev. 4 Divisions 22, 31 and 32] Any manufacturing industry not included above.*
Import Non-Coking Coal (Table 4.34)		

Note:

Since the statistics on *sectoral end-use consumption of coal* dispatched though the channel of *auction by CIL* and also the *Non-Coking coal Imported by India*, is not available in the official energy-statistics database of India, the same results in a significantly higher amount of coal which gets categorized under *Non-Specified Industries* , in the *Energy Commodity Balance* table of India. To come-up with a feasible solution to surmount over the scenario, the Economic Statistics Division (ESD) of MoSPI has explored the possibility of dis-aggregation of such data using the annual database available from the *Annual Survey of Industries (ASI).*

- ***The Annual Survey of Industries (ASI)*** is the principal source of Industrial Statistics in India. The ASI is conducted on an annual basis by MoSPI, with the primary objective to provide a meaningful insight into the dynamics of change in the composition, growth and structure of various manufacturing industries in terms of output, value added, employment, capital formation and a host of other parameters. It provides valuable input to the National Accounts Statistics at national and state level.
- The ***coverage of ASI extends to the entire country***-covering all factories registered under Sections 2(m)(i) and 2(m)(ii) of the Factories Act, 1948, where the manufacturing process is defined under Section 2(k) of the said Act. All electricity undertakings engaged in generation, transmission and distribution of electricity, ***not registered with the Central Electricity Authority (CEA)*** are also covered under ASI.

Data used by ESD, MoSPI to find the dis-aggregated data of coal used in non-power sector:

The *Table 6(a) (All-India)- Fuels consumed in the factory sector by type of fuel for each 2-digit industry division (NIC-2008) for each State/UT and Table 5 (All India)- Fuels consumed in the factory sector by type of fuel for each 4-digit industry division (NIC-2008) for each State/UT* of the Vol-I of ASI report has been reproduced below:

Table 6a: Fuels consumed in the factory sector by type of fuel for each 2-digit industry division (NIC-2008) for each State/UT

~~All India~~

(Value figures in ₹ Thousand)

Industry (2-digit code)	Type of fuel						
	Coal		Electricity Purchased		Petroleum Products	Other Fuels	Total
	Quantity Th. Tonne	Value	Quantity Th. Kwh.	Value	Value	Value	Value
01	11	103687	1022509	8888481	1322315	240460	10554942
08	33	235624	120844	1019473	574866	9265	1839227
10	3857	28657652	30575848	262488836	64543491	86251537	441941516
11	769	6639984	4066579	34624484	9756694	11918079	62939241
12	73	560098	342186	3013561	985247	406973	4965878
13	7725	58196194	34601107	280051563	26305156	31982308	396535220
14	150	1161314	3515629	30326033	9960377	3005672	44453397
15	30	294560	1669010	14522497	2536793	740046	18093896
16	79	600628	1696761	13768607	4531846	1732778	20633860
17	5823	40928528	10232923	86741127	17308938	26408733	171387326
18	0	0	1118906	9757648	1508689	274637	11540974
19	2011	15349806	5891263	49611685	155979137	162335114	383275742
20	11921	93501433	37564830	309264502	64214478	306724851	773705263
21	1633	13404078	13525706	112442018	20118166	15814393	161778654
22	921	7963289	21214541	178836763	23085315	12566144	222451511
23	28569	248283061	37355282	311511592	89000442	228636931	877432027
24	94905	508924664	129605409	951695698	163293488	142361593	1766275444
25	76	769803	7881340	69002162	18440941	10927998	99140903
26	0	0	2348609	21265904	2737852	458645	24462400
27	1	14224	7158267	60541044	9957697	6561466	77074432
28	65	789430	9195968	80007236	16963041	7510248	105269956
29	5	45415	14854565	129318267	22542523	19538305	171444510
30	41	222851	3094576	27600023	7251215	3226219	38300308
31	0	1132	601864	5330422	1207720	385488	6924763
32	1	8506	3181038	27834729	4917804	1532181	34293220
33	0	0	103464	992930	1088847	46907	2128683
38	123	1077691	359350	3184983	1468783	1438959	7170416
58	0	0	151514	1349813	341178	7580	1698571
Others	2672	9010906	5308008	46474093	16536281	15917662	87938943
All	***161498***	***1036744555***	***388357895***	***3131466174***	***758479321***	***1098961171***	***6025651220***

Table 5: Fuels consumed in the factory sector by type of fuel for each 4-digit industry class (NIC-2008) for all-India

All-India *(Value figures in ₹ Thousand)*

Industry (4-digit code)	*Type of fuel*						
	Coal		*Electricity Purchased*		*Petroleum Products*	*Other Fuels*	*Total*
	Quantity Th. Tonne	*Value*	*Quantity Th. Kwh.*	*Value*	*Value*	*Value*	*Value*
1702	394	2454630	3235095	27599247	3582169	7823687	41459733
1709	1229	10537186	1720264	14395589	3155678	6532778	34621231
1811	0	0	973167	8378711	1288130	209425	9876265
1812	0	0	136943	1299778	137063	65211	1502053
1820	0	0	8795	79159	83497	0	162656
1910	41	582910	319377	2502623	865499	243472	4194504
1920	1970	14766895	5571887	47109062	155113638	162091643	379081238
2011	6654	49895899	12002539	105910806	31731908	42546776	230085389
2012	2496	20227255	6785222	62353476	8959220	169939692	261479642
2013	567	5720128	5751425	37397234	2504589	67152544	112774496
2021	603	4368483	1902855	16819318	2877128	6361125	30426055
2022	214	1675048	932148	7864745	1629467	2194389	13363649
2023	276	2079604	1946330	16587874	7076170	5054153	30797802
2029	483	3964827	3067669	24274830	6728677	6243811	41212144
2030	629	5570188	5176644	38056219	2707319	7232362	53566087
2100	1633	13404078	13525706	112442018	20118166	15814393	161778654
2211	679	5950757	3314364	27639690	4847200	5388489	43826137
2219	45	440529	1826432	15772682	2624164	2018233	20855608
2220	197	1572003	16073745	135424391	15613951	5159421	157769767
2310	48	682039	4004269	33762373	10580181	45386965	90411558
2391	633	4907296	1436200	11678439	7007182	8620492	32213410
2392	1446	16718704	549741	4807357	1917767	10799161	34242988
2393	2803	17186028	5634001	51689235	1802692	113228929	183906884
2394	23320	206489305	20270534	162967864	29617983	45067393	444142544
2395	110	780911	1331287	12218388	10367324	2917032	26283656
[illegible]	0	0	2907573	23918748	23690383	1127330	48736461
2399	209	1518778	1221677	10469188	4016929	1489631	17494526
2410	50421	348020388	96208409	713966359	107467855	108558354	1278012957
2420	43566	150587283	21379553	133828550	43075741	23862192	351353765
2431	914	10295447	10981131	94702914	11141579	8182160	124322099
2432	3	21546	1036316	9197876	1608313	1758887	12586622
2511	34	400396	1309449	10859841	3263273	2689310	17212821

Proposed Methodology by MoSPI to dis-aggregate the others sector of end use consumption of coal (refer table below):

- The Industry-wise consumption of Coal over a financial year, which is available in the *Table 6(a)* (at 2-digit level of NIC) has been clubbed according to the end-use sectors of UNSD/IEA. The percentage (%) of consumption of coal into different sub-sectors have been derived to assess the pattern of distribution.
- Further, for capturing the share of non-ferrous metals , *Iron and steel sector (*NIC 2 digit code-24*)* under *Table 6 (a)* has been bifurcated into *Iron and Steel (*NIC 4 digit Code : 2410, 2431*)* and *Non-ferrous Minerals* (NIC Code : 2420,2432) using *Table 5 (at 4 digit NIC code).*

- The same exercise has been done for 13 years from 2010-11 to 2022-23. A *moving-average of five (5) years* has been considered to ease-out the irregularities and also to capture the latest trend.
- ***Refer table 1 below*** showing the percentage consumption of coal against different sub-sectors using Moving average of last 5 years (i.e. for ascertaining the percentage consumption of coal in sub sector for the year 2022-23, an average of last 5 years is taken from 2017-18 to 2021-22.)

Table 1

Percentage of Consumption of Coal against different sub-sections (as per Table 6a and Table 5 of ASI, Vol-I)						
Sectors as per UNSD/IEA	2017-18	2018-19	2019-20	2020-21	2021-22	**Average (last 5 years)**
Agriculture/forestry	0.0	0.0	0.01	0.00	0.00	0.00
Iron and Steel	20.92	18.95	24.18	19.92	29.23	22.64
Non-ferrous metals	24.00	30.03	22.90	26.05	23.11	25.22
Chemical and Petrolchemicals	10.15	9.59	11.38	12.37	10.52	10.80
Non-mettalic minerals	25.99	25.20	23.41	23.02	21.92	23.91
Transport equipment	0.04	0.06	0.02	0.01	0.01	0.03
Machinery	0.18	0.27	0.21	0.23	0.18	0.21
Mining and Quarrying	0.03	0.04	0.05	0.03	0.01	0.03
Food, beverages and tobacco	3.36	3.03	4.10	4.21	3.11	3.56
Paper, pulp and print	5.27	4.10	5.57	5.55	4.58	5.01
Wood and wood products	0.09	0.04	0.09	0.04	0.07	0.07
Textiles and leather	7.49	6.74	7.12	5.98	5.37	6.54
Non-specified industry	2.47	1.93	0.96	2.59	1.90	1.97
Total	**100**	**100**	**100**	**100**	**100**	**100**

- It is pertaining to mention that, since the ASI focuses on the *consumption side of the statistics* hence the same includes coal which have been received by the companies via, i) Fuel Supply Agreement (FSA), ii) Auction and also the iii) Imported coal from Traders.
- It has been proposed that, since using this *representative ratio of coal consumption by Industry* will include the 'unaccounted portion' of *auction coal* and *Imported Coal* and hence will prove an improved statistic of sectoral end-use consumption *of Coal* with a significantly reduced amount under *Non-Specified*.
- A study in this regard has been carried out by MoSPI and the findings are given below:

Existing sectoral end-use consumption of Coal under ES publication

All figures are in Million Tonnes

End-use Consuming Sectors	**2021-22**	**2022-23**	**2023-24**
Domestic dispatch of Coal to Power Sector (Captive + Utility) (source : MoC)	710.05	785.4	859.34
Iron and steel (*including Import-Coking*)	75.31	77.53	76.16
Chemical and petrochemical	1.31	0.86	0.8
Construction (reclassified under *Non-mettalic minerals*)	7.33	9.42	9.26

Proposed sectoral end-use consumption of Coal (using ASI data)

All figures are in Million Tonnes

End-use Consuming Sectors	**2021-22**	**2022-23**	**2023-24**
Domestic dispatch of Coal to Power Sector (Captive + Utility) (source : MoC)	710.05	785.4	859.34
Imported Coal : Dispatched to Power Sector (source: Table 7.7 under *All India Electricity Statistics* by CEA	27	55.64	65.73
Agriculture/forestry	0.00	0.00	0.01
Iron and Steel	64.78	62.08	79.01
Non-ferrous minerals	72.64	69.14	77.88
Chemical and Petrochemicals	30.69	29.62	33.09
Non-mettalic minerals (presently *Construction)*	70.67	65.55	71.63
Transport equipment	0.11	0.08	0.08
Machinery	0.68	0.58	0.67
Mining and Quarrying	0.32	0.09	0.09

Paper, pulp and print	1.24	1.26	1.03
Textile and leather	0.08	0.09	0.17
Non-specified industry (*including Imported Non-Coking*)	*232.72*	*240.67*	*278.98*
Total consumption (including Import of Coal)	**1,028**	**1,115**	**1,237**
% of coal dispatched to Non-Specified Industry	**22.60%**	**21.60%**	**22.55%**

Food, beverages and tobacco	10.31	9.76	10.70
Paper, pulp and print	14.70	13.75	14.62
Wood and wood products	0.21	0.19	0.18
Textiles and leather	20.74	17.94	19.10
Non-specified industry	5.13	5.40	5.57
Total consumption (including Import of Coal)	**1,028**	**1,115**	**1237**
% of coal dispatched to Non-Specified Industry	**0.50%**	**0.48%**	**0.45%**

Observation: we can see that,

i) The percentage of Coal categorized under *Non-Specified Industry* has been reduced significantly.

ii) The proportion of Coal consumed under *Iron and Steel Industry* has been increased significantly.

- The matter is placed for the comment/feedback from M/o Coal and the other esteemed committee members please.

2. *Lignite*		
End use sectors as per M/o Coal *(Refer Table 4.26 of Coal Directory of India 2023-24)*	**End use sector as per IEA/UNSC**	**Description**
Steel & Washery	Iron and steel	*[ISIC Rev. 4 Group 241 and Class 2431]*
Sponge Iron		
Fertilizers & Chemicals	Chemical and petrochemical	*[ISIC Rev. 4 Divisions 20 and 21] Excluding petrochemical feed-stocks.*
Cement	Non-metallic minerals	*[ISIC Rev. 4 and NACE Division 23] Report glass, ceramic, cement, and other building material industries.*
Bricks		
Pulp & Paper	Paper, pulp and print	*[ISIC Rev. 4 Divisions 17 and 18]*
Textiles & Rayons	Textile and leather	*[ISIC Rev. 4 Divisions 13 to 15]*
Others	Non-specified Industry	*[ISIC Rev. 4 Divisions 22, 31 and 32] Any manufacturing industry not included above.*
Imported Lignite		

2. Ministry of Petroleum and Natural Gas:

In the annual publication of *Indian Petroleum and Natural Gas Statistics* by MoPNG, under *Chapter V-Consumption*, the end use consumption sectors of various Petroleum fuels have been provided. The below table maps the end use sectors as per various tables of the Chapter V of IPNG Statistics to the end use sectors as per *IEA/UNSC.*

1. LPG		
End use sectors as per MoPNG *(Refer Table V.8 of IPNG Statistics 2023-24)*	**End use sector as per IEA/UNSC**	**Description**
Chemicals	Chemical and petrochemical	*[ISIC Rev. 4 Divisions 20 and 21] Excluding petrochemical feed-stocks.*
Metallurgical	Non-ferrous metals	*[ISIC Rev. 4 Group 242 and Class 2432] Basic industries.*

Electronics	Machinery	*[ISIC Rev. 4 Divisions 25 to 28] Fabricated metal products, machinery and equipment other than transport equipment.*
Mechanical		
Engineering		
Mining	Mining and Quarrying	*[ISIC Rev. 4 Divisions 07 and 08 and Group 099] Mining (excluding fuels) and quarrying.*
Textiles	Textile and leather	*[ISIC Rev. 4 Divisions 13 to 15]*
Non- Domestic /Industry/Commercial	Non-specified Industry	*[ISIC Rev. 4 Divisions 22, 31 and 32] Any manufacturing industry not included above.*
Other consumer/Industrial goods		
Auto LPG	Road Transport	*Includes fuels used in road vehicles as well as agricultural and industrial highway use. Excludes military consumption as well as motor gasoline used in stationary engines and diesel oil for use in tractors that are not for highway use.*
Railways	Rail	*Includes quantities used in rail traffic, including industrial railways.*
Domestic Distribution	Residential	*Includes consumption by households, excluding fuels used for transport. Includes households with employed persons [ISIC Rev. 4 Division 97] which is a small part of total residential consumption.*
Agriculture sector	Agriculture/forestry	*Includes deliveries to users classified as agriculture, hunting and forestry by the ISIC, and therefore includes energy consumed by such users whether for traction (excluding agricultural highway use), power or heating (agricultural and domestic) [ISIC Rev. 4 Divisions 01 and 02].*
Reseller/Retailer	Non-specified (others use)	*Includes all fuel use not elsewhere specified as well as consumption in the above-designated categories for which separate figures have not been provided. Military fuel use for all mobile and stationary consumption is included here (e.g. ships, aircraft, road and energy used in living quarters) regardless of whether the fuel delivered is for the military of that country or for the military of another country.*
Miscellaneous		
Private Imports		

2. Naphtha		
End use sectors as per MoPNG *(Refer Table V.10 of IPNG Statistics 2023-24)*	**End use sector as per IEA/UNSC**	**Description**
Steel plants	Iron and steel	*[ISIC Rev. 4 Group 241 and Class 2431]*
Fertilizers	Chemical and petrochemical	*[ISIC Rev. 4 Divisions 20 and 21] Excluding petrochemical feed-stocks.*
Petrochemicals		
Others	Non-specified Industry	*[ISIC Rev. 4 Divisions 22, 31 and 32] Any manufacturing industry not included above.*
Private Imports		
SEZ data		

Kerosene		
End use sectors as per MoPNG *(Refer Table V.11 of IPNG Statistics 2023-24)*	**End use sector as per IEA/UNSC**	**Description**
Domestic PDS	Residential	*Includes consumption by households, excluding fuels used for transport. Includes households with employed persons [ISIC Rev. 4 Division 97] which is a small part of total residential consumption.*
Commercial/Industry	Comm. and public services	*[ISIC Rev. 4 Divisions 33, 36-39, 45-47, 52, 53, 55-56, 58-66, 68-75, 77-82, 84 (excluding Class 8422), 85-88, 90-96 and 99]*
Others	Non-specified (others use)	*Includes all fuel use not elsewhere specified as well as consumption in the above-designated categories for which separate figures have not been provided. Military fuel use for all mobile and stationary consumption is included here (e.g. ships, aircraft, road and energy used in living quarters) regardless of whether the fuel delivered is for the military of that country or for the military of another country.*

3. Diesel (HSD

End use sectors as per MoPNG *(Refer Table V.14 of the IPNG Statistics 2023-24)*	**End use sector as per IEA/UNSC**	**Description**
Iron & Steel (Metallurgy)	Iron and steel	*[ISIC Rev. 4 Group 241 and Class 2431]*
Chemicals & Allied	Chemical and petrochemical	*[ISIC Rev. 4 Divisions 20 and 21] Excluding petrochemical feed-stocks.*
Fertilizers		
Aluminium	Non-ferrous minerals	*[ISIC Rev. 4 Group 242 and Class 2432] Basic industries.*
Cement	Non-metallic minerals	*[ISIC Rev. 4 and NACE Division 23] Report glass, ceramic, cement, and other building material industries.*
Ceramic & Glass		
Elec./Electronics	Machinery	*[ISIC Rev. 4 Divisions 25 to 28] Fabricated metal products, machinery and equipment other than transport equipment.*
Mechanical		
Mining & Quarrying	Mining and Quarrying	*[ISIC Rev. 4 Divisions 07 and 08 and Group 099] Mining (excluding fuels) and quarrying.*
Civil Engineering	Construction	*[ISIC Rev. 4 Division 41 to 43]*
Textile	Textile and leather	*[ISIC Rev. 4 Divisions 13 to 15]*
Other Consumer/ Industrial Goods	Non-specified Industry	*[ISIC Rev. 4 Divisions 22, 31 and 32] Any manufacturing industry not included above.*
Resellers/Retail in Other Consumer/ Industrial Goods *(Refer Note2)***		
Road Transport	Road Transport	*Includes fuels used in road vehicles as well as agricultural and industrial highway use. Excludes military consumption as well as motor gasoline used in stationary engines and diesel oil for use in tractors that are not for highway use.*
Resellers/Retail in Road Transport *(Refer Note2)***		
Aviation	Domestic Aviation	*Includes deliveries of aviation fuels to aircraft for domestic aviation - commercial, private, agricultural, etc. It includes use for purposes other than flying, e.g. bench testing of engines, but not airline use of fuel for road transport. The domestic/international split should be determined on the basis of departure and landing locations and not by the nationality*

		of the airline. Note that this may include journeys of considerable length between two airports in a country (e.g. San Francisco to Honolulu). For many countries this incorrectly includes fuel used by domestically owned carriers for outbound international traffic.
Railways Resellers/Retail in Railways *(Refer Note2)***	Rail	*Includes quantities used in rail traffic, including industrial railways.*
Shipping Resellers/Retail in Shipping *(Refer Note2)***	Domestic navigation	*Includes fuels delivered to vessels of all flags not engaged in international navigation (see international marine bunkers). The domestic/international split should be determined on the basis of port of departure and port of arrival and not by the flag or nationality of the ship. Note that this may include journeys of considerable length between two ports in a country (e.g. San Francisco to Honolulu). Fuel used for ocean, coastal and inland fishing and military consumption are excluded.*
Agriculture Resellers/Retail in Agriculture *(Refer Note2)***	Agriculture/forestry	*Includes deliveries to users classified as agriculture, hunting and forestry by the ISIC, and therefore includes energy consumed by such users whether for traction (excluding agricultural highway use), power or heating (agricultural and domestic) [ISIC Rev. 4 Divisions 01 and 02].*
Miscellaneous including remaining part of Resellers/Retail *(Refer Note2)*** Pvt Imports	Non-specified (others use)	*Includes all fuel use not elsewhere specified as well as consumption in the above-designated categories for which separate figures have not been provided. Military fuel use for all mobile and stationary consumption is included here (e.g. ships, aircraft, road and energy used in living quarters) regardless of whether the fuel delivered is for the military of that country or for the military of another country.*

Note 3: -

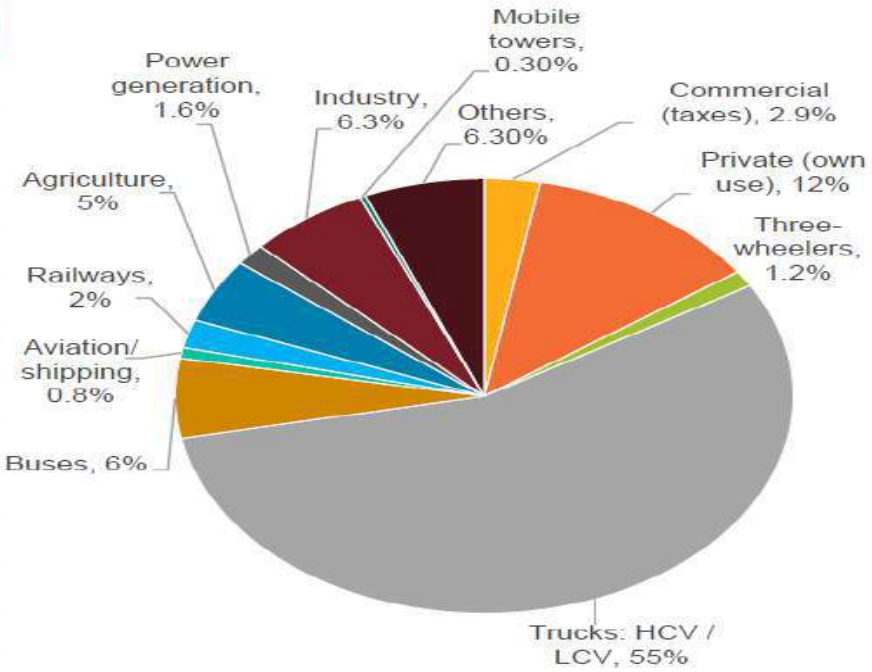
A study was conducted by CRISIL (*refer annexure A*) under the guidance of PPAC, MoPNG where the end-use consumption pattern of petrol and diesel across pan-India was assessed. In the report under *Figure 17: Direct Sales and Retail Sales-diesel*, we have sectoral end-use consumption of Diesel across India has been depicted. (refer pic below),

1.5 Direct sales and retail sales – diesel

The end-use segment-wise share of diesel sale, including both retail sales and direct sales, is presented below.

Figure 17: End-use share (%) of diesel (retail and direct) across India

Consumer segment		Share (%) Full year
	Commercial (taxis)	2.9%
	Private cars	12.4%
	3-wheelers	1.2%
	Trucks: HCV / LCV	55.4%
	Buses	5.9%
	Aviation/shipping	0.8%
	Railways	2.1%
Sub-total – transport		**80.7%**
	Agriculture	4.8%
	Power generation – gensets	1.6%
	Industry	6.3%
	Mobile towers	0.3%
	Others	6.3%
Sub-total - non-transport		**19.3%**



It is proposed that, the proportionate share of consumption against different end-use sectors of HSD may be capitalized to segregate the amount which has been adjusted against *Retail/Reseller* under the *IPNG Statistics (Table V.14) by MoPNG*. The ES publication of MoSPI, presently segregates the same and prepares *a separate Table 6.6(A-1)* (refer pic below) containing end-use consumption pattern of HSD only.

Table 6.6(A-1) : Distribution of High Speed Diesel(HSD) under Reseller/ Retail into different End-Use sectors ('000 Tonnes)								
FY	**Road Transport**	**Shipping**	**Railways**	**Agriculture**	**Power Generation**	**Other Consumer/ Industrial Goods**	**Others**	**Total**
2021-22	51,663	531	1,394	3,187	1,062	4,183	4,383	66,404
2022-23	62,260	640	1,681	3,841	1,280	5,042	5,282	80,026
2023-24	61,567	633	1,662	3,798	1,266	4,986	5,223	79,135
% Share in total consumption for 2023-24 (P)	**77.80**	**0.80**	**2.10**	**4.80**	**1.60**	**6.30**	**6.60**	**100.00**
Growth rate of 2023-24 over 2022-23(%)	**-1.11**	**-1.11**	**-1.11**	**-1.11**	**-1.11**	**-1.11**	**-1.11**	**-1.11**

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).*

We may agree to include this segregated information in the main table containing end-use consumption data of HSD, along with suitable disclaimer and delete the *Table 6.6(A-1).*

4. Diesel (LDO)		
End use sectors as per MoPNG *(Refer Table V.16 of IPNG Statistics 2023-24)*	**End use sector as per IEA/UNSC**	**Description**
Metallurgical	Iron and steel	*[ISIC Rev. 4 Group 241 and Class 2431]*
Chemicals & Allied	Chemical and petroleum	*[ISIC Rev. 4 Divisions 20 and 21] Excluding petrochemical feed-stocks.*
Aluminium	Non-ferrous metals	*[ISIC Rev. 4 Group 242 and Class 2432] Basic industries.*
Cement	Non-metallic minerals	*[ISIC Rev. 4 and NACE Division 23]Report glass, ceramic, cement, and other building material industries.*
Ceramic & Glass		
Elec./Electronics	Machinery	*[ISIC Rev. 4 Divisions 25 to 28] Fabricated metal products, machinery and equipment other than transport equipment.*
Mechanical		
Mining & Quarrying	Mining and Quarrying	*[ISIC Rev. 4 Divisions 07 and 08 and Group 099] Mining (excluding fuels) and quarrying.*
Civil Engineering	Construction	*[ISIC Rev. 4 Division 41 to 43]*
Textile & Fibre	Textile and leather	*[ISIC Rev. 4 Divisions 13 to 15]*
Other Consumer/ Industrial Goods	Non-specified Industry	*[ISIC Rev. 4 Divisions 22, 31 and 32] Any manufacturing industry not included above.*
Road transport	Road Transport	*Includes fuels used in road vehicles as well as agricultural and industrial highway use. Excludes military consumption as well as motor gasoline used in stationary engines and diesel oil for use in tractors that are not for highway use.*
Railways	Rail	*Includes quantities used in rail traffic, including industrial railways.*
Shipping	Domestic navigation	*Includes fuels delivered to vessels of all flags not engaged in international navigation (see international marine bunkers). The domestic/international split should be determined on the basis of port of departure and port of arrival and not by the flag or nationality of the ship. Note that this may include journeys of considerable length between two ports in a country (e.g. San Francisco to*

		Honolulu). Fuel used for ocean, coastal and inland fishing and military consumption are excluded.
Agriculture	Agriculture/forestry	*Includes deliveries to users classified as agriculture, hunting and forestry by the ISIC, and therefore includes energy consumed by such users whether for traction (excluding agricultural highway use), power or heating (agricultural and domestic) [ISIC Rev. 4 Divisions 01 and 02].*
Resellers	Non-specified (others use)	*Includes all fuel use not elsewhere specified as well as consumption in the above-designated categories for which separate figures have not been provided. Military fuel use for all mobile and stationary consumption is included here (e.g. ships, aircraft, road and energy used in living quarters) regardless of whether the fuel delivered is for the military of that country or for the military of another country.*
Miscellaneous		
Pvt Imports		

5. *Fuel Oil (Furnace Oil)*

End use sectors as per MoPNG *(Refer Table V.18 of IPNG Statistics 2023-24)*	**End use sector as per IEA/UNSC**	**Description**
Metallurgical	Iron and steel	*[ISIC Rev. 4 Group 241 and Class 2431]*
Chemicals & Allied	Chemical and petroleum	*[ISIC Rev. 4 Divisions 20 and 21] Excluding petrochemical feed-stocks.*
Fertilizers		
Aluminum	Non-ferrous metals	*[ISIC Rev. 4 Group 242 and Class 2432] Basic industries.*
Cement	Non-metallic minerals	*[ISIC Rev. 4 and NACE Division 23] Report glass, ceramic, cement, and other building material industries.*
Ceramic & Glass		
Electrical	Machinery	*[ISIC Rev. 4 Divisions 25 to 28] Fabricated metal products, machinery and equipment other than transport equipment.*
Mechanical		
Mining & Quarrying	Mining and Quarrying	*[ISIC Rev. 4 Divisions 07 and 08 and Group 099] Mining (excluding fuels) and quarrying.*

Civil Engineering	Construction	*[ISIC Rev. 4 Division 41 to 43]*
Textile & Fibre	Textile and leather	*[ISIC Rev. 4 Divisions 13 to 15]*
Other Consumer/ Industrial Goods	Non-specified Industry	*[ISIC Rev. 4 Divisions 22, 31 and 32] Any manufacturing industry not included above.*
Road transport	Road Transport	*Includes fuels used in road vehicles as well as agricultural and industrial highway use. Excludes military consumption as well as motor gasoline used in stationary engines and diesel oil for use in tractors that are not for highway use.*
Railways	Rail	*Includes quantities used in rail traffic, including industrial railways.*
Shipping	Domestic navigation	*Includes fuels delivered to vessels of all flags not engaged in international navigation (see international marine bunkers). The domestic/international split should be determined on the basis of port of departure and port of arrival and not by the flag or nationality of the ship. Note that this may include journeys of considerable length between two ports in a country (e.g. San Francisco to Honolulu). Fuel used for ocean, coastal and inland fishing and military consumption are excluded.*
Other Transport (incl. Agri. Retail Trade)	Non-specified Transport	*Includes all transport not elsewhere specified. Note: International marine bunkers and International aviation bunkers are shown in supply and are not included in the transport sector as part of final consumption.*
Agriculture	Agriculture/forestry	*Includes deliveries to users classified as agriculture, hunting and forestry by the ISIC, and therefore includes energy consumed by such users whether for traction (excluding agricultural highway use), power or heating (agricultural and domestic) [ISIC Rev. 4 Divisions 01 and 02].*
Resellers	Non-specified (Others use)	*Includes all fuel use not elsewhere specified as well as consumption in the above-designated categories for which separate figures have not been provided. Military fuel use for all mobile and stationary consumption is included here (e.g. ships, aircraft, road and energy used in living quarters) regardless of whether the fuel delivered is for*
Miscellaneous		
Pvt Imports		

		the military of that country or for the military of another country.

6. Fuel Oil (LSHS)		
End use sectors as per MoPNG *(Refer Table V.20 of IPNG Statistics 2023-24)*	**End use sector as per IEA/UNSC**	**Description**
Metallurgical	Iron and steel	*[ISIC Rev. 4 Group 241 and Class 2431]*
Chemicals & Allied	Chemical and petroleum	*[ISIC Rev. 4 Divisions 20 and 21] Excluding petrochemical feed-stocks.*
Fertilizers		
Cement	Non-metallic minerals	*[ISIC Rev. 4 and NACE Division 23]Report glass, ceramic, cement, and other building material industries.*
Electrical	Machinery	*[ISIC Rev. 4 Divisions 25 to 28] Fabricated metal products, machinery and equipment other than transport equipment.*
Mechanical		
Mining & Quarrying	Mining and Quarrying	*[ISIC Rev. 4 Divisions 07 and 08 and Group 099] Mining (excluding fuels) and quarrying.*
Civil Engineering	Construction	*[ISIC Rev. 4 Division 41 to 43]*
Textile & Fibre	Textile and leather	*[ISIC Rev. 4 Divisions 13 to 15]*
Other Consumer/ Industrial Goods	Non-specified Industry	*[ISIC Rev. 4 Divisions 22, 31 and 32] Any manufacturing industry not included above.*
Agriculture	Agriculture/forestry	*Includes deliveries to users classified as agriculture, hunting and forestry by the ISIC, and therefore includes energy consumed by such users whether for traction (excluding agricultural highway use), power or heating (agricultural and domestic) [ISIC Rev. 4 Divisions 01 and 02].*
Reseller	Non-specified (Others use)	*Includes all fuel use not elsewhere specified as well as consumption in the above-designated categories for which separate figures have not been provided. Military fuel use for all mobile and stationary consumption is included here (e.g. ships, aircraft, road and energy used*
Miscellaneous		
Pvt Imports		

		in living quarters) regardless of whether the fuel delivered is for the military of that country or for the military of another country.

7. Lubricants		
End use sectors as per MoPNG *(Refer Table V.21 of IPNG Statistics 2023-24)*	**End use sector as per IEA/UNSC**	**Description**
Total consumption	Non-specified (Others use)	*Includes all fuel use not elsewhere specified as well as consumption in the above-designated categories for which separate figures have not been provided. Military fuel use for all mobile and stationary consumption is included here (e.g. ships, aircraft, road and energy used in living quarters) regardless of whether the fuel delivered is for the military of that country or for the military of another country.*

8. Bitumin		
End use sectors as per MoPNG *(Refer Table V.23 of IPNG Statistics 2023-24)*	**End use sector as per IEA/UNSC**	**Description**
Total consumption	Non-specified (Others use)	

9. Petrol/Motor spirit		
End use sectors as per MoPNG *(Refer Table V.12 of IPNG Statistics 2023-24)*	**End use sector as per IEA/UNSC**	**Description**
Total consumption- Resellers and Others	Report of PPAC can be utilized. The complete report by CRISIL is not available on Internet **PPAC may be requested to provide the complete report.**	*Includes fuels used in road vehicles as well as agricultural and industrial highway use. Excludes military consumption as well as motor gasoline used in stationary engines and diesel oil for use in tractors that are not for highway use.*

10. ATF		
End use sectors as per MoPNG *(Refer Table V.13 of IPNG Statistics 2023-24)*	**End use sector as per IEA/UNSC**	**Description**
Total Consumption	Domestic navigation	*Includes fuels delivered to vessels of all flags not engaged in international navigation (see international marine bunkers). The domestic/international split should be determined on the basis of port of departure and port of arrival and not by the flag or nationality of the ship. Note that this may include journeys of considerable length between two ports in a country (e.g. San Francisco to Honolulu). Fuel used for ocean, coastal and inland fishing and military consumption are excluded.*

11. Petroleum coke		
End use sectors as per MoPNG *(Refer Table V.22 of IPNG Statistics 2023-24)*	**End use sector as per IEA/UNSC**	**Description**
Total Consumption	Non-specified Industry	*[ISIC Rev. 4 Divisions 22, 31 and 32] Any manufacturing industry not included above.*

12. Other Petroleum products *(Refer Table V.2 of IPNG Statistics 2023-24)*		
End use sectors as per MoPNG	**End use sector as per IEA/UNSC**	**Description**
Others	Non-specified Industry	*[ISIC Rev. 4 Divisions 22, 31 and 32] Any manufacturing industry not included above.*
Paraffin Wax		

13. Natural Gas *(Refer Table V.1 of IPNG Statistics 2023-24)*		
End use sectors as per MoPNG	**End use sector as per IEA/UNSC**	**Description**
Industrial and Manufacturing	Non-specified Industry	*[ISIC Rev. 4 Divisions 22, 31 and 32] Any manufacturing industry not included above.*
City or Local Natural Gas Distribution Network incl. Road Transport	Road Transport	*Includes fuels used in road vehicles as well as agricultural and industrial highway use. Excludes military consumption as well as motor gasoline used in stationary engines and diesel oil for use in tractors that are not for highway use.*
Internal Consumption for Pipeline System	Pipeline transport	*Includes energy used in the support and operation of pipelines trans-porting gases, liquids, slurries and other commodities, including the energy used for pump stations and maintenance of the pipeline.*
Agriculture (Tea Plantation)	Agriculture/forestry	*Includes deliveries to users classified as agriculture, hunting and forestry by the ISIC, and therefore includes energy consumed by such users whether for traction (excluding agricultural highway use), power or heating (agricultural and domestic) [ISIC Rev. 4 Divisions 01 and 02].*

3. Central Electricity Authority (CEA)

In the Annual Publication of *All India Electricity Statistics General review* under Chapter 1, the end use consumption sectors of Electricity are given. The below table maps the end use sectors as per *Table 1.4 of All India Electricity Statistics General review 2024* to the end use sectors as per *IEA/UNSC.*

Electricity		
End use sectors as per CEA *(Refer Table 1.4 of All India Electricity Statistics General review 2024)*	**End use sector as per IEA/UNSC**	**Description**
Industry	***Please refer note no. 4	
Traction	Rail	*Includes quantities used in rail traffic, including industrial railways.*
Domestic	Residential	*Includes consumption by households, excluding fuels used for transport. Includes households with employed persons [ISIC Rev. 4 Division 97] which is a small part of total residential consumption.*
Commercial	Comm. And public services	*[ISIC Rev. 4 Divisions 33, 36-39, 45-47, 52, 53, 55-56, 58-66, 68-75, 77-82, 84 (excluding Class 8422), 85-88, 90-96 and 99]*
Agriculture	Agriculture/forestry	*Includes deliveries to users classified as agriculture, hunting and forestry by the ISIC, and therefore includes energy consumed by such users whether for traction (excluding agricultural highway use), power or heating (agricultural and domestic) [ISIC Rev. 4 Divisions 01 and 02].*
Others	Non-specified (Others use)	*Includes all fuel use not elsewhere specified as well as consumption in the above-designated categories for which separate figures have not been provided. Military fuel use for all mobile and stationary consumption is included here (e.g. ships, aircraft, road and energy used in living quarters) regardless of whether the fuel delivered is for the military of that country or for the military of another country.*

*****Note No. 4: Segregation of Industry sector of Electricity consumption**

A technical deliberation with CEA revealed that presently the dis-aggregated level information is not maintained by DISCOM. Accordingly, MoSPI explored the possibility of dis-aggregation of such data using the database of the Annual Survey of Industries (ASI).

- ***The Annual Survey of Industries (ASI)*** is the principal source of Industrial Statistics in India. The ASI is conducted on an annual basis by MoSPI, with the primary objective to provide a meaningful insight into the dynamics of change in the composition, growth and structure of various manufacturing industries in terms of output, value added, employment, capital formation and a host of other parameters. It provides valuable input to the National Accounts Statistics at national and state level.
- The ***coverage of ASI extends to the entire country***-covering all factories registered under Sections 2(m)(i) and 2(m)(ii) of the Factories Act, 1948, where the manufacturing process is defined under Section 2(k) of the said Act. All electricity undertakings engaged in generation, transmission and distribution of electricity, ***not registered with the Central Electricity Authority (CEA)*** are also covered under ASI.

Data used by ESD, MoSPI to find the dis-aggregated data of Electricity consumption of the Industry sector:

The *Table 6(a) (All-India)- Fuels consumed in the factory sector by type of fuel for each 2-digit industry division (NIC-2008) for each State/UT and Table 5 (All India)- Fuels consumed in the factory sector by type of fuel for each 4-digit industry division (NIC-2008) for each State/UT* of the Vol-I of ASI report has been reproduced below:

Table 6a: Fuels consumed in the factory sector by type of fuel for each 2-digit industry division (NIC-2008) for each State/UT

All-India *(Value figures in ₹ Thousand)*

Industry (2-digit code)	Type of fuel						
	Coal		Electricity Purchased		Petroleum Products	Other Fuels	Total
	Quantity Th. Tonne	Value	Quantity Th. Kwh.	Value	Value	Value	Value
01	11	103687	1022509	8888481	1322315	240460	10554942
08	33	235624	120844	1019473	574866	9265	1839227
10	3857	28657652	30575848	262488836	64543491	86251537	441941516
11	769	6639984	4066579	34624484	9756694	11918079	62939241
12	73	560098	342186	3013561	985247	406973	4965878
13	7725	58196194	34601107	280051563	26305156	31982308	396535220
14	150	1161314	3515629	30326033	9960377	3005672	44453397
15	30	294560	1669010	14522497	2536793	740046	18093896
16	79	600628	1696761	13768607	4531846	1732778	20633860
17	5823	40928528	10232923	86741127	17308938	26408733	171387326
18	0	0	1118906	9757648	1508689	274637	11540974
19	2011	15349806	5891263	49611685	155979137	162335114	383275742
20	11921	93501433	37564830	309264502	64214478	306724851	773705263
21	1633	13404078	13525706	112442018	20118166	15814393	161778654
22	921	7963289	21214541	178836763	23085315	12566144	222451511
23	28569	248283061	37355282	311511592	89000442	228636931	877432027
24	94905	508924664	129605409	951695698	163293488	142361593	1766275444
25	76	769803	7881340	69002162	18440941	10927998	99140903
26	0	0	2348609	21265904	2737852	458645	24462400
27	1	14224	7158267	60541044	9957697	6561466	77074432
28	65	789430	9195968	80007236	16963041	7510248	105269956
29	5	45415	14854565	129318267	22542523	19538305	171444510
30	41	222851	3094576	27600023	7251215	3226219	38300308
31	0	1132	601864	5330422	1207720	385488	6924763
32	1	8506	3181038	27834729	4917804	1532181	34293220
33	0	0	103464	992930	1088847	46907	2128683
38	123	1077691	359350	3184983	1468783	1438959	7170416
58	0	0	151514	1349813	341178	7580	1698571
Others	2672	9010906	5308008	46474093	16536281	15917662	87938943
All	***161498***	***1036744555***	***388357895***	***3131466174***	***758479321***	***1098961171***	***6025651220***

Table 5: Fuels consumed in the factory sector by type of fuel for each 4-digit industry class (NIC-2008) for all-India

All-India *(Value figures in ₹ Thousand)*

Industry (4-digit code)	Type of fuel						
	Coal		Electricity Purchased		Petroleum Products	Other Fuels	Total
	Quantity Th. Tonne	Value	Quantity Th. Kwh.	Value	Value	Value	Value
1702	394	2454630	3235095	27599247	3582169	7823687	41459733
1709	1229	10537186	1720264	14395589	3155678	6532778	34621231
1811	0	0	973167	8378711	1288130	209425	9876265
1812	0	0	136943	1299778	137063	65211	1502053
1820	0	0	8795	79159	83497	0	162656
1910	41	582910	319377	2502623	865499	243472	4194504
1920	1970	14766895	5571887	47109062	155113638	162091643	379081238
2011	6654	49895899	12002539	105910806	31731908	42546776	230085389
2012	2496	20227255	6785222	62353476	8959220	169939692	261479642
2013	567	5720128	5751425	37397234	2504589	67152544	112774496
2021	603	4368483	1902855	16819318	2877128	6361125	30426055
2022	214	1675048	932148	7864745	1629467	2194389	13363649
2023	276	2079604	1946330	16587874	7076170	5054153	30797802
2029	483	3964827	3067669	24274830	6728677	6243811	41212144
2030	629	5570188	5176644	38056219	2707319	7232362	53566087
2100	1633	13404078	13525706	112442018	20118166	15814393	161778654
2211	679	5950757	3314364	27639690	4847200	5388489	43826137
2219	45	440529	1826432	15772682	2624164	2018233	20855608
2220	197	1572003	16073745	135424391	15613951	5159421	157769767
2310	48	682039	4004269	33762373	10580181	45386965	90411558
2391	633	4907296	1436200	11678439	7007182	8620492	32213410
2392	1446	16718704	549741	4807357	1917767	10799161	34242988
2393	2803	17186028	5634001	51689235	1802692	113228929	183906884
2394	23320	206489305	20270534	162967864	29617983	45067393	444142544
2395	110	780911	1331287	12218388	10367324	2917032	26283656
2396	0	0	2907573	23918748	23690383	1127330	48736461
2399	209	1518778	1221677	10469188	4016929	1489631	17494526
2410	50421	348020388	96208409	713966359	107467855	108558354	1278012957
2420	43566	150587283	21379553	133828550	43075741	23862192	351353765
2431	914	10295447	10981131	94702914	11141579	8182160	124322099
2432	3	21546	1036316	9197876	1608313	1758887	12586622
2511	34	400396	1309449	10859841	3263273	2689310	17212821

Proposed Methodology by MoSPI to dis-aggregate the Industry level data of CEA (refer table below):

- The Industry-wise purchase/consumption of electricity over a financial year, which is available in the *Table 6(a)* has been clubbed according to the end-use sectors of UNSD/IEA.
- Further, for capturing the share of non-ferrous metals, *Iron and steel sector (*NIC 2 digit code-24*)* under *Table 6 (a)* has been bifurcated into *Iron and Steel (*NIC 4 digit Code : 2410, 2431*)* and *Non-ferrous Minerals* (NIC Code : 2420,2432) using *Table 5 (at 4 digit NIC code).*
- The same exercise has been done for 13 years from 2010-11 to 2022-23. A *moving-average of five (5) years* has been considered to ease-out the irregularities and also to capture the latest trend.
- ***Refer table below*** showing the percentage consumption of electricity against different sub-sectors using average of last 5 years (i.e. for ascertaining the percentage consumption of coal in sub sector for the year 2022-23, an average of last 5 years is taken from 2017-18 to 2021-22.)

Percentage of Consumption of Electricity against different sub-sections under Industry						
Sectors as per UNSD/IEA	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	Average (last 5 years)
	% share	**% share**	**% share**	**% share**	**% share**	
Iron and Steel	27.62	27.52	26.47	27.65	25.52	26.96
Non-ferrous metals	6.94	4.86	4.01	7.36	5.80	5.80
Chemical and Petrochemicals	12.13	14.09	14.61	14.57	18.59	14.80
Non-metallic minerals	8.80	8.96	8.86	8.82	9.58	9.00
Transport equipment	4.82	5.21	4.75	4.61	4.80	4.84
Machinery	6.29	6.47	9.25	6.18	6.16	6.87
Mining and Quarrying	0.02	0.02	0.03	0.03	0.02	0.02

Food, beverages and tobacco	8.64	8.93	9.14	9.78	8.53	9.00
Paper, pulp and print	2.73	3.12	2.85	2.53	2.39	2.72
Wood and wood products	0.38	0.42	0.47	0.41	0.41	0.42
Textiles and leather	13.76	13.36	12.01	11.02	11.16	12.26
Non-specified industry	7.87	7.04	7.57	7.05	7.06	7.32
Total	100	100	100	100	100	100

- The '*consumption figure of electricity under Industry'* as provided by CEA under *Table 1.4* of the *All India Electricity Statistics, General Review*, has been distributed into different sub-sectors under *Industry* according to the *representative ratios*, to come-up with the sectoral end-use consumption figures.
- A proposed structure of the ***Table 6.8*** with all the changes is shown below:
-

Table 6.8-Consumption of Electricity sectorwise
(in Giga Watt Hour = 106 Kilo Watt Hour)

Financial Year / Sectors	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25 (P)
Industry Sector	**4,23,523**	**4,40,206**	**4,68,613**	**5,19,196**	**5,32,820**	**5,08,776**	**5,56,481**	**5,93,895**	**6,40,626**	**6,55,562**
Iron and steel	1,22,023	1,23,165	1,29,205	1,40,440	1,42,526	1,36,095	1,50,317	1,60,096	1,72,797	1,77,586
Chemical and petrochemical	46,437	48,919	54,300	60,418	69,227	66,103	75,580	87,876	98,955	1,00,356
Non-ferrous metals	21,520	21,825	23,692	29,992	30,306	28,939	33,314	34,427	36,508	38,691
Non-metallic minerals	37,114	38,747	41,580	45,855	47,831	45,672	49,596	53,468	59,390	61,872
Transport equipment	18,799	20,531	22,612	25,245	26,886	25,673	27,012	28,727	30,725	30,776

Machinery	27,967	28,426	30,201	33,207	37,574	35,879	38,910	40,785	44,053	45,741
Mining & Quarrying	115	135	162	186	141	134	148	142	164	178
Food, beverages and tobacco	34,125	36,009	39,211	44,123	46,943	44,825	50,622	53,468	58,139	59,809
Paper, pulp and print	12,832	12,779	13,213	14,226	14,864	14,193	15,540	16,164	17,271	17,489
Wood and Wood Products	1,563	1,665	1,860	2,068	2,237	2,136	2,328	2,473	2,697	2,796
Construction	0	0	0	0	0	0	0	0	0	0
Textile and leather	60,320	63,644	69,116	76,217	73,541	70,223	71,859	72,818	74,163	72,045
Non-specified	40,708	44,362	43,461	47,219	40,744	38,905	41,253	43,451	45,763	48,223
Transport Sector	**16,594**	**15,683**	**17,433**	**18,837**	**19,148**	**14,668**	**21,935**	**30,028**	**33,918**	**34,500**
Road	0	0	0	0	0	0	0	0	0	0
Domestic Aviation	0	0	0	0	0	0	0	0	0	0
Rail	16,594	15,683	17,433	18,837	19,148	14,668	21,935	30,028	33,918	34,500
Pipeline transport	0	0	0	0	0	0	0	0	0	0
Domestic navigation	0	0	0	0	0	0	0	0	0	0
Non-specified	0	0	0	0	0	0	0	0	0	0
Other Sectors	**5,61,073**	**6,05,294**	**6,37,381**	**6,71,938**	**6,96,118**	**7,06,764**	**7,38,349**	**8,16,388**	**8,66,043**	**9,32,907**
Residential	2,38,876	2,55,826	2,73,545	2,88,243	3,08,745	3,30,809	3,39,780	3,53,156	3,69,059	4,08,515
Comm. And public services	86,037	89,825	93,755	98,228	1,06,047	86,950	97,121	1,17,231	1,28,623	1,35,163
Agriculture/forestry	1,73,185	1,91,151	1,99,247	2,13,409	2,11,295	2,21,303	2,28,451	2,43,852	2,75,485	2,60,276
Non-specified	62,976	68,493	70,834	72,058	70,031	67,701	72,996	1,02,149	92,876	1,28,953
Total consumption	**10,01,191**	**10,61,183**	**11,23,427**	**12,09,972**	**12,48,086**	**12,30,208**	**13,16,765**	**14,40,311**	**15,40,587**	**16,22,969**

End of the report

***

Annexure- 4

File No.:P-11012/5/2019-(ES)ESD
भारत सरकार / Government of India
सांख्यिकी और कार्यक्रम कार्यान्वयन मंत्रालय
Ministry of Statistics and Programme Implementation
राष्ट्रीय सांख्यिकी कार्यालय / National Statistics Office
(आर्थिक सांख्यिकी प्रभाग/ Economic Statistics Division)

K.L. Bhawan Janpath,
New Delhi
Dated: 22-Oct-2025

OFFICE MEMORANDUM

Subject: Constitution of Sub-committee for building concordance between domestic and international classification of Coal-reg.

In order to harmonize and bring concordance between the domestic classification system of coal (IS-770 and ISP) and the international classification standards adopted by the United Nations Statistics Division (UNSD), the Govt. of India has decided to constitute a Sub-Committee under the Chairmanship of Prof. RM Bhattacharjee, Professor, Dept of Mining Engineering to look into the matter.

2. The Composition, Terms of References (ToR) and the tenure of the committee are as under:

Composition:

Sl.no.	Name and Designation	Ministry/ Organisation/ Department	Designation
1	Prof. Ram Madhab Bhattacharjee, Prof. Dept of Mining Engineering	Indian School of Mines (ISM), Dhanbad	Chairperson/Non-Official Member
2	Shri R.K. Singh, GM	Central Mine Planning & Design Institute Limited (CMPDIL)	Official Member
3	D. Pinaki Sarkar, Chief Scientist	Central Institute of Mining and Fuel Research (CMIFR)	Official Member
4	Dr. Sudip Bhattacharyya, DDG	Geological Survey of India (GSI)	Official Member
5	Smt. Chetna Shukla, DDG	Ministry of Coal	Official Member
6	Smt. Aditi Choudhury	Bureau of Indian Standard (BIS)	Official Member
7	Smt. Ankita Singh, DDG	ESD, MoSPI	Member Secretary

3. Terms of Reference(ToR):

The Terms of Reference (ToRs) of the sub-committee shall be as follows:

i. To examine the existing domestic classification of Coal which are, the IS – 770 by Bureau of Indian Standards (BIS) and Indian Standard Procedure (ISP) by GSI) and International

classification system of coal i.e. the Standards International Energy-product Classification (SIEC) used for energy statistics and reporting purposes.

ii. To suggest a framework for aligning the domestic classification with international standards for better comparability of data.

iii. Any other related issues with the permission of the Chair

4. The tenure of the committee will be forty-five(45) days from the date of issuing of this OM.
5. The committee may Co-opt/ invite subject experts in the meeting as special invitee, if necessary, in order to meet specific requirements.
6. The Sitting Fees and the TA/DA against all the Non-Official Members will be governed by the following OMs: i) OM No. 19047/10/2016-E-IV dated 12-04-2017 by Dept. of Expenditure, Ministry of Finance (as revised from time to time). ii) OM No. 19047/1/2016-E-IV dated 14-09-2017 by Dept. of Expenditure, Ministry of Finance (as revised from time to time).
7. The expenditure on conducting the meetings of the committee and on payments/ reimbursements to be made to the Non-Official Members will be borne by the Ministry of Statistics and Programme Implementation, New Delhi under 3454-Census, Survey and Statistics (Major Head), 02- Survey and Statistics (Sub Major Head), 02.204- Central Statistics Office (Minor Head), 19- Capacity Development (Capacity Development of CSO and Institutional Development & Capacity Building).
8. The Code of Professional Ethics as notified vide Gazette Notification No. Y 18020/3/2019-CAP dated19th July 2019 shall be binding on the Chairman and Members (both Official and Non-official) of the committee.
9. The Secretariat support to the Committee will be provided by the Economic Statistics Division (ESD) of MoSPI.
10. This issue with the approval of Secretary, M/o Statistics & PI.

22/10/25

(Indradeep Roy Chowdhury)
Director
ESD, MoSPI

To:

1. The Chairman of the Sub-Committee;
2. All members of the Sub-Committee;

Copy for information:

1. PPS to ADG(ESD);
2. PS to DDG(AS)

Report of The Sub-Committee on Coal

Under the Chairmanship of Prof. Ram Madhab Bhattacharjee,
Department of Mining Engineering, IIT (ISM)Dhanbad

ABSTRACT

The report is on the feasibility of having a concordance between the domestic and International Classification on Coal

Submitted on
18th -Dec-2025

Table of Contents

1. Background

Coal has always played an important role in the catering the energy-need of India. India, having a potential proven coal reserve of over 220 Billion Metric Tonnes as on 01.04.2025, is one of the largest reservoirs of Coal in the world. The ease of accessibility and commercial viability to extract the same have ensured that Coal has remained the prime energy-resources for generating the electricity to accommodate the rapidly expanding economy and industrialization of India.

Coal is considered the most heterogeneous energy-commodities among all. In India, we have the *IS 770:2013, i.e. "Indian Standard on Classification and Codification of Indian coals, Lignite and Semi-Anthracites"* developed by BIS, which is the classification of domestic coal based on its' properties (like *Mean random Reflectance*, *Volatile Matter*, *Moisture Content* etc.), and *ISP 2022* which also categorized the Indian Coal into a much simpler version for the ease of administrative purpose. It has been observed that, at International level the classifications of Coal prescribed under the *Standard International Energy-product Classification (SIEC)* by UNSC is somehow not strictly align with the categorizations which has been followed in India.

In order to harmonize and bring concordance between the domestic classification system of coal (IS-770 and ISP) and the international classification standards adopted by the United Nations Statistics Division (UNSD), the Expert Committee under the Chairmanship of Dr. Rangan Banerjee, Director, IIT-Delhi, have recommended to constituted a Sub-Committee under the Chairmanship of Prof. RM Bhattacharjee, Professor, Dept of Mining Engineering to look into the matter.

The Composition and Terms of References (ToR) of the committee are as under:

Sl. No.	Name and Designation	Ministry/ Organization/ Department	Designation
1.	Prof. Ram Madhab Bhattacharjee	Professor, Department of Mining Engineering, IIT (ISM), Dhanbad	Chairperson/Non-Official Member
2.	Shri. R.K. Singh, GM	Central Mine Planning & Design Institute Limited (CMPDIL)	Official Member
3.	Dr. Pinaki Sarkar, Chief Scientist	Central Institute of Mining and Fuel Research (CIMFR)	Official Member
4.	Dr. Sudip Bhattacharyya, DDG	Geological Survey of India (GSI)	Official Member
5.	Suit. Chetna Shukla, DDG	Ministry of Coal (MoC)	Official Member
6.	Smt. Aditi Choudhury	Bureau of Indian Standards (BIS)	Official Member
7.	Smt. Ankita Singh, DDG	ESD, Ministry of Statistics and Programme Implementation (MoSPI)	Member Secretary
8.	Dr. Ankush Galav	Assistant Professor, Department of Mining Engineering, IIT (ISM), Dhanbad	Co-opted member (Special Invitee)
9.	Mr. Saurabh Singh	Sr. Manager (Geo), CMPDIL	Representative of GM, CMPDIL
10.	Dr Prabal Boral	Sr Technical Officer-3, CIMFR	Co-opted member (Special Invitee)
11.	Mr. Niraj Kumar Shukla	Sr. Technical Officer-2, CIMFR	Co-opted member (Special Invitee)

The Terms of Reference (ToRs) of the sub-committee are as follows:

- To examine the existing domestic classification of Coal which are IS 770 by Bureau of Indian Standards (BIS) and Indian Standard Procedure (ISP) and International Classification system of coal i.e. the Standards International Energy-product Classification (SIEC) used for energy statistics and reporting purposes.
- To suggest a framework for aligning the domestic classification with international standards for better comparability of data.
- Any other related issues with the permission of the Chair.

2. Developments:

The use of the grades of Coal in India has dominated by its' administrative purposes. In India, as per ISP 2022, Coal is primarily categorised into Coking, Non-Coking and Semi-Coking purposed having certain grades which are mainly based on either its' GCV or Ash/Moisture-content. The IS 770 provides a wider variation of Coal based on its' caking and volatility properties. Within the stipulated and stringent time-period of 45 days the Sub-Committee met thrice to have form a consolidated view in this matter.

The following meetings were held by the sub-committee:

- First meeting of the subcommittee was held on 31st October 2025 in online mode (Record of Discussion is enclosed in ***Annexure V***). As per the RoD the consolidated feedback, received from all the esteemed members of the Sub-Committee, on their views on the potential challenges in development of concordance between domestic and international classification of Coal has been placed under ***Annexure VI.***
- Second meeting of the subcommittee was held on 28th November 2025 at IIT(ISM) IIIF at Kolkata (Record of Discussion is enclosed in ***Annexure VI***).
- Technical discussion and exercise on coal-analysis data as well as on the comparative analysis of the content of SIEC, IS 770, ISO 11760 and ASTM D388 was held on 11th December 2025 at the office of Natural Energy Resources, GSI, Kolkata in which Members/Experts of GSI, CIMFR and CMPDIL were present. Draft Annexure II, III and IV in tabular format were prepared in the meeting.
- Third meeting of the subcommittee was held on 12th December 2025 at IIT(ISM) IIIF at Kolkata.

  The outcome of the day long exercise on 11th December, 2025, were presented by Dr. Sudip Bhattacharyya, DDG, GSI in tabular format (altogether 3 tables). Thereafter, the committee members critically analysed the submitted draft tables and substantiated the table content through various intellectual inputs. Accordingly, the tables were modified with enriched information. The said tables in their final forms are attached here as ***Annexure II, III***, and ***IV***. Based on the critical evaluation of the tables, various observations emerged before the committee members which are stated below:

3. Observations of the Sub-Committee:

3.1 Standard International Energy Product Classification (SIEC) defines coal as solid fossil fuel consisting of carbonized vegetal matter and coal products derived directly or indirectly from the

various classes of coal by carbonization or pyrolysis processes, by the aggregation of finely divided coal or by chemical reactions with oxidizing agents, including water. The SIEC system has classified coal in two main categories of hard coal (comprising medium and high-rank coals) and brown coal (low-rank coals), identified by their Gross Calorific Value (Moisture, Ash Free basis) and the Vitrinite mean Random Reflectance. Peat is not included here.

3.2 Indian Standard Procedure (ISP) for Coal & Lignite i.e. ISP is a guideline and norm for coal and Lignite resource estimation, intended to provide uniform criteria, terms and modalities for Geologists and Mining Engineers so that the geological and grade continuity estimate prepared can be suitably correlated and combined. ISP adopts commercial Coal and Lignite grading system notified by Coal Controller Organisation (CCO) and also uses generic coal classification as per IS 770.

3.3 As per ISP Coal-2022, the following coal grades are used in India mainly for commercial and resource estimation purpose:

a. **Coking Coal:** Classified by ash content, from high-quality Steel Grade I (ash ≤ 15%) to Washery Grade VI (ash 42-49%).
b. **Non-Coking Coal:** Classified by Gross Calorific Value (GCV) at 60% RH & 40^0C, with a newer 17-level system implemented by the 2017 ISP norms.

As per ISP Lignite-2025, the lignite grades used in India are GL1 to GL9 and "Below Grade".

Analytical procedures for determining the coal/lignite parameters for grade wise classification of coal and lignite conform to relevant Indian Standards.

3.4 Indian coals and lignite have been classified **by IS 770:2013, i.e. "Indian Standard on Classification and Codification of Indian coals, Lignite and Semi-Anthracites"** published by Bureau of Indian Standards, New Delhi. The IS 770 classification is a detailed classification system, essentially based on the following two sets of parameters:

a. Basic Parameters

i. Mean random reflectance;
ii. Volatile matter (dry mineral matter free basis, DMMF); and
iii. Gross calorific value (dry mineral matter free basis, DMMF)

b. Supplementary Parameters

i. Capacity moisture equilibrated at 96% relative humidity and 40° C;
ii. Gray King low temperature (GKLT) coke type; and
iii. Crucible swelling number (CSN)

Based on the above Basic and Supplementary parameters, classification and codification of Indian coals and lignite have been done wherein 11 different classes have been identified with respect to Indian coals and Lignite (Enclosed as ***Annexure I***).

3.5 As per the ToR, the committee examined the existing domestic classification of Coal which are IS 770 by Bureau of Indian Standards (BIS) and Indian Standard Procedure (ISP) and International Classification system of coal i.e. the Standards International Energy-product Classification (SIEC) used for energy statistics and reporting purposes. An attempt was also made to compare IS-770 with few other global standards such as SIEC, IS-770, ISO-11760, and ASTM D388. As discussed, and decided in the second meeting of the sub-committee, a pilot exercise was conducted using

more than 100 coal-analysis results of different coalfields of India to evaluate potential correlations between domestic and international classifications. Accordingly, the coals were categorised as per different standards such as SIEC, IS-770, ISO-11760, and ASTM D388. The analysis table is enclosed in the ***Annexure II***.

3.6 From the pilot exercise and detailed deliberations in the meetings, the committee observed the following major issues regarding concordance between the domestic classification system of coal (IS-770 and ISP) and the international classification standards SIEC, adopted by the United Nations Statistics Division (UNSD):

a. Coal classifications of the countries and their bounding parameters are defined as per the country-specific conditions, which is scientifically essential. The ISO document is generalised, but country-specific classifications are different from that. Thus, different countries have varied classifications of Coal and lignite.

b. Annexure II depicts that the attempts towards categorisation of coal resulted in different coal-wise class-nomenclature as per different standards.

c. Indian Classification system IS-770 is very much elaborate, based on the basic parameters for characterisation of coal and dependent on the generic nature of the Indian coal, which is unique, being different from the coals of other countries. This makes the difference of Indian classification from other classification systems in the global context.

d. Comparison of Boundary conditions for different classes contained in different standards are given in ***Annexure III***. The committee observed the significant variations in boundary limits of different parameters used for classification in SIEC, IS-770, ISO-11760, and ASTM D388.

i. With respect to the bituminous coal:

- the boundary of the mean random reflectance is ≥0.60, >0.55, and ≥0.50 for SIEC, IS 770, and ISO-11760 respectively, while ASTM D388 has not considered it.
- the variation of GCV for SIEC, IS 770 and ASTM D388 are ≥5736 kcal/kg (DAF), >7500 kcal/kg (DMMF) and ≥5836 kcal/kg (DMMF) respectively, while ISO-11760 has not considered it.

ii. With respect to the sub-bituminous coal:

- the boundary of the mean random reflectance is <0.60, >0.38-0.55, and ≥0.40-<0.50 for SIEC, IS 770, and ISO-11760 respectively, while ASTM D388 has not considered it.
- the variation of GCV for SIEC, IS 770 and ASTM D388 are ≥4785- <5736 kcal/kg (DAF), >6950 -7500 kcal/kg (DMMF), and ≥4617-6398 kcal/kg (DMMF), respectively, while ISO-11760 has not considered it.

iii. With respect to the Lignite:

- the boundary of the mean random reflectance is <0.60, >0.28-0.38, and <0.40 for SIEC, IS 770, and ISO-11760 respectively, while ASTM D388 has not considered it.
- the variation of GCV for SIEC and IS 770 and ASTM D388 are <4785 kcal/kg (DAF), >6150 - 6950 kcal/kg (DMMF), and <4617 kcal/kg (DMMF), respectively, while ISO-11760 has not considered it.

iv. The comparative analysis of the standards reveals that there is significant variation in the GCV and mean random reflectance-based boundary conditions for both bituminous coal and lignite.

v. Volatile matter (VM), which is a basic parameter for classification of coal in IS 770, has not been considered in SIEC.

vi. In SIEC, no specific parameter has been assigned for the identification of the coking coal.

e. Standard-wise categories of coal classification vary a lot and that has been presented in Annexure IV. SIEC, IS-770, ISO-11760, and ASTM D388 have 5, 11, 9 and 12 sub-categories, respectively.

5. Challenges involved in building the Concordance:

(a consolidated report based on the feedbacks from the members placed under *Annexure -VI*)

1. India does maintain a formal classification system for coking, semi-coking, and non-coking (Gondwana) coal, though it is primarily based on ash content and moisture (for coking coal) and gross calorific value (GCV) for non-coking coal. However, other critical parameters, such as volatile matter percentage (VM%), swelling index, caking index, and reflectance (Ro) also play a significant role in accurately determining coal quality.
2. In the referenced table, as per IS 770:2013 (Reaffirmed 2019), moisture content is determined at 96% relative humidity (RH) and 40°C, whereas in the ISP system, it is typically assessed at 60% RH and 40°C.
3. In the SIEC, both Other Bituminous Coal (non-caking) and Sub-Bituminous Coal (under Brown Coal) are non-caking in nature; therefore, a clear demarcation is essential before classification based on physical and chemical characteristics.
4. Commercial grading system in India for various coal categories (effective from 1.1.2012) has been implemented through thorough exercise, long term Research and concurrence of all stake holders/ concerned Ministries. On this basis commercial markets of coal have been stabilized in India. Present exercise should not be conflicting with the existing system of Coal grading and pricing.
5. Indian coals are different from foreign coal due to their unique formation and genesis. Classification and Codification of Indian Coals and Lignites was evolved through extensive R&D work, where the Concordance could not be built up due to generic constraints. Nature of the coals are completely different form foreign coals and due this reason it is very difficult to build Concordance between Domestic and International Classification of Coal.
6. Difference in Parameters for Classification: SIEC classification is based mainly on two parameters: Gross Calorific Value (GCV) and Random Mean Vitrinite Reflectance. ISP or Grades of coal notified by CCO use GCV for grading of Non-Coking Coal and for coking coal grading Ash content is the criteria.
7. GCV Reporting Differences: While GCV is a common parameter, the basis for reporting differs significantly, making the GCV values of the two systems not directly comparable:
    - SIEC uses a Dry Ash-Free (DAF) basis.
    - IS:770 uses a Dry Mineral Matter-Free (DMMF) basis.

- ISP reports GCV on an as-received basis.

8. Case of Semi-Coking Coal or Weakly Coking Coal: these coals are not suitable for direct coke production but are used for blending purposes with coking coal.
9. Non-Coking Coal Variability: Since the Indian classification does not account for vitrinite reflectance, a single Indian grade may belong to different SIEC categories.
10. Sulphur-rich Indian Coal (Tertiary Coal) is classified separately in the Indian system.
11. The UNFC code classifies coal grades primarily based on Gross Calorific Value (GCV), whereas the IS 770 classification uses three main parameters: reflectance, volatile matter (VM), and GCV. Additionally, IS 770 incorporates supplementary factors such as moisture content equilibrated at 96% relative humidity and 40°C, Gray King low temperature (GKLT) coke type, and Crucible Swelling Number (CSN). Although both standards consider GCV for grading, the Indian classification includes unique parameters specific to the Indian context that do not directly correspond to international systems. Furthermore, the technical codification under IS 770 for coal types may lack a direct international counterpart, making product-level concordance more complex. Importantly, GCV alone is insufficient to determine coal's suitability for particular industrial applications such as coking or power generation.
12. G1-G17 grading is for non-coking coal while IS 770 specifies type – non-caking and caking.
13. Some IS 770 grade bands overlap in GCV values but may differ in other properties. For example, two different codes may have similar GCV but very different caking or swelling behavior. International standards may not recognize these fine technical differences.

Way forward/Proposed Roadmap for building the Concordance:

1. A broad and generalised concordance between BIS classification and ISP-2022 may be put forward.
2. Indian classification may be scrutinized thoroughly against the international classification through physical meeting among the expert group members to explore the possibilities if any.
3. GCV is the common parameter in case of non-coking coal in both SIEC and ISP, a concordance table may be developing by grouping classes of ISP for their correlation with SIEC classes. Some correlation factor needs to develop for GCV as received used in ISP and GCV DAF used in SIEC.
4. Indian Coking Coal may directly be correlated with coking coal of SIEC.
5. In case of Semi-Coking Coal or Weakly Coking Coal as these coals are not suitable for direct coke production but are used for blending purposes with coking coal. Their grouping may be done on basis of their end use.
6. Sulphur-rich Indian Coal (Tertiary Coal) may be kept in Bituminous coal category of SIEC.

6. Concluding Remarks

The committee carefully examined the possibility of the concordance between existing domestic classification of Coal i.e. IS 770 by Bureau of Indian Standards (BIS) and Indian Standard Procedure (ISP) and International Classification system of coal i.e. the Standards International Energy-product Classification (SIEC) used for energy statistics and reporting purposes. Apart from this, the committee also considered the ASTM D388 and ISO-11760 standards for the purpose of comparison.

The committee discussed in detail different aspects of comparison among the International and Domestic standards of coal classification and their relevance with respect to SIEC. The detailed exercise revealed that

- there are mismatches of coal classes mentioned in different standards,
- there are significant variations in boundary limits of various classes in respect of different parameters used for classification in SIEC, IS-770, ISO-11760, and ASTM D388,
- the specific parameters of coking coal are not defined in SIEC, whereas the domestic classification considers the caking properties of coal,
- there is a significant mismatch between SIEC and IS 770 in respect of GCV and mean random reflectance range for bituminous coal and lignite,
- SIEC has classified the coals and lignite into 5 classes based on only two basic parameters (Gross Calorific Value and the Vitrinite mean Random Reflectance) whereas the IS 770 has classified the coals and lignite in 11 classes based on four additional parameters like Volatile matter content, Moisture content, Caking property and Swelling factor.
- In SIEC system, Bituminous coal is sub-divided into two categories, i.e. coking and other bituminous, whereas in IS 770 system, Bituminous coals are divided into different categories based on volatile matter content (low, medium and high) and caking properties of coal (strongly caking / medium caking/ weakly caking / non-caking).

In view of the above significant variations between the SIEC and IS 770 and other international classification system, the attempt of one-to-one mapping of different classes of coal & lignite between the Domestic and International Classification standards may be too simplistic and may not reasonably achieve the objective of harmonization and bringing concordance between the domestic classification system in India and the international classification standards adopted by the United Nations Statistics Division (UNSD).

5. Acknowledgement: The Chairman of the Sub-Committee acknowledges the contribution and support of all the members and co-opted members of the Sub-Committee, who have actively participated in the discussions, provided valuable inputs and put their sincere efforts in analysing the past reports / data in appropriate context, with all due diligence, while examining the existing domestic and international coal classification systems / standards and suggesting a framework for aligning the domestic classification with international standards for better comparability of data.

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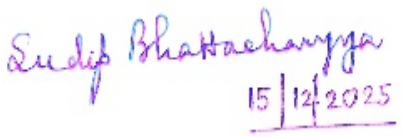

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Methodology for determining the Representative calorific values of Coal

ESD, MoSPI, with the help of existing documents like *Operational guidelines of National Coal Index and Representative prices* from M/o Coal, CMPDIL, along with the data from M/o Coal, *All India Electricity General Review* of CEA, CIL and SCCL has come-up with the representative calorific values of Coal against the following four(4) scenario:

a) Coal Produced during a financial year;
b) Coal Imported during a financial year;
c) Coal dispatched to Power Sector during a financial year and
d) Coal dispatched to Non-Power Sector during a financial year

a) *Coal Produced during a financial year*:

1. To determine the average representative Gross Calorific Value (GCV) of domestically produced coal in India (in Kcal/Kg), coal production is first divided into two categories—Non-Coking and Coking.

Non-coking coal:

i. Firstly, the mid-point calorific value/representative calorific value against a particular grade of Coal will be calculated as,

$$MPCV_G = \frac{R_1 + R_2}{2}$$

Where,
$MPCV_G$ = Mid-point Calorific Value of G^{th} grade of Coal
R_1 = Lower value in range
R_2 = Upper value in range

Table 1: Calculation of Mid-point Calorific Values of Non-Coking Coal

Types of coal	Grades	GCV Range (Kcal/Kg)		Mid-point CV (in Kcal/kg)
Non - Coking Coal	G1	>7000		7,150
	G2	7,000	6,701	6,851
	G3	6,700	6,401	6,551
	G4	6,400	6,101	6,251

	G5	6,100	5,801	5,951
	G6	5,800	5,501	5,651
	G7	5,500	5,201	5,351
	G8	5,200	4,901	5,051
	G9	4,900	4,601	4,751
	G10	4,600	4,301	4,451
	G11	4,300	4,001	4,151
	G12	4,000	3,700	3,850
	G13	3,700	3,400	3,550
	G14	3,400	3,101	3,251
	G15	3,100	2,801	2,951
	G16	2,800	2,501	2,651
	G17	2,500	2,201	2,351

ii. Following which, to come-up with the unique representative value of Non-Coking Coal against a particular year, *weighted-average* method is used where the weights have been considered as the respective production volume of a particular grade of Coal.

The same can be placed using the following formula,

$$\text{F1} = AvgCV_{NC} = \frac{\sum_G (MPCV_{G-NC}\ X\ P_{G-NC})}{\sum_G P_{G-NC}}$$

Where,

$AvgCV_{NC}$ = Average Calorific Value of Non-Coking coal

$MPCV_{G-NC}$ = Mid-point calorific value of Gth grade of Non-Coking coal

P_{G-NC} = Annual production of Gth grade of Non-Coking coal

Coking coal:

i. In absence of representative calorific value of different grades of Coking coal, it became difficult to determine the unique representative calorific value of the Coking coal produced in India, against a particular financial year.

ii. The ESD, MoSPI approached M/o Coal, with the request to assign some calorific values against each grades of Coking coal, exclusive for the purpose of determining the representative calorific value of Coal. The CMPDIL (Central Mine Planning and Development Ltd.), a subsidiary under CIL, the research

wing of the M/o Coal, came out with some unique values against each of the categories of Coking coal. A detail of the same is given below (refer Table 2),

Table 2: Representative Mid-point Calorific Values of Coking Coal

Types of coal	Grades	Representative CV (in Kcal/kg)
Coking Coal	Steel Gr - 1	7,094
	Steel Gr - 2	6,945
	Semi Coking - 1	6,915
	Washer Gr. - I	6,647
	Washer Gr. - II	6,349
	Washer Gr. - III	6,002
	Washer Gr. - IV	5,456
	Washer Gr. - V	4,762
	Washer Gr. - VI	4,067

iii. The production of coking coal in India w.r.t different grades, also varies over year. Hence, in order to have a representative calorific value of the Coking Coal produced against a particular financial year, we need to consider its' *grade-wise production* over the year. Thus, here also the methodology of *weighted average* has been adopted to come-up with the unique representative calorific value of Coking coal in India, where the representative CV of each grade of Coking coal along with its' weights (the respective production volume against a particular grade of Coking coal) has been used. The mathematical form of the same comes out to be,

$$\text{F2} = AvgCV_C = \frac{\sum_G (MPCV_{G-C}\ X\ P_{G-C})}{\sum_G P_{G-C}}$$

Where,

$AvgCV_C$ = Average Calorific Value of Coking coal

$MPCV_{G-C}$ = Mid-point calorific value of G^{th} grade of Coking coal

P_{G-C} = Annual production of G^{th} grade of Coking coal

2. Then in the next step, the proportionate share of each type in total domestic production is derived. The proportion of Non-coking and Coking coal in India, against a particular financial year can be derived using the following formulae,

$$Share_{NC} = \frac{P_{NC}}{P_T}$$

Where,

$Share_{NC}$ = Proportion of Non-Coking coal in total domestic production

P_N = Total domestic production of Non-Coking coal

P_T = Total domestic production of coal

$$ffShare_C = \frac{P_C}{P_T}$$

Where,

$Share_C$ = Proportion of Coking coal in total domestic production

P_C = Total domestic production of Coking coal

P_T = Total domestic production of coal

3. Finally, the Average representative *Gross Calorific Value (GCV)* of domestically produced Coal in India, gets calculated using the following formula,

$$Avg\ GCV\ of\ Domestic\ Coal\ Production = (F1\ X\ Share_{NC}) + (F2\ X\ Share_C)$$

The Average Gross Calorific Value of domestic Coal in Production is calculated in Kcal/Kg. The same can be converted into kilo Joule/ kg using the conversion factor

1 calorie = 4.1868 Joule
(Or 1 kilo calorie = 4.1868 Kilo Joule)

b) *Coal Imported during a financial year:*

1. Firstly, the grouping of non-coking and coking coal is done on the lines of the practices followed in WPI by DPIIT and after incorporating some assumptions such as:
    - *Non- Coking Coal imported from all countries (except Indonesia) come under Top Grade category of Non-Coking Coal (G1-G6);*

- *Non- Coking Coal imported from Indonesia (only) comes under Middle Grade category of Non-Coking Coal (G7-G14);*
- *All the imported coking coal has been considered under Top Grade coking coal category (ST-I, II).*
- It has been assumed that, India doesn't import any inferior quality of Coal (Non-*Coking Bottom* or *Coking Bottom*) for its' domestic consumption. These assumptions are indispensable for coming out the representative CV of Imported coal in India.

- They are grouped into 3 categories- Non-Coking (Top), Non-Coking (Middle) and Coking (Top). The representative calorific value of coal in each of these groups are calculated as the average CV of each category from the grades within it.

2. To calculate the overall average Gross Calorific Value (GCV) of imported coal for a financial year, a weighted average method is applied, wherein the representative calorific value of each coal category is multiplied by the volume of coal imported in that category. The sum of these weighted values is then divided by the total volume of all imported coal for that year.
3. Hence, the average CV of *Non-Coking Top, Non-Coking Middle* and *Coking Top* categories of Coal can be computed using the following formula,

$$AvgCV_{NC-Top} = \sum Average(\ MPCV_{GNC})$$

Where,

$AvgCV_{NC-Top}$ = Average Calorific Value of *Non-Coking-Top* category of coal

$MPCV_{GNC}$ = Mid-point calorific value of G^{th} grade of Non-Coking coal

G (the grade of Non-Coking Coal) runs from 1 to 6.

Similarly, we can compute the Mid-point CV of *Non-Coking Medium* and *Coking-Top* category of Coal also. The final representative Mid-point CV of Coal under respective categories of Coal have been given below,

Table 3: Representative Mid-point Calorific Values of different groups of Coal

Coal	Grades	Mid-point GCV	Avg. GCV
Non- Coking Top Grade	G1	7,150	6,400
	G2	6,851	
	G3	6,551	
	G4	6,251	
	G5	5,951	
	G6	5,651	
Non- Coking Middle Grade	G7	5,351	4,300
	G8	5,051	
	G9	4,751	
	G10	4,451	
	G11	4,151	
	G12	3,850	
	G13	3,550	
	G14	3,251	
Coking Top Grade	Steel Gr - 1	7,094	7,020
	Steel Gr - 2	6,945	

4. So, we have three distinct categories of Coal (using the practices followed in WPI) along with their representative CVs; also, we have certain assumptions for determining the volume of Import against a particular financial year. Thus, using the volume as weight, here also we have made use of the *weighted average* methodology to come-up with the average representative Calorific Value of Imported coal against a particular financial year. The mathematical formula of the same is given as below,

$$AvgGCV_I = \frac{(AvgGCV_{NC-T}\ X\ I_{NC-T}) + (AvgGCV_{NC-M}\ X\ I_{NC-M}) + \left(AvgGCV_{C-Top}\ X\ I_{C-T}\right)}{I_T}$$

Where,

$AvgGCV_I$ = Average gross calorific value of Imported Coal

I_{NC-T} = Amount of *Top-Grade of Non-Coking* coal imported

I_{NC-M} = Amount of *Middle-Grade of Non-Coking* coal imported

I_{C-T} = Amount of *Top-Grade of Coking* coal imported

I_T = Total coal Imported in India

c) *Coal dispatched to Power Sector during a financial year:*

1. Here we take the coal despatched to power sector from 3 sources: Coal India Limited (CIL), Singareni Collieries Company Limited (SCCL) and *Table 7.7* of the All India Electricity Statistics: General Review publication of CEA.
2. Once all the data against a particular financial year have been obtained, the average/representative Calorific Value of Imported Coal of India has been computed using the following formula:

$$Ave.GCV - Power = \left(\frac{\sum_G MPCV_{G-CIL}\, X\, QPow_{G-CIL}}{\sum_G QPow_{G-CIL}} \right) * P_1 + \left(\frac{\sum_G MPCV_{G-SCCL}\, X\, QPow_{G-SCCL}}{\sum_G QPow_{G-SCCL}} \right) * P_2 + (MPCV_{I-Pow}\ ) * P_3$$

Where,

$Avg.GCV - Pow$ = Average GCV of coal despatched to power sector

$MPCV_{G-CIL}$ = Mid-point Calorific Value of Gth grade of coal despatched by CIL to power sector

$MPCV_{G-SCCL}$ = Mid-point Calorific Value of Gth grade of coal despatched by SCCL to power sector

$MPCV_{I-Pow}$ = Mid-point Calorific Value of Imported Coal

$QPow_{G-CIL}$ = Quantity of Gth grade of Coal despatched by CIL to power sector

$QPow_{G-SCCL}$ = Quantity of Gth grade Coal despatched by SCCL to power sector

The Proportion P_1 , P_2 and P_3 is the weights assigned against each of the components, which is simply the proportionate share of quantity in the *total coal dispatched to Power sector*. The same will be computed using the following formula:

$$P_1 = \frac{\sum_G QPow_{G-CIL}}{\sum_G QPow_{G-CIL} + \sum_G QPow_{G-SCCL} + QPow_I}$$

$$P_2 = \frac{\sum_G QPow_{G-SCCL}}{\sum_G QPow_{G-CIL} + \sum_G QPow_{G-SCCL} + QPow_I}$$

$$P_3 = \frac{QPow_I}{\sum_G QPow_{G-CIL} + \sum_G QPow_{G-SCCL} + QPow_I}$$

Where,

$QPow_I$ = Quantity of Coal imported by India dispatched to power plants.

d) *Coal despatched to Non-Power Sector during a financial year:*

1. Similar to Coal despatched to Non-Power Sector, here also we take coal despatched to power sector from 3 sources: Coal India Limited (CIL), Singareni Collieries Company Limited (SCCL) and Imported coal from CEA or DGCIS.
2. First, the mid-point calorific values of non-coking coal of grades G1 to G6 (say $MPCV_{TNC}$) and non-coking coal of grades G7 to G14 (say $MPCV_{MNC}$) are calculated using Formula F_1 given in *Section a- Coal Produced during a financial year*.
3. Second, the mid-point calorific values of coking coal of grades Steel Grade-1 and Steel Grade-2 (say $MPCV_{TC}$)are calculated using *Table 3* above.
4. Third, the average GCV of imported coal dispatched to the non-power sector for the financial year is computed by combining these mid-point calorific values of top-grade non-coking coal, middle-grade non-coking coal and top-grade coking coal using the formula F_8 given below.

$$AvgGCV_{INP} = \frac{(MPCV_{TNC}\ X\ I_{TNC}) + (MPCV_{MNC}\ X\ I_{MNCNP}) + (MPCV_{TC}\ X\ I_{TC})}{I_{TNC} + I_{MNCNP} + I_{TC}}$$

Where,

$AvgGCV_{INP}$ = Average GCV of imported coal despatched to non-power sector
$MPCV_{TNC}$ = Mid-point calorific value of top-grade non-coking coal
$MPCV_{MNC}$ = Mid-point calorific value of middle-grade non-coking coal
$MPCV_{TC}$ = Mid-point calorific value of top-grade coking coal
I_{TNC} = Total import of top-grade non-coking coal
I_{MNCNP} = Total import of middle-grade non-coking despatched to non-power sector[1]
I_{TC} = Total import of top-grade coking coal

Finally, the average GCV of coal despatched to non-power sector for a particular FY is calculated using the formula $\boldsymbol{F_9}$ **below:**

[1] Details of the calculation are given in the Appendix.

$$AvgGCVNP = \frac{(\sum_{GCL} MPCV_{GCL} X\ DNP_{GCL}) + (\sum_{GSL} MPCV_{GSL} X\ DNP_{GSL}) + (AvgGCV_{INP} X\ DNP_{INP})}{\sum_{GCL} DNP_{GCL} + \sum_{GSL} DNP_{GSL} + DNP_{INP}}$$

Where,

$AvgGCVNP$ = Average GCV of coal despatched to non-power sector
$MPCV_{GCL}$ = Mid-point Calorific Value of Gth grade of coal despatched by CIL to non-power sector
$MPCV_{GSL}$ = Mid-point Calorific Value of Gth grade of coal despatched by SCCL to non-power sector
$AvgGCV_{INP}$ = Average GCV of imported coal despatched to non-power sector
DNP_{GCL} = Coal of Gth grade despatched by CIL to power sector
DNP_{GSL} = Coal of Gth grade despatched by SCCL to power sector
DNP_{IP} = Imported coal despatched to power sector

Findings

Based on the above methodology, the conversion factors derived are reproduced below:

Representative calorific value/Conversion Factors of Coal

Type of energy Commodity	**Conversion factors (NCV) for FY: 2024-25**	
Coal	**Kcal/kg**	**KJ/Kg**
Coal Production	4,237	16,854
Coal Imported	5,662	22,522
Coal dispatched to Power Sector	4,322	17,192
Coal dispatched to Non-Power Sector	5,957	23,695

Representative calorific value/Conversion Factors of Petroleum Products using MoPNG statistics

Type of Fuel	**As per IEA**		**As per Table XVIII of IPNG - 2023-24**	
	KJ/Kg	**Toe / Metric Tonnes**	**Toe / Metric Tonnes**	**KJ/Kg**
Crude Oil	42,789	1.022		
Natural Gas Liquids	42,998	1.027		
Refinery Feedstocks	44,799	1.070		
Additives/Blending Comp	41,868	1.000		
Other Hydrocarbons	41,868	1.000		
Refinery Gas	48,100	1.149		
Ethane	49,400	1.180		

Liquefied Petroleum Gases	47,300	1.130	1.130	
Motor Gasoline	44,800	1.070	1.070	
Aviation Gasoline	44,800	1.070	1.070	
Kerosene Type Jet Fuel	44,600	1.065	1.065	
Kerosene	**43,800**	**1.046**	**1.045**	**43,752**
Gas/Diesel Oil	**43,300**	**1.034**	**1.035**	**43,334**
Fuel Oil	**40,200**	**0.960**	**0.985**	**41,240**
Naphtha	45,000	1.075	1.075	
White Spirit	43,000	1.027		
Lubricants	42,000	1.003		
Bitumen	39,000	0.931		
Paraffin Waxes	40,000	0.955		
Petroleum Coke	32,000	0.764		
Non-specified Oil Products	**40,000**	**0.955**	**0.96**	**40,193**

Representative calorific value/Conversion Factors of other energy-Commodities

Types	**Conversion Factors**	**Responsible Ministry**
Natural Gas	1 Billion Cubic Meter = 38.735 Peta Joule	MoPNG
Electricity from Hydro and RES	1 GwH = 0.086 Ktoe	MNRE
Average nuclear conversion efficiency (electricity Vs. Thermal)	33% (0.086 / 0.33) Ktoe	DAE

Comments on the use of Annual Survey of Industries (ASI) data to improve estimation of sectoral end-use consumption of energy

Srihari Dukkipati, Prayas (Energy Group), January 9th 2026

Annual statistics published by the energy ministries provide a wealth of information on the production, transfer and consumption of the associated energy carriers. These are the *Coal Directory of India* published by Ministry of Coal (MoC), the *Indian Petroleum and Natural Gas Statistics* published by Ministry of Petroleum and Natural Gas (MoPNG) and the *All India Electricity Statistics-General Review* published by Central Electricity Authority (CEA). Data from these sources is compiled by the Ministry of Statistics and Programme Implementation (MoSPI) into an annual publication titled 'Energy Statistics India', additionally including physical and energy balances and Sankey diagrams, thus providing a comprehensive statistical snapshot of the commercial energy sector in India.

However, the reporting of energy products, end uses and energy content are not standardised across the different publications making it difficult to collate them together. In particular, categorisation of end uses across different energy products is useful in understanding trends in the economy over time, thus assisting in planning and policy formulation.

An Expert Committee on Energy Statistics was set up to standardise and improve various aspects of energy statistics reporting in the country. Specifically, the following are the issues relevant to this note were deliberated by the Committee:

- Agenda II (a): In case of Coal, the end-use sector "Others" has a share of around 65-70%, out of the total dispatch to non-power/Industry sector, in a financial year
- Agenda II (b): The end-use dispatch of Imported coal (which accounts to nearly 20% of the total availability of Coal in a FY) is not captured
- Agenda II (d): The entire consumption of electricity against all sectors of 'Industries' have been clubbed together and placed as a 'single value'

The Economic Statistics Division (ESD) of MoSPI proposed the possibility of dis-aggregation of such data using the annual database available from the Annual Survey of Industries (ASI). Data collected under the Perform Achieve and Trade (PAT) scheme administered by Bureau of Energy Efficiency (BEE) was proposed as another source that could be used for this purpose.

In the 2nd meeting of the Committee, it was proposed that a comparative study between the statistics available under ASI and the PAT scheme be conducted to arrive at a methodology to improve the sub-sectoral allocation of consumption of coal and electricity within the industry sector. Following analysis is the result of a study undertaken by Prayas (Energy Group) to evaluate if and how the two datasets can be used for arriving at more accurate sub-sectoral classification of coal and electricity use within the industrial sector.

1 The proposed methodology to use ASI data to disaggregate industrial energy use

Under the methodology proposed by ESD, the industry-wise consumption of coal and electricity, available at the level of 2-digit NIC in the ASI report (Table 6(a)), is aggregated as per the end-use sectors recommended by IEA/UNSD, for each of the last five financial years prior to the year for which the disaggregation is desired. Based on this, the sub-sectoral shares of coal and electricity

consumption are calculated for all five years and averaged to smoothen out yearly variations. These average shares are then applied to the total non-power sector coal consumed for the year under consideration as reported by MoC and the industrial power consumption as reported by CEA to arrive at industry-wise estimated consumption of coal and electricity respectively.

2 Comments on the methodology to use ASI data

Following are comments based on reviewing the methodology adopted to disaggregate sectoral end-use consumption of coal and electricity using the ASI data.

2.1 Classification of industries to represent important energy consumers

ASI is the principal source of annual industrial statistics in the country, hence is a good source to disaggregate industrial demand into component industry types. The ASI employs two methods to survey registered industrial units: census and sampling. The census covers all registered units that employ 100 employees or more as well as those belonging to strata (District x 4-digit NIC) having 4 units or lesser. A fraction (say, 20%) of the remaining units are sampled within each stratum (District x 4-digit NIC).

In the proposed methodology, energy consumption is mapped to industrial sub-sectors as per UNSD ISIC using the 2-digit NIC code. This level is likely not sufficient since multiple industry types that are large energy consumers could fall under the same 2-digit NIC code. Instead, it is better to extract the ASI data based on the 6-digit NIC code and then aggregate as needed to map to categories in the other energy statistics publications.

An example of why using 2-digit NIC code is an issue can be seen when considering the manufacture of basic metals (2-digit NIC code 24). This category comprises data about the production of steel and aluminium, both of which are energy intensive and hence need to be tracked separately. The relevant categories are manufacture of basic iron and steel (NIC code 241), manufacture of alumina, aluminium and aluminium products (NIC code 242002-242005), casting of iron and steel (2431), casting of aluminium (243202). At the least, the 3-digit NIC code of 242 should be used to distinguish iron and steel from non-ferrous metals. The Coal Directory reports offtake of coal for production of sponge iron (i.e., DRI), steel, and other basic metals (which includes aluminium) separately, and it may be useful to retain this distinction. Likewise, aluminium production involves consumption of large amounts of electricity for the electrolysis process and the specific energy consumption of electricity (per tonne of product) in aluminium production is about 13 times that of iron and steel production. Thus, while the quantity of steel produced in India is roughly 25 times that of aluminium, steel production requires less than double the quantum of electricity consumed in aluminium production.

This distinction is shown taking the example iron & steel and other basic metals for 2023-24 in Section 2.6.

2.2 Consumption by coal type

Imported coking coal is primarily used for iron and steel production, and consumption of domestic coking coal is largely categorised by end use in the Coal Directory (Table 4.23) with only about 5% attributed to the ‘Other’ category. In contrast, the ‘Other’ category constitutes over two-thirds of the non-power consumption of non-coking coal (Table 4.24), and there is no official source for end use of imported non-coking coal for purposes other than the power sector. Thus, the primary uncertainty in coal consumption is with respect to non-coking coal, and the methodology for disaggregating industrial end-use applies only to non-coking coal.

It appears that ASI does not collect data on consumption of coking coal, non-coking coal and lignite separately, and all of the coal consumed is classified under one item code (9990700). If this is true, the sub-sectoral shares calculated include coking coal consumption as well, which is primarily used during iron making processes. In addition, the sub-sectoral shares are applied on offtake of total raw coal, combining both coking and non-coking coal. This leads to some inaccuracy. Despite this inaccuracy, arising from the fact that it is not possible to distinguish between consumption of coking and other coal in the ASI data, it is still more accurate to apply the sub-sectoral coal consumption shares from ASI to the non-coking coal dispatched to non-power sectors. This is demonstrated with the example of 2023-24 in Section 2.6.

In the future, it would be beneficial for ASI to collect data on coking, non-coking coal and lignite separately since their uses and energy content are different. It is also preferable to adopt the energy product classification as per the Standard International Energy Product Classification (SIEC) recommended by the UN Statistics Division, which distinguishes coking coal (code: 0121) and lignite (code: 0220) from other coal.

2.3 Treatment of coal used for captive generation of electricity

It is assumed that the electricity consumption derived from the ASI report includes electricity generated and consumed on-site as well as that purchased over the grid from the utility and other sources, since these are tracked separately in the ASI questionnaire. However, it is not clear whether any electricity generated from co-gen (i.e., simultaneous process heat and electricity generation) and waste heat recovery (WHR) is tracked separately in the ASI.

Ideally, captive generation should be accounted for separately, with the input fuels accounted towards power generation and consumption of the output electricity accounted towards the industry sub-sector. Likewise, co-generation and WHR should be treated as part of the production process, i.e., consumption of the input fuels should be accounted towards the industry sub-sector and the electricity produced should not be accounted as an input to the industry.

2.4 Energy use in unincorporated enterprises, households and commercial establishments

The ASI survey only covers registered industrial units. However, some coal is used in the unregistered industrial, residential and commercial units as well. This coal use is spread across the different industrial sub-sectors under this methodology, and hence leads to some inaccuracy.

In this regard, three related surveys are conducted by MoSPI (NSSO) which could be used to estimate coal use outside the power and formal industry units:

- Household Consumption Expenditure Survey (HCES) collects data on use of energy commodities in households
- Annual Survey on Unincorporated Sector Enterprises (ASUSE) collects data on unincorporated enterprises
- Annual Survey on Service Sector Enterprises (ASSSE) recently commenced with a pilot survey; details are awaited

2.5 Recommended methodology when using ASI data for disaggregating sub-sectoral end-use of coal and electricity in industry

We recommend two changes to the proposed methodology that can be implemented immediately with existing data:

- Distinguish energy consumption between iron & steel and non-ferrous metals. This applies to both coal and electricity.

- Apply the sub-sectoral shares based on ASI data on non-coking coal only, since there is much greater certainty that imported coking coal is consumed in iron-making. This recommendation applies only to coal.

Table 1 shows the energy consumption estimates resulting from implementing these recommendations for the year 2023-24:

Table 1: Industrial sector-wise estimated coal consumption (in MT) in 2023-24

2023-24 Coal End-use (MT)	Proposed methodology		Revised methodology		Recommended methodology		
Sectors as per UNSD/IEA	Shares	Raw coal	Shares	Raw coal	Non-coking	Coking	Total
Agriculture/forestry	0.00%	0.01	0.00%	0.01	0.00		0.00
Iron and Steel	50.74%	158.63	25.55%	79.87	59.62	69.49	129.11
Non-ferrous metals			25.20%	78.77	58.80		58.80
Chemical and Petrochemicals	10.70%	33.46	10.70%	33.46	24.98	0.469	25.45
Non-metallic minerals	23.17%	72.43	23.17%	72.43	54.07	0.072	54.14
Transport equipment	0.03%	0.08	0.03%	0.08	0.06		0.06
Machinery	0.22%	0.68	0.22%	0.68	0.50		0.50
Mining and Quarrying	0.03%	0.10	0.03%	0.10	0.07		0.07
Food, beverages and tobacco	3.46%	10.82	3.46%	10.82	8.08		8.08
Paper, pulp and print	4.73%	14.78	4.73%	14.78	11.03		11.03
Wood and wood products	0.06%	0.19	0.06%	0.19	0.14		0.14
Textiles and leather	6.18%	19.31	6.18%	19.31	14.41		14.41
Non-specified industry	0.69%	2.15	0.69%	2.15	1.61		1.61
Total	100%	312.63	100%	312.63	233.38	70.03	303.41

- The “Raw coal” column under “Proposed methodology” shows the estimated consumption of raw coal under the methodology proposed by ESD.
- The “Raw coal” column under “Revised methodology” shows raw coal consumption estimates after implementing the first recommendation to distinguish between iron & steel and non-ferrous metals based on shares provided by ESD. As can be seen, raw coal used in production of non-ferrous metals is significant. However, the raw coal quantity of 78.77 MT attributed to non-ferrous metal production seems too high given the quantity of non-ferrous metals produced in the country. It should be checked if the coal used for captive generation of electricity is being counted towards end-use as indicated in Section 2.3. It is also noticed that coal consumption shares of iron & steel and non-ferrous metals vary significantly over the years. It needs to be confirmed that there are no quality issues with the survey.
- The columns under “Recommended methodology” show the coking and non-coking consumption estimates after incorporating the second recommendation to apply the sub-sectoral shares from ASI to non-coking coal only. The sub-sectoral shares are applied on the 233.38 MT of non-coking coal as opposed to the entire 312.63 MT of raw coal in the original proposed methodology. This results in significantly different estimates.

The total coal consumption under “Recommended methodology” is lower than that under the “Proposed methodology” (303.41 vs 312.63 MT) since the sector-wise offtake of coking and non-coking coal (Tables 4.23 and 4.24 of the Coal Directory) includes coal beneficiation which results in

slightly lower coal quantity (with higher energy content). Table 2 shows the relevant numbers from Coal Directory of India 2023-24.

Table 2: Split of coking and non-coking coal (in MT) outside power sector in 2023-24 as per Coal Directory

2023-24 Coal Offtake	Domestic coal		Imported coal		Total coal
	Coking	Non-coking	Coking	Non-coking	Non-coking
Total	62.32	901.53	58.81	205.72	
Power	51.11	808.14	0	65.73	
Non-power	11.22	93.39	58.81	139.99	233.38

The first recommendation above can be implemented for determining the shares within industry of electricity consumption in iron & steel and non-ferrous metal production. This is expected to result in a significant share of electricity being attributed to non-ferrous metals due to the high consumption of electricity in aluminium production.

2.6 Comparison of coal and electricity use between ASI and other official statistics

Table 3 has coal offtake/consumption as reported in Coal Directory and the ASI report

Table 3: Coal offtake/consumption (in MT) in non-power sectors

Source →	Coal Directory			CEA	Calculated	ASI
Year	Domestic coal offtake by non-power	Imported coking Coal	Imported non-coking coal	Imported coal to power sector	Total coal to non-power sector	Coal use in Industry
2018-19	88.59	51.84	183.51	61.66	262.28	152.00
2019-20	81.24	51.83	196.70	69.22	260.56	123.42
2020-21	97.80	51.20	164.05	45.48	267.57	102.76
2021-22	109.36	57.12	151.50	27.00	290.98	147.49
2022-23	92.15	56.05	181.62	55.64	274.19	179.18
2023-24	113.83	58.81	205.72	65.73	312.63	156.69

Table 4 has industrial electricity consumption as reported in CEA General Review and the ASI report

Table 4: Electricity consumption (in TWh) in industry

Source →	CEA General Review			ASI
Year	Utility	Captive	Total	
2018-19	346.7	172.5	519.2	274.1
2019-20	337.1	195.7	532.8	275.1
2020-21	320.2	188.6	508.8	261.1
2021-22	381.2	175.3	556.5	311.7
2022-23	417.7	176.2	593.9	360.8
2023-24	450.1	190.5	640.6	375.5

For both coal and electricity, consumption estimated in the ASI survey is roughly half that reported by other official statistics. Given that all registered units are covered either through census or sample survey (with appropriate weights), this could either be due to sampling errors or data collection issues, since the magnitude of difference cannot be explained merely by consumption from units outside the scope of ASI.

3 Use of PAT data to disaggregate the coal and electricity use in industry

The PAT scheme covers designated consumers characterised by high energy intensity. Since the data is collected for compliance purposes and to issue energy savings certificates, it is expected to be more accurate than the ASI data. Thus, PAT data could be used to estimate the energy consumption from larger units, while ASI data can be used to estimate the consumption from the rest of the industries.

BEE provided PAT data for three years - 2021-22, 2022-23 and 2024-25. Data for 2023-24 has not been provided. Note that the latest year for which ASI, Coal Directory and CEA General Review data are available is 2023-24. Data was provided for 2021-22/2022-23 and 2024-25 in different formats.

3.1 PAT data for 2021-22 and 2022-23

- The data has been provided for the following sectors: Aluminium, Cement, Chlor-Alkali, Fertilizer, Iron and Steel, Pulp & Paper and Thermal Power Plants.
- However, coal consumption data is reported by source (domestic or imported) but not by coal type (non-coking or coking).
- Electricity consumption data has not been provided.

Table 5 summarises the relevant PAT data for 2021-22 and 2022-23:

Table 5: Coal consumption (in MT) in PAT designated industries in 2021-22 and 2022-23

Year	Source	End-use	Aluminium	Cement	Chlor-Alkali	Fertilizer	Iron and Steel	Pulp and Paper	Total
2021-22	**Number of units**		**14**	**20**	**29**	**38**	**119**	**16**	**236**
2021-22	Indian	CPP	42.37	0.40	0.56	0.00	2.05	0.00	45.38
2021-22	Indian	Co-gen	1.86	0.00	1.02	0.43	0.00	1.51	4.82
2021-22	Indian	Process	2.23	0.70	0.05	0.27	6.37	0.10	9.73
2021-22	**Indian**	**Total**	**46.47**	**1.10**	**1.64**	**0.69**	**8.42**	**1.61**	**59.93**
2021-22	Import	CPP	0.32	0.42	1.25	0.00	0.59	0.00	2.58
2021-22	Import	Co-gen	0.01	0.00	3.13	0.02	0.00	0.29	3.45
2021-22	Import	Process	0.02	1.03	0.02	0.32	4.03	0.04	5.46
2021-22	**Import**	**Total**	**0.35**	**1.45**	**4.40**	**0.34**	**4.62**	**0.32**	**11.49**
2021-22	**Number of units**		**14**	**20**	**29**	**38**	**119**	**16**	**236**
2022-23	Indian	CPP	31.26	0.50	0.54	0.00	0.00	0.00	32.30
2022-23	Indian	Co-gen	2.14	0.00	0.74	0.27	0.00	2.29	5.44
2022-23	Indian	Process	2.04	0.82	0.06	0.73	0.00	0.20	3.84
2022-23	**Indian**	**Total**	**35.44**	**1.32**	**1.34**	**1.00**	**0.00**	**2.49**	**41.58**
2022-23	Import	CPP	0.66	0.17	1.34	0.00	0.40	0.00	2.56
2022-23	Import	Co-gen	0.09	0.00	3.57	0.05	0.00	0.56	4.27
2022-23	Import	Process	0.17	1.15	0.02	0.41	4.53	0.06	6.34
2022-23	**Import**	**Total**	**0.91**	**1.32**	**4.93**	**0.45**	**4.93**	**0.63**	**13.17**

The total coal consumption reported in the provided data is 71.42 MT in 2021-22 and 54.75 MT in 2022-23. A good portion of this consumption is for captive power generation which is outside the scope of this exercise. If captive power generation is excluded, the coal consumption reported is 21.46 MT in 2021-22 and 19.89 MT in 2022-23. Given this, no further analysis was done with this data.

3.2 PAT data for 2024-25

- In 2024-25, data for Integrated Steel Plants (ISPs), Petrochemicals, Textiles, and Refineries are included. However, Pulp & Paper and Thermal Power Plants are missing in the data.
- More detailed data has been provided for this year:
  - Fuel consumption is reported by specific technologies/products within many industries, such as for iron & steel, cement and chlor alkali, petrochemicals
  - Fuels consumed are classified into finer categories, e.g., coal consumption is disaggregated where applicable into coking, non-coking, lignite, met coke and other coal types
  - Energy content of different fuels is also reported
  - All of the above data helps in arriving at a more accurate energy balance.
- There are some gaps in the data. For Aluminium, total solid fuel consumption in energy terms (not physical quantities) has been reported, and not disaggregated into coal types, biomass etc. For ISPs, non-coking coal is combined with pet coke. Electricity consumption data is not provided for Petrochemicals. These data gaps should be easy to fill since BEE is likely to have the necessary data.

Table 6 summarises the relevant PAT data for 2024-25.

Table 6: Coal (in MT) and electricity (in TWh) consumed by PAT designated industries in 2024-25

2024-25 PAT data	Number of units covered under PAT	Thermal coal consumed for process (MT)	Thermal coal consumed for WHR and Cogen (MT)	Share of thermal coal consumed (%)	Electricity consumed for process (TWh)	Share of electricity consumed (%)
Aluminium	14	22.39	0.00	36%	67.12	45%
Cement	49	5.65	0.00	9%	10.95	7%
Chlor-Alkali	24	0.10	4.47	7%	11.20	7%
Fertilizer	32	0.70	0.26	2%	6.05	4%
Iron and Steel	58	23.11	0.13	37%	49.48	33%
Petrochem		4.06	0.00	6%		0%
Textiles	83	0.63	1.11	3%	5.31	4%
Total	260	56.64	5.98		150.11	

The 2024-25 data covers over 260 units, about 20% of a total of over 1300 designated consumers (DCs). These 260 units account for thermal (non-coking, lignite etc) coal consumption of 62.62 MT for process heat, WHR and co-generation. This is roughly 20% of the thermal coal consumed in the country outside the power sector. This data also accounts for electricity consumption of over 150 TWh, which is also between 20-25% of the total industrial consumption in the country. However, the shares for both thermal coal and electricity consumption are skewed towards the Iron and Steel and Aluminium sectors. Perhaps more accurate shares could be arrived at with better coverage of the designated consumers. One particular benefit of using PAT data is that it consists of data on energy content of fuels that can be used to arrive at a more accurate energy balance. The exact methodology can be arrived at when such comprehensive PAT data is available.

4 Conclusion

It is desirable to disaggregate coal and electricity consumption in industry into the constituent industry types as per the UNSD industry classification. However, India's official energy statistics do not follow a common standard industry classification. Hence, data from the Annual Survey of Industries and Perform Achieve Trade scheme have been evaluated, and both have some lacunae mainly with respect to the coverage achieved. With ASI, there is some missing information too, such as the split between consumption of coking and non-coking coal. With PAT, more granular data is available with respect to different types of fuel and their energy content.

Nevertheless, until more comprehensive PAT data is available, the methodology proposed by ESD could be used with the couple of modifications suggested in Section 2.5 of this note.

Report on Methodology

On

"Inclusion of Biofuel in the annual publication 'Energy Statistics' of MoSPI"

Submitted to Expert Committee on Energy Statistics

Prepared by MNRE and TERI

Table of Contents

Background

Apart from the conventional commercial fuels, several other energy forms are used across sectors, but they are not included and accounted for in India's energy balance. These include biomass and biofuels, comprising solid biomass/biofuels, biogases, liquid biofuels and municipal solid waste. These fuels are used across multiple end-use sectors, including households, industry, electricity generation, and transport, and play a significant role in meeting India's energy requirements. Their contribution to the overall energy mix is substantial and is in fact reflected in energy balances and statistics published by international organisations, underscoring the importance of systematically accounting for bioenergy in national energy statistics.

In India, comprehensive and directly observed data on biomass and biofuel consumption are not available for most bioenergy streams. Data related to bioenergy is scattered across administrative records, programme-level reports, and household surveys, many of which are not designed for energy accounting or for use in a national energy balance. In several cases, data are available only for selected activities or outputs, while direct consumption data are not reported at all. Consequently, the contribution of biomass and biofuels cannot be captured through simple compilation of existing datasets and requires the use of estimation approaches based on indirect indicators, survey data, and back-calculation methods.

This lack of consolidated and consistent treatment poses challenges for accurately representing India's energy structure and for ensuring comparability of national energy statistics with international frameworks such as the International Recommendations for Energy Statistics (IRES) and the Standard International Energy Product Classification (SIEC). In the absence of harmonised reporting, biomass and biofuels—despite their significance—remain underrepresented in transformation and final consumption accounts.

Recognising these issues, the Expert Committee on Energy Statistics identified the need to develop systematic methodologies for incorporating biofuels into India's energy statistics. Accordingly, under Agenda Item II (e): "Incorporating the component of Bio-fuel", the Committee recommended a focused technical exercise in consultation with key stakeholder institutions. As part of the follow-up actions to the Committee's deliberations, a dedicated technical consultation was undertaken to examine data availability, potential sources, and feasible estimation approaches for bioenergy streams across end-use sectors. The methodological approaches presented in this report are the outcome of this exercise and are consistent with national practices and international energy accounting frameworks such as the International Recommendations for Energy Statistics (IRES) and the Standard International Energy Product Classification (SIEC).

Disclaimer: It is noted that the methodologies proposed aim to capture the major components of biomass/biofuels consumption in India. However, due to limitations in data availability and reporting, certain smaller or more dispersed uses of biomass and biofuels may still remain unaccounted for. These gaps are acknowledged, and the coverage may be further refined in future iterations of the energy balance, subject to improvements in data availability and reporting.

The officials and experts associated with this technical exercise are listed below:

Sl. No.	Name	Organization	Designation
1.	Smt. Mini Prasannakumar	Ministry of New and Renewable Energy (MNRE)	DDG
2.	Dr. Gaurav Mishra	Ministry of New and Renewable Energy (MNRE)	Scientist 'F'
3.	Dr. Ritu Mathur	The Energy and Resources Institute (TERI)	Director
4.	Shri Pratham Saraf	The Energy and Resources Institute (TERI)	Project Associate

Methodologies

Solid biofuels

Firewood

Households Consumption

Data Source:

Household Consumption Expenditure Survey (HCES), MoSPI: Block 8.1 of HCES pertains to Consumption of energy (fuel & light) during the last 30 days. Consumption, both in quantity (kg) and value (Rs), is reported for firewood and chips (Item Code 331).

The net calorific value of firewood has been taken from World Bank-ESMAP sources.

All India estimation procedure:

Per capita monthly consumption of firewood is multiplied by the projected population for the respective year, as taken from the *Report of the Technical Group on Population Projections (2011–2036)* of the Ministry of Health and Family Welfare, and by a factor of 12 to obtain the annual total consumption in quantity and value terms.

Conversion to Energy term in ktoe:

Data for 2022-23 and 2023-24.

Firewood	**2022-23**	**2023-24**
Quantity (Thousand Metric Ton)	169963.0	156224.0
NCV (kcal/kg)	3728.5	3728.5
Energy (ktoe)	63328.1	58208.9

Treatment in Energy balance:

Total household firewood consumption may be included under the Residential sector in the final consumption part of the energy balance.

Consumption by Unincorporated sector

Data Source:

Annual Survey of Unincorporated Sector Enterprises (ASUSE), MoSPI - In ASUSE survey, product Code '052' represents 'firewood'. Consumption of firewood from Block 3.1 to Block 3.14 of ASUSE may be

calculated at NIC level and may be clubbed at appropriate Industry level. **Only Value of consumption of Firewood is available in ASUSUE.**

Consumption by Organized sector

Data Source:

Annual Survey of Industries (ASI), MoSPI - Block H: Indigenous input items consumed may be used for extraction of data on Firewood consumption as fuel. As per ASI instruction manual, item No 20, NPCMS code – 9920400 of Block H include "*other fuel consumed like firewood consumed as fuel*"**.** From item No. 15 to item No. 19 of Block H covers almost all fuel items used by Industry such as electricity, petrol, diesel, oil, lubricants, coal (includes charcoal also) and gas. Therefore, it may be assumed that NPCMS Code-9920400 covers mostly 'firewood used as fuel'.

In view of the above, we may take the value against NPCMS- 9920400 as the firewood consumed by Industries as fuel. Firewood consumption may be estimated for the NPCMS Code of 9920400 at NIC level and may be clubbed at appropriate Industry level. Only Value of consumption of Firewood is available in ASI**.**

The net calorific value of firewood has been taken from World Bank-ESMAP sources.

Calculation of Quantity of Firewood consumed reported under ASI and ASUSE:

Quantity = Value / Unit Price

For calculating unit price two options are there.

Option 1. Price Statistics division is capturing price/Kg of firewood on regular basis. Annual average price per Kg of firewood may be used for estimating the quantity from value of consumption of firewood from ASUSUE and ASI.

Option 2: Following data are available in HCES and may be utilized for calculation of unit price from value and quantity of Non Home produce firewood

Home produce consumption		Total consumption	
Quantity	Value	Quantity	Value

Unit price of Non- Home produce firewood = (Value $_{\text{Total Consumption}}$ - Value $_{\text{Home produce Consumption}}$)/ (Quantity $_{\text{Total Consumption}}$ - Quantity $_{\text{Home produce Consumption}}$)

Purchase value of non- Home produce Firewood as per HCES 2022-23 and 2023-24 are as follows:

Year	Price /Kg of Non Home produce (Rs.)
2022-23	4.76
2023-24	4.86

Conversion to Energy Terms:

Year	Quantity (in Thousand Metric Ton)			NCV (kcal/kg)	Energy (ktoe)
	ASI	ASUSE	Total		
2022-23	89327	10380	99706	3728.5	37150
2023-24	80960	17326	98286	3728.5	36621

Sector-wise Consumption of Firewood

Categories in Energy consumers	2022-23				2023-24			
	Quantity (Thousand Metric ton)			Ktoe	Quantity (Thousand Metric ton)			Ktoe
	ASI	ASUSE	Total		ASI	ASUSE	Total	
Manufacturing construction and non-fuel mining industries	**77730**	**5684**	**83413**	**31080**	**72733**	**7054**	**79787**	**29729**
Iron and steel	10215	0	10215	**3806**	6830	2	6831	**2545**
Chemical and petrochemical	21050	36	21086	**7857**	19475	152	19627	**7313**
Non-ferrous metals	5461	0	5461	**2035**	3416	1	3417	**1273**
Non-metallic minerals	12864	3817	16681	**6215**	13148	3490	16638	**6199**
Transport equipment	491	1	492	**183**	609	1	610	**227**
Machinery	1164	29	1193	**444**	1476	50	1526	**568**
Mining and quarrying	1	0	1	**0**	2	0	2	**1**
Food and tobacco	13725	673	14398	**5365**	14885	306	15190	**5660**
Paper, pulp and print	5271	0	5271	**1964**	5252	21	5273	**1965**
Wood and wood products (other than pulp and paper)	319	472	791	**295**	336	1887	2223	**828**
Textile and leather	5432	6	5439	**2026**	5767	130	5896	**2197**
Industries not elsewhere specified	1737	649	2386	**889**	1538	1017	2555	**952**
Household*			**169963**	**63328**			**156224**	**58209**
Commerce and public services	**414**	**4295**	**4709**	**1755**	**436**	**10140**	**10577**	**3941**
Agriculture, forestry	**26**	**0**	**26**	**10**	**39**	**0**	**39**	**15**
Other non-specified sectors	**11157**	**401**	**11558**	**4306**	**7751**	**132**	**7883**	**2937**
Grand Total	**89327**	**10380**	**269669**	**100479**	**80960**	**17326**	**254510**	**94830**

*** HCES, MoSPI**

Note: In this analysis, industrial firewood consumption has been estimated using data from the Annual Survey of Unincorporated Sector Enterprises (ASUSE) and the Annual Survey of Industries (ASI). Within ASI, firewood consumption has been identified from Block H (Indigenous input items consumed), specifically Item No. 20 under NPCMS Code 9920400, which is described as "other fuels consumed", including firewood used as fuel, as per the ASI instruction manual. However, there is no explicit distinction as to whether this category also includes other forms of biomass, such as agro-residues.

Treatment in Energy balance:

Total firewood consumption estimated from ASI and ASUSE may be included under the Industry sector and Commercial and public services sector, respectively, in the final consumption part of the energy balance.

Bagasse

Consumption in Sugar Mills for Electricity Generation

Data Source:

- **For Installed Capacity of Bagasse based Co-generation plants- MNRE:** The "Year-wise Achievements" section on the MNRE website provides cumulative year-wise installed capacity for various renewable energy sources, including bagasse-based cogeneration.

- **SFC, SHR and GCV - CERC and SERC tariff orders:** The SFC is calculated from the Station Heat Rate (SHR) and Gross Calorific Value (GCV) specified in "Draft Central Electricity Regulatory Commission (Terms and Conditions for Tariff Determination from Renewable Energy Sources) Regulations, 2024" and "State Electricity Regulatory Commission (SERC) tariff orders" for various states, including the Tamil Nadu ERC order which also provides comparable values from other states. In the CERC Regulations (February 2024), GCV and SHR (for the power generation component alone) values are provided on Page 24, while the TNERC tariff order (2023) provides SHR (Page 33) and GCV (Page 35).

- **Plant Load Factor (PLF):** The Plant Load Factor (PLF) for bagasse-based cogeneration plants is taken from tariff orders issued by various State Electricity Regulatory Commissions (SERCs)**.** These tariff orders specify state-wise PLF norms, which typically lie in the range of 50–60 percent.

- The NCV of bagasse has been taken as 1,960 kcal/kg, consistent with values reported in World Bank–ESMAP studies and also aligned with GCV values used in CERC and SERC tariff orders.

All India estimation procedure:

Estimation of Electricity Generation from Bagasse-Based Cogeneration Plants:

The total electricity generation from bagasse-based cogeneration plants is estimated using the installed capacity and assumed operational characteristics of sugar mills.

For all-India estimation, a uniform operating period of 210 days and an average PLF of 53 percent are assumed, based on a review of state-wise norms specified in SERC tariff orders.

Electricity generation is calculated as:

Electricity Generation (GWh) = (Installed Capacity (MW) × 210 days × Plant Load Factor (PLF) × 24) / 1000

Where:

- Installed capacity refers to the total capacity of bagasse-based cogeneration plants operating in sugar mills.
- Plant Load Factor (PLF) reflects the extent to which installed cogeneration capacity is actually utilised, accounting for partial load operation, seasonal availability of bagasse, and planned or unplanned downtime.
- Operating days represent the average number of days during which sugar mills operate in a year.

This provides the total electricity generated from bagasse-based cogeneration plants, including electricity used internally in sugar mills as well as electricity exported to the grid.

Estimation of Specific Fuel Consumption (SFC)

To estimate the amount of bagasse used for power generation, we use the Specific Fuel Consumption (SFC) of bagasse co-generation plants.

The SFC is obtained from the Station Heat Rate (SHR) and Gross Calorific Value (GCV). Using these values:

SFC (kg/kWh) = SHR (kcal/kWh)/GCV (kcal/kg)

This SFC represents the quantity of bagasse required to generate 1 unit of electricity.

The electricity generated from bagasse based cogeneration plants, is converted to Kwh, and multiplied by the SFC to obtain the total bagasse (in Kg) consumed in cogeneration for generating electricity:

Quantity of Bagasse used for electricity generation (kg) = Electricity generated from Bagasse based cogeneration (kWh) * SFC (kg/kWh)

This gives the total bagasse consumed by cogeneration units in sugar mills for generating electricity.

Conversion to Energy term in ktoe:

Year	Installed Capacity of Bagasse Cogeneration (MW)	Operating Days	PLF	Total Electricity Generation (GWh)	SFC (Kg/Kwh)	Bagasse used for electricity generation in cogeneration plants(MMT)	NCV (kcal/kg)	Energy from bagasse used for electricity generation in cogeneration plants (ktoe)
2022-23	9433.6	210	0.53	25199	1.6	40.3	1960	7896
2023-24	9433.6	210	0.53	25199	1.6	40.3	1960	7896

Note: The SFC has been calculated using the formula given above, based on the Station Heat Rate (SHR) and Gross Calorific Value (GCV).

Treatment in Energy balance:

In a national energy balance (MOSPI / IRES-compliant), bagasse used for electricity generation from cogeneration plants may be treated as an input to Auto-producer CHP plants in the Transformation section.

Consumption in sugar-mills for process heat (non-electricity use)

Data Source:

The total sugarcane production is taken from the Ministry of Agriculture and Farmers' Welfare (Department of Agriculture & Farmers Welfare, DA&FW). The quantity of sugarcane crushed in sugar mills is taken from ChiniMandi, which provide state-wise cane-crushing data.

Bagasse recovery factor: A recovery factor of 0.3 has been used to estimate bagasse production from sugarcane crushed, consistent with values reported in national and international studies, including assessments by NITI Aayog and FAO.

Use of bagasse as fuel: It is assumed that around 90 percent of bagasse is used as fuel, mainly for power generation and process heat in sugar mills, as reported in FAO literature (Rangnekar, *Integration of Sugarcane and Milk Production in Western India*).

The NCV of bagasse has been taken as 1,960 kcal/kg, consistent with values reported in World Bank–ESMAP studies and also aligned with GCV values used in CERC and SERC tariff orders.

Estimation Procedure:

The quantity of bagasse produced in sugar mills is estimated by applying a bagasse recovery factor of 30% to the total sugarcane crushed.

Bagasse Produced (MMT) = Cane Crushed (MMT) * 0.3

From the total estimated bagasse production, it is assumed that 10 percent of bagasse is diverted to non-energy uses, such as paper and board manufacturing, packaging materials, composting, and other material applications, indicating that around 90 percent of bagasse is typically used as fuel. Accordingly, 90 percent of the total estimated bagasse is treated as bagasse available for energy use.

From this energy-use bagasse, the quantity of bagasse used for electricity generation in bagasse-based cogeneration plants (as estimated in the previous section) is subtracted. The remaining bagasse is treated as the quantity used in sugar mills for process heat and other non-electricity purposes, including steam generation for juice heating, evaporation, crystallisation, and other thermal processes within the mill.

The estimation can be expressed as:

Bagasse (energy) =0.9 × Total Bagasse

Bagasse (process heat) =Bagasse (energy) – Bagasse (electricity)

Conversion to Energy term in ktoe:

Year	Sugar-cane Production (MMT)	Cane Crushed (MMT)	Bagasse Recovery Factor	Estimated Bagasse Production (MMT)	Bagasse used for heat generation in sugar mills (MMT)	NCV (kcal/kg)	Energy from bagasse used for heat generation (ktoe)
2022-23	491	339	0.3	102	51	1960	10054
2023-24	453	318	0.3	95	46	1960	8917

Treatment in Energy balance:

Bagasse used for process heat in sugar mills may be treated as thermal energy consumption of the sugar industry and may be accounted for as the energy consumption under the industry sector.

Biomass Pellets

Consumption in Thermal Power Plants

Data Sources:

Year-wise biomass pellet consumption by thermal power plants is taken from the SAMARTH (Sustainable Agrarian Mission on Use of Agro Residue in Thermal Power Plants) portal, which reports cumulative pellet usage under National Mission on use of Biomass in Thermal Power plants.

Conversion to Energy terms in ktoe:

Year	Biomass Pellets (MT-metric tonne)	NCV (kcal/kg)	Energy value(ktoe)
2022-23	50,092.0	3150.0	15.8
2023-24	3,74,858.0	3150.0	118.0

Note: The GCV used in this analysis is the midpoint of the calorific value range (3000–4000 kcal/kg) provided in the SAMARTH FAQ section. For conversion of GCV to NCV, a factor of 0.9 is used.

Treatment in Energy balance:

Biomass pellets co-fired in thermal power plants may be recorded under the Transformation – Electricity Plants section as a fuel input to electricity generation. The energy generated from pellet is shown as a negative entry in Transformation, and the resulting electricity generated (already included) is recorded as a positive output under electricity production.

Biomass-based power plant fuel input

Consumption of Biomass in Biomass based Power-plants

Data Sources:

Electricity generation from biomass-based power plants is taken from Monthly *Renewable Energy Generation Report, published by CEA.* It provides the annual electricity generation (in Billion Units) under the Bio-power category, where electricity generation from Biomass (non-bagasse) based power-plants is separately reported.

The Specific Fuel Consumption (SFC) used to estimate biomass quantity is derived from the Station Heat Rate (SHR) and Gross Calorific Value (GCV) specified in the Draft Central Electricity Regulatory Commission (Terms and Conditions for Tariff Determination from Renewable Energy Sources) Regulations, 2024 – *Page 22*.

All India estimation procedure:

To estimate the amount of biomass used for power generation in biomass-based power plants, we use the Specific Fuel Consumption (SFC) of Biomass based Power projects.

The SFC is obtained from the Station Heat Rate (SHR) and Gross Calorific Value (GCV). Using these values:

SFC (kg/kWh) = SHR (kcal/kWh)/GCV (kcal/kg)

This SFC represents the quantity of Biomass required to generate 1 unit of electricity.

The electricity generated from biomass in Biomass based power-plants, is converted to kWh, and multiplied by the SFC to obtain the total biomass (in kg) consumed for electricity generation in these plants:

Quantity of biomass used for electricity generation (kg) = Electricity generated from Biomass based power-plants (kWh) * SFC (kg/kWh)

This gives the total biomass burned in biomass based electricity plants.

Conversion to Energy terms in ktoe:

Year	Biomass (BU)	SFC (kg/kWh)	Quantity of Biomass used in Biomass based Power Plants (MMT)	NCV (kcal/kg)	Energy from biomass used in Biomass based electricity plants(ktoe)
2022-23	3.16	1.35	4.28	2790	1194
2023-24	3.42	1.35	4.63	2790	1292

Note: The GCV value represents a normative average for biomass fuels as specified in CERC regulations and is used uniformly due to lack of fuel-wise calorific value data. For conversion of GCV to NCV, a factor of 0.9 is used.

Treatment in Energy Balance:

Biomass used for electricity generation in biomass-based power plants may be recorded under the Transformation – Electricity Plants section as a fuel input to electricity generation. The energy input from biomass is shown as a negative entry in the Transformation section, while the corresponding energy from electricity generation (already accounted for) is recorded as a positive output under electricity column.

Municipal Solid Waste

Consumption in Waste-to-Energy Plants

Data Sources:

The electricity generated from Waste to Energy plants is taken from Monthly *Renewable Energy Generation Report, published by CEA*. It provides the annual electricity generation (in

Billion Units) where electricity generation from Waste-to-Energy plants is separately reported under "others".

GCV (Gross Calorific Value) and SHR (Station Heat Rate): *"Norms for determination of generic tariff for Municipal Solid Waste/Waste to Energy projects and indicative tariff for 2015–16" – Page 8 and 9*, issued by CERC. These norms provide the calorific value range for MSW/RDF and the SHR used for tariff determination.

Estimation Procedure:

To estimate the amount of MSW/RDF used for power generation in Waste-to-Energy plants, the Specific Fuel Consumption (SFC) applicable to MSW/RDF-based WtE projects is used. The SFC is obtained from the Station Heat Rate (SHR) and Gross Calorific Value (GCV). Using these values:

SFC (kg/kWh) = SHR (kcal/kWh)/GCV (kcal/kg)

This SFC represents the quantity of MSW/RDF required to generate 1 unit of electricity.

The electricity generated from MSW in Waste to Energy plants, reported by MNRE (in BU), is converted to kWh, and multiplied by the SFC to obtain the total MSW/RDF (in kg) consumed for electricity generation in these plants:

MSW consumed for electricity generation (kg) = Electricity generated from Waste to Energy plants (kWh) * SFC (kg/kWh)

This provides the total MSW burned in Waste to Energy plants.

Conversion to Energy terms (ktoe):

Year	Waste to Energy generation (BU)	SFC (kg/kWh)	Quantity of Waste used for W2E generation (MMT)	NCV (kcal/kg)	Energy from Waste (ktoe)
2022-23	2.53	1.86	4.72	2025.00	955.70
2023-24	2.75	1.86	5.13	2025.00	1038.80

Note: For the above analysis, the calorific value of Refuse Derived Fuel (RDF), as specified in CERC tariff norms, has been used for the estimation of Specific Fuel Consumption (SFC) as well as for conversion of fuel quantities into energy terms. For conversion of GCV to NCV, a factor of 0.9 is used.

Treatment in Energy Balance:

MSW/RDF inputs to electricity-producing WtE plants may be recorded under the Transformation – Electricity Plants section as a fuel input to electricity generation. The energy input from MSW/RDF is shown as a negative entry in the Transformation section, while the corresponding energy from electricity generation (already accounted for) is recorded as a positive output under electricity column.

Dung Cake

Consumption of Dung Cake in the Residential Sector for Energy Purposes

Data Source:

Household Consumption Expenditure Survey (HCES), MoSPI: Block 8.1 of HCES pertains to Consumption of energy (fuel & light) during the last 30 days. Consumption, both in quantity (kg) and value (Rs), is reported for dung cake (Item Code 333).

The net calorific value of dung cake has been taken from World Bank-ESMAP sources.

All India estimation procedure and conversion to Energy term:

Per capita monthly consumption of dung cake, derived directly from HCES household consumption data, is multiplied by the projected population for the respective year, as taken from the *Report of the Technical Group on Population Projections (2011–2036)* of the Ministry of Health and Family Welfare, and by a factor of 12 to obtain the annual total consumption.

Data for 2022-23 and 2023-24:

Dung Cake	**2022-23**	**2023-24**
Quantity (Thousand Metric Tonnes)	30919	30018
NCV (kcal/kg)	2868.1	2868.1
Energy (ktoe)	8862	8604

Treatment in Energy balance:

Total dung cake consumption in households used directly for burning should be accounted under the Residential sector in the final consumption part of the energy balance.

Charcoal

Consumption of Charcoal in the residential sector:

Data Source:

Household Consumption Expenditure Survey (HCES), MoSPI: Block 8.1 of HCES pertains to consumption of energy (fuel & light) during the last 30 days. Consumption, both in quantity (kg) and value (Rs), is reported for charcoal (Item Code 341).

The net calorific value of charcoal has been taken from World Bank–ESMAP sources.

All India estimation procedure and conversion to Energy term:

Per capita monthly consumption of charcoal is derived from HCES data and multiplied by the projected population for the respective year, as taken from the *Report of the Technical Group on Population Projections (2011–2036)* of the Ministry of Health and Family Welfare, and by a factor of 12 to obtain the annual total consumption.

Data for 2022-23 and 2023-24:

Charcoal	2022-23	2023-24
Quantity (Thousand Metric Tonnes)	135.7	171.7
NCV (kcal/kg)	6931.2	6931.2
Energy (ktoe)	94.02	118.94

Treatment in Energy balance:

Total charcoal consumption in households may be included under the Residential sector in the final consumption part of the energy balance.

Black Liquor

Black liquor is a by-product formed during the chemical pulping of wood and agro-residues in the pulp and paper industry. Since black liquor is generated only from virgin fibre pulping, the estimation is based solely on the share of paper production using wood and agro-residues, while paper produced from recycled fibre is excluded.

Although wood-based and agro-residue-based pulping processes differ, separate conversion factors has not been applied due to the lack of reliable national-level data. Therefore, single representative factors has been used in the analysis. It is also recognised that in some small mills not all black liquor may be used for energy recovery; however, due to data unavailability of the share, it is assumed that 100% of the generated black liquor is used for energy purposes.

Data Sources:

- **Production of paper, paperboard and newsprint**: Annual production data are taken from the annual reports of the Central Pulp and Paper Research Institute (CPPRI) and the Indian Paper Manufacturers Association (IPMA).
- **Share of wood-based and agro-residue-based production**: The proportion of paper production based on wood and agro-residues is taken from CPPRI annual reports, which provide information on the fibre mix of the Indian pulp and paper industry.
- **Conversion factor from pulp to black liquor solids**: The conversion factor for estimating black liquor generation from chemical pulp production is taken from the International Energy Agency (IEA) Bioenergy study *"Black Liquor Gasification"*, presented at the IEA Bioenergy EXCO54 workshop.
- **Net calorific value (NCV) of black liquor**: The NCV of black liquor dry solids is taken from the same IEA Bioenergy study, which reports both higher and net heating values for black liquor solids.

All India estimation procedure:

The estimation of black liquor generation is carried out in the following steps.

Step 1: Estimation of wood- and agro-residue-based paper production

Total production of paper, paperboard and newsprint is multiplied by the share of wood-based and agro-residue-based production to estimate the quantity of paper produced using virgin fibre.

Wood and agro-based paper production = Total paper production × Share of wood and agro-based production

Step 2: Estimation of pulp requirement

The quantity of chemical pulp required for paper production is estimated by adjusting wood- and agro-residue-based paper output to account for non-fibrous components added during papermaking.

Pulp production=Wood and agro-based paper production × 0.9

Note: Due to the non-availability of direct national data on pulp production, an inverse conversion factor of 0.90 has been assumed, for converting paper production to pulp requirement. This factor is an approximation that accounts for the presence of fillers, additives and other non-fibrous components added during papermaking, which cause the mass of finished paper to differ from the mass of pulp fibre used. The crux of the assumption is that per unit of paper production requires 0.90 unit of pulp and 0.10 unit of other components.

Step 3: Estimation of black liquor solids

Black liquor generation is estimated by applying a conversion factor of 1.7 tonnes of black liquor (dry solids) per tonne of chemical pulp, as reported by IEA Bioenergy.

Black liquor solids = Pulp production × 1.7

The resulting quantity represents black liquor on a dry solids basis.

Conversion to Energy Terms:

Data for 2023-24 and 2024-25

Year	Total paper production (MMT)	Wood & agro-based share of production (%)	Wood & agro-based paper production (MMT)	Fibre content adjustment factor	Estimated pulp requirement (MMT)	Black liquor solids generation factor (t BL/t pulp)	Black liquor solids (MMT)	NCV (kcal/kg)	Energy content (ktoe)
2023-24	23.0	24.0	5.5	0.9	4.97	1.7	8.4	2937.4	2,479.1
2024-25	22.6	24.0	5.4	0.9	4.88	1.7	8.3	2937.4	2,434.9

Treatment in Energy Balance

Black liquor consumption may be accounted under the industry sector, within the pulp and paper subsector, as part of final energy consumption in the energy balance.

Biogases

Consumption of Biogas/Gobar gas in the residential sector

Data Source:

Household Consumption Expenditure Survey (HCES), MoSPI: Block 8.1 of HCES pertains to Consumption of energy (fuel & light) during the last 30 days. Consumption, both in Quantity in kgs and Value in Rs, are reported for Biogas, Gobar gas (Item Code 343).

The calorific value of biogas has been derived based on the range reported on the MNRE biogas portal.

All India estimation procedure and conversion to Energy term:

Per capita monthly consumption of biogas/gobar gas is multiplied by the projected population for the respective year, as taken from the *Report of the Technical Group on Population Projections (2011–2036)* of the Ministry of Health and Family Welfare, and by a factor of 12 to obtain the annual total consumption in quantity and value terms.

Data for 2022-23 and 2023-24:

Biogas	**2022-23**	**2023-24**
Quantity (Metric Tonnes)	56101.2	50619.8
NCV (MJ/m^3)	19.7	19.7
Energy (ktoe)	38.8	35.0

Note: 1 cubic meter = 0.68 kg (HCES)

The estimate reflects reported household use of biogas as a cooking fuel and represents final energy consumption. Estimates based on biogas plant capacity or production potential are not used.

Treatment in Energy balance:

Total biogas consumption in households would be included under the Residential sector in the final consumption part of the energy balance.

Consumption of CBG reported by MoPNG

Data Source:

Sale of Compressed Biogas (CBG) in tonnes is reported in Chapter 9 of the IPNG statistics published by MoPNG.

The calorific value of CBG has been taken from the International Energy Agency (IEA).

Conversion to Energy term:

Data for 2022-23 and 2023-24:

CBG	**2022-23**	**2023-24**
Quantity (Metric Tonnes)	11227	19724
NCV (MJ/m^3)	36	36
Energy (ktoe)	13.41	23.55

Note: 1 cubic meter = 0.72 kg

Treatment in Energy balance:

At present, reported CBG consumption is predominantly in the transport sector; accordingly, total CBG consumption can be included under the Road Transport sector of the energy balance.

Liquid Biofuels

Ethanol

Data Source:

Quantities of ethanol blended with petrol are reported in Chapter 9 of the IPNG statistics published by MoPNG.

Conversion to Energy Terms:

Data for Ethanol consumption for 2022-23 and 2023-24:

Ethanol	**2022-23**	**2023-24**
Quantity (Cr Litres)	508	707
NCV (kcal/kg)	6453.2	6453.2
Energy (ktoe)	2578	3586

Note: 1 litre of ethanol = 0.789 kg

Treatment in Energy balance:

Ethanol consumption should be included under the Road Transport category of the transport sector in the energy balance.

Bio-diesel

Data Source:

Quantities of biodiesel blended with diesel are reported in Chapter 9 of the IPNG statistics published by MoPNG.

Conversion to Energy Terms:

Data for Bio-diesel consumption for 2022-23 and 2023-24:

Bio-diesel	**2022-23**	**2023-24**
Quantity (Cr Litres)	6.06	43.99
NCV (kcal/kg)	8962.7	8962.7
Energy (ktoe)	48	347

Note: 1 litre of bio-diesel = 0.88 kg

Treatment in Energy balance:

Biodiesel consumption should be included under the Road Transport category of the transport sector in the energy balance.

Results

Based on the above analysis, biofuels and waste contributed an estimated 118,940 ktoe to India's total final energy consumption in 2023-24, accounting for around 16 percent of total final energy use. The residential sector emerged as the dominant consumer of biomass energy, with an estimated consumption of 66,966 ktoe, representing about 56 percent of total biomass consumption as final

energy. This reflects the continued use of traditional biomass fuels in households for cooking and other energy needs. The industrial sector was the second-largest consumer, with biomass consumption estimated at 41,125 ktoe, contributing around 35 percent of total biomass use. The commercial and transport sectors accounted for relatively smaller shares, contributing around 3 percent each to total biofuel consumption.

Treatment of Biomass and Biofuels in the Energy Balance

During the analysis and compilation of biomass and biofuel consumption, it was observed that some biofuels are already included in the national energy balance through their blending with conventional fuels. Ethanol is blended with petrol, biodiesel is blended with diesel, and compressed biogas (CBG) is blended with natural gas; as a result, their energy contribution is embedded within the corresponding conventional fuel categories and is not reported separately.

To clearly present this aspect, two tables are provided below. The first table presents biofuels that are already included in the energy balance through blending with conventional fuels but are not reported separately as distinct energy products. The second table presents remaining biomass and biofuels that are not included in the existing energy balance.

Biofuels Included in the Energy Balance through Blending

	2022-23		2023-24	
	Quantity (MMT)	**Energy (ktoe)**	**Quantity (MMT)**	**Energy (ktoe)**
Ethanol	4.01	2,577.63	5.58	3,585.91
Bio-Diesel	0.05	47.76	0.39	346.73
CBG (Transport)	0.01	13.41	0.02	23.55

Other Biomass and Biofuels not included in the Energy Balance

	2022-23		2023-24	
	Quantity (MMT)	**Energy (ktoe)**	**Quantity (MMT)**	**Energy (ktoe)**
Firewood	269.7	100479	254.5	94830
Bagasse	91.7	17950.0	85.8	16813.4
Dung cake	30.9	8861.8	30.0	8603.5
Biomass-based power plant fuel input	4.28	1194	4.6	1292
Biomass Pellets	0.05	15.77	0.37	118.00
Black liquor	NA	NA	8.45	2479.13
MSW/RDF used for electricity	4.72	955.70	5.13	1038.80
Biogas	0.06	38.82	0.05	35.03
Charcoal	0.14	94.02	0.17	118.94

Note: The above table also includes biomass and biofuels used as fuel inputs in electricity and CHP plants. These quantities are accounted for under the Transformation sector in the energy balance and should not be included in total final energy consumption.

It may be noted that, since ethanol, biodiesel and CBG are already included within petrol, diesel and natural gas consumption respectively, their quantities must first be deducted from the corresponding conventional fuel totals in order to estimate the consumption correctly. After this adjustment, the remaining quantities of petrol, diesel and natural gas should converted to energy terms using their respective calorific values. This approach avoids double counting and ensures consistency in the energy balance.

In the energy balance, under the production category of "solar, wind, others", the energy term corresponding to "others" may be deleted to avoid duplication of electricity from bio-power, as the corresponding electricity has already been appropriately accounted for through the conversion of biomass inputs such as biomass, bagasse, and municipal solid waste.

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STRENGTHENING INDIA'S DEMAND-SIDE ENERGY DATA FRAMEWORK

CONTEXT AND RATIONALE

India's energy transition, economic competitiveness, and climate commitments increasingly depend on the availability of **robust, disaggregated, and policy-relevant demand-side energy data**. While India has made significant progress in strengthening supply-side energy statistics, demand-side data — particularly end-use, process-level, and activity-linked information — remain fragmented across multiple institutions, datasets, and methodologies.

Current demand-side energy estimates rely on a mix of administrative records, surveys, and modelling assumptions, often resulting in large **"non-specified" categories** in industry and buildings, **retail/reseller residuals** in transport fuels, limited visibility into **end-use and process-level consumption**, and challenges in producing **official, defensible energy intensity indicators** aligned with international standards.

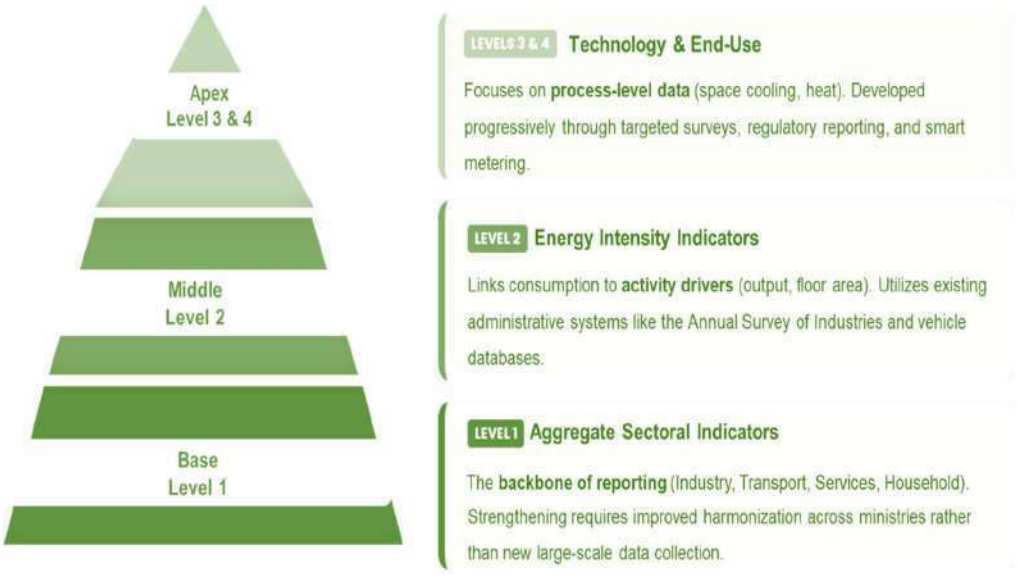
While India participates in global statistical reporting mechanisms, limited sectoral and end-use disaggregation constrains the country's ability to comprehensively populate key components, particularly detailed final energy consumption by sector and sub-sector.

These gaps are even more consequential under the United Nations Framework Convention on Climate Change (UNFCCC) Enhanced Transparency Framework, which mandates the submission of Biennial Update Reports and Biennial Transparency Reports supported by robust National Inventory Reports prepared in line with IPCC guidelines.

Recognizing these gaps, the Committee examined existing datasets, analytical work undertaken by the Bureau of Energy Efficiency (BEE) through its Energy Data Management Unit (EDMU), and expert inputs. This chapter presents a **comprehensive, implementable framework** to strengthen India's demand-side energy data system, building on existing mandates and institutional capacities.

CONCEPTUAL FRAMEWORK: ALIGNMENT WITH THE IEA ENERGY END-USE PYRAMID

The proposed framework is anchored in the **IEA Energy End-use Pyramid**, which provides a structured progression of demand-side information.



Presently concerned Line M/Ds capture and maintain data in a decentralized manner and lacks uniformity. Better harmonization for streamlining the data obtained from various Line M/Ds in uniform format is required at National Level. The framework proposed by the Committee is explicitly designed to **progressively move up the pyramid**, prioritizing Level 3 end-use visibility in the near term and selectively advancing toward Level 4 for high-impact sectors such as industry, buildings, and transport.

Crucially, the framework adopts a **hybrid data strategy**, combining administrative datasets, periodic surveys, programme-based data (such as PAT), and transparent modelling and validation methods, rather than relying on any single data source.

PROPOSED INSTITUTIONAL GOVERNANCE

The development of a comprehensive demand-side energy data framework is not solely a technical exercise; it is fundamentally an institutional undertaking. At present, the energy data ecosystem in India remains fragmented, with relevant information dispersed across administrative ministries, public sector undertakings, and regulatory bodies.

To transition towards a unified, standardized, and policy-relevant framework, establishing a clearly articulated governance and coordination structure is essential.

BEE AS THE TECHNICAL HUB

With reference to the directions of Ministry of Power, the Energy Data Management Unit (EDMU) has been established within the Bureau of Energy Efficiency (BEE) as the designated agency to operationalize an integrated national energy data framework. The EDMU leads the systematic development, standardization, harmonization, and governance of granular demand-side energy consumption data across sectors, ensuring convergence with ongoing ministerial efforts and strengthening evidence-based policy formulation, implementation monitoring, and periodic review.

BEE, through EDMU, should serve as the **national technical integration hub** for demand-side energy indicators and analytics. Its role would include:

- Developing sector- and end-use-specific methodologies,
- Integrating data from multiple custodians,
- Producing analytical outputs such as energy intensities and scenarios, and
- Supporting national planning exercises (e.g., IESS, NDC tracking).

The BEE EDMU is currently in the process of formalizing a collaboration with the Indian Statistical Institute (ISI) to strengthen data processing frameworks. It is expected that the signing of a Memorandum of Understanding (MoU) will further institutionalize and enhance the robustness, methodological structure, and statistical reliability of the national energy data collection and validation processes.

LINE MINISTRIES, DEPARTMENTS

Line Ministries/Departments (e.g., MoP, MoPNG, MoRTH, CEA, PPAC, Railways, DGCA, DISCOMs) remain the **primary custodians and collectors of sector-specific administrative data**. BEE-EDMU is collecting and presenting all relevant sectoral energy data in a uniform and standardised reporting format, to ensure consistency, interoperability, and integration within the national demand-side energy data framework.

THE MINISTRY OF STATISTICS AND PROGRAMME IMPLEMENTATION (MOSPI)

The Ministry of Statistics and Programme Implementation (MoSPI), is the statutory authority and custodian of India's official energy statistics. As the designated national statistical authority, MoSPI must retain ownership, oversight, and publication responsibility to ensure coherence, credibility, and legal validity of energy data within the national statistical system. BEE will share the consolidated data with MoSPI for publication of the annual statistics report.

MoSPI's leadership is critical to:

- Ensuring methodological consistency with established statistical classifications and standards, including ISIC and SIEC frameworks;
- Integrating dedicated energy modules within large-scale national surveys such as ASI and NSS/HCES, thereby strengthening demand-side data capture; and
- Assigning official statistical status to energy estimates through formal validation, standardization, and publication processes. Assigning official statistical status to estimates.

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE (MOEFCC)

Ministry of Environment, Forest and Climate Change (MoEFCC) collates energy data to support the preparation and submission of Biennial Transparency Reports under the Enhanced Transparency Framework of the United Nations Framework Convention on Climate Change (UNFCCC).

STRATEGIC USERS: NITI AAYOG AND OTHERS

Institutions such as NITI Aayog act as **strategic users** of demand-side data utilizes this data for long-term planning, scenario analysis, and monitoring national commitments. Their engagement ensures that the data framework remains policy-relevant and forward-looking.

PROPOSED DEMAND SIDE DATA COLLECTION FRAMEWORK FOR HARMONIZATION

A dedicated **demand-side energy data framework** is proposed for proper harmonization and streamlining of data collection across various Ministries and Departments.

At present, various Ministries and Departments independently compile supply-side and demand-side energy data for the preparation of their respective annual publications, such as *Energy Statistics* (published by Ministry of Statistics and Programme Implementation), *India Energy Scenario* (brought out by Bureau of Energy Efficiency), and the *Biennial Transparency Report* (prepared by Ministry of Environment, Forest and Climate Change). However, this parallel data collection process by multiple Ministries/Departments often results in partial duplication of datasets, placing additional pressure on data-providing agencies and consequently leading to delays in data reconciliation and the timely release of reports.

Institutional Alignment for Integrated Energy Data Governance

To address duplication and improve efficiency, a coordinated institutional framework may be established wherein Line M/Ds share validated datasets through clearly defined channels:

1. Clear Functional Demarcation

- **Supply-side data** (production, imports, transformation, energy balance components) may be collated and validated by Ministry of Statistics and Programme Implementation,

leveraging its established statistical systems, national accounting expertise, and mandate for official statistics.

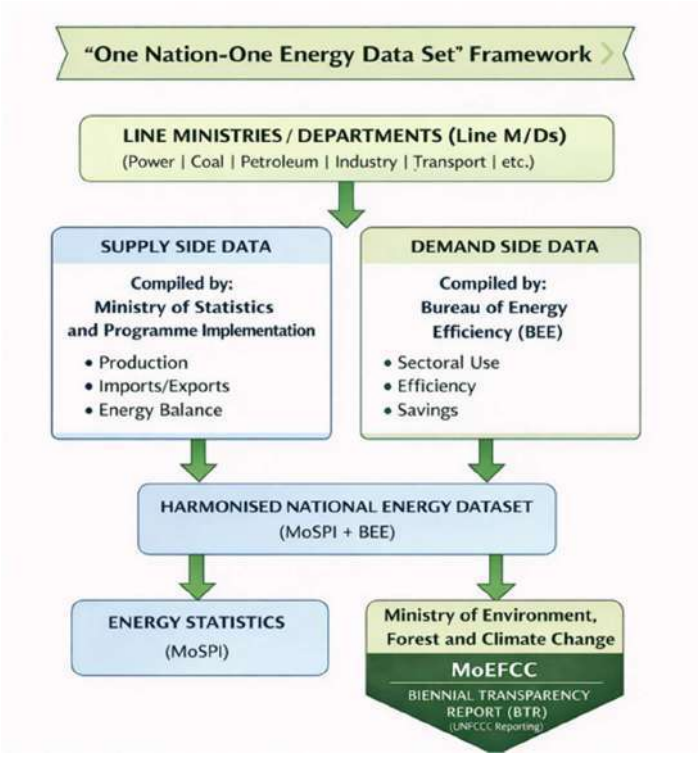
- **Demand-side data** (sectoral consumption, energy efficiency performance, savings estimates, policy impact assessment) may be compiled and analysed by Bureau of Energy Efficiency, given its domain expertise in end-use sectors and policy-driven interventions.

2. Single Integrated Energy Dataset

- MoSPI and BEE may jointly reconcile supply–demand datasets through a structured validation mechanism.
- A **harmonised national energy dataset** could be finalised annually to ensure consistency across publications.
- Based on this reconciled dataset, MOSPI to publish annual Energy Statistics report, thereby eliminating overlapping publications and ensuring uniformity in figures.

3. Unified Reporting to MoEFCC

- The annual Energy Statistics report can be used by Ministry of Environment, Forest and Climate Change for preparation of the **Biennial Transparency Report (BTR)** under UNFCCC obligations.
- This would ensure:
    - Consistency between domestic statistical publications and international climate reporting.
    - Improved transparency and credibility.
    - Avoidance of multiple data submission requests to Line M/Ds.



CORE DESIGN PRINCIPLES

Across all sectors, the framework is anchored in the following principles:

- **Progressive movement up the IEA Energy End-use Pyramid**, prioritising end-use (Level 3) visibility in the near term and selective process/technology-level (Level 4) insights where policy relevance is highest.
- **Use of existing administrative and statistical systems as the backbone**, with surveys and modelling used to complement - not substitute official datasets.
- **Explicit treatment of uncertainty and residuals**, with transparent documentation of assumptions and coefficients.

FRAMEWORK OVERVIEW

The framework covers **industry, buildings, transport, agriculture, and biomass**, with each sector adopting a tailored data strategy reflecting its structural characteristics and existing data maturity.

- In the short term (0–2 years), BEE, in collaboration with ISI, will develop the survey instruments, methodological framework, and a detailed implementation roadmap to establish a robust demand-side data architecture.
- In the medium term (2–6 years), surveys will be operationalised with institutional support from MoSPI, leveraging NSSO and ASI mechanisms to ensure statistical rigour and national coverage.
- In the long term (6–10 years), these surveys could be completely aligned with NSSO and ASI surveys for better harmonization.

Methodology to estimate the consumption of electricity from decentralised renewable electricity systems in India

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The installation of small, decentralised renewable electricity generating systems is increasing rapidly in India due to initiatives such as PM-KUSUM and PM Surya Ghar Yojana. While capacity of such systems is tracked by MNRE due to the subsidy provided for such systems, self-consumption of the power generated from such systems is not tracked in the national electricity consumption statistics reported in the CEA's All India Electricity Statistics-General Review report (henceforth referred to as General Review). This gap is likely to increase further going forward as more such systems are installed. Hence, it was determined that it would be useful to develop a methodology to estimate the untracked consumption so that there is a more accurate estimate of the per-capita consumption of electricity in India. Following is a proposed methodology to estimate electricity consumed from such systems. The methodology is employed to arrive at an initial estimate of the untracked consumption and to identify data gaps that could be addressed through additional data collection. **Due to significant data gaps, the initial estimates made in this report are subject to review, and can be revised based on better availability of data. To this extent, the main contributions of this report are the methodology, identification of data gaps and shortlisting of technologies where data collection needs to prioritised.**

1 Current data availability

We first look at the available official data on decentralised power generation. These systems can be off-grid or grid connected. Of interest, is the capacity, generation and self-consumption data at least at an annual temporal granularity and national spatial granularity, but preferably at a monthly and state granularity.

Following is a list of off-grid and grid-connected distributed renewable electricity generation sources as of March 31 2025, reported in the annual MNRE Renewable Energy Statistics publication[1].

Table 1: Installation of decentralised renewable systems as on 31 March 2025

Category	Technology	Capacity (MW)/No. of systems
Off-grid	Home solar lighting systems	17,23,479 nos.
	Street lighting systems	9,44,802 nos.
	Solar lanterns	84,59,119 nos.
	Rooftop Solar PV (off-grid)	316.816 MW
	Agri solar pumps (KUSUM-B)	10,86,333 nos.
	Waste to energy (off-grid)	530.87 MW
Grid-connected	Agri solar power plants (KUSUM A)	839.4 MW
	Agri solar feeder (KUSUM C)	4742.89 MW
	Rooftop solar PV (grid)	17,017.44 MW

[1] MNRE Renewable Energy Statistics 2024-25 (Tables 8.3 and 8.4) downloaded from https://cdnbbsr.s3waas.gov.in/s3716e1b8c6cd17b771da77391355749f3/uploads/2025/11/2025110616276787 82.pdf on April 1 2026

	Bagasse cogeneration	9,821.32 MW
	Biomass cogeneration (non-bagasse)	921.79 MW
	Waste to energy (grid)	309.34 MW

Data on the current operational status as well as the electricity generated from these systems that is consumed at source is not reported. Hence, we develop methods in this note for identifying the key parameters needed to estimate the electricity generated from these systems and self-consumption of electricity from these systems. This exercise also helps in identifying data gaps that can be addressed in the future. Even though the underlying calculations are similar, the methods could be different across technologies depending on the available data; hence these have been dealt with separately in the following sections.

2 Methods for estimating electricity consumed at source from decentralised electricity generating systems

2.1 Home solar lighting systems and solar lanterns (off-grid)

Home solar lighting systems typically consist of a small solar PV panel accompanied by battery storage. The number of home solar lighting systems and solar lanterns is large, together over 1 crore (see Table 1). However, it is not clear how many of these systems are still operational. This is important especially since these systems are quite old and pre-dated the household electrification drive under the Central Government's Saubhagya program in 2018-19 which resulted in close to 100% household electrification in the country. These systems typically serve small loads such as a 7-10 W LED bulb.

The proposed method to estimate the consumption of electricity generated from these systems consists of the following parameters:

a. Number of systems, *N*,
b. % of operational systems, *InUseShare*,
c. average load in Watts of the appliances connected to the systems, Avg*LoadW*, and
d. average number of hours per day for which the appliances can be operated, *AvgHrs*

Following is the calculation of *HLS_SL_GWh*, the annual self-consumption in GWh from home solar lighting systems and solar lanterns:

*HLS_SL_GWh = (N * InUseShare * AvgLoadW * AvgHrs * 365)/10^9*

As an illustration, we assume an *InUseShare* in the range of 20-60%, *AvgLoadW* of 10 W and *AvgHrs* of 4 hours every day.

HLS_SL_GWh_lo = (17,23,479+84,59,119) * 20% * 10 W * 4 h * 365/10^9 = 29.7 GWh

HLS_SL_GWh_hi = (17,23,479+84,59,119) * 60% * 10 W * 4 h * 365/10^9 = 89.2 GWh

Thus, *HLS_SL_GWh* is estimated at ***29.7-89.2 GWh*** in 2024-25. In comparison, the total electricity consumed in the country in FY2024-25 is ~1623 TWh (including utility and captive)[2]. Thus, these systems account for a very small share of the electricity consumption in the country.

[2] As per CEA Growth of Electricity Sector 2025 report download from https://cea.nic.in/wp-content/uploads/pdm/2025/11/Growth_Book_2025.pdf on April 1 2026

2.2 Solar street lighting systems (off-grid)

The parameters for estimating consumption from solar street lighting systems are the same as those for solar home lighting systems. Thus, self-consumption in GWh from solar street lighting systems, *SLS_GWh* is:

$$SLS\_GWh = (N * InUseShare * AvgLoadW * AvgHrs * 365)/10^9$$

We assume an average LED street light wattage of 50 W operating for 12 hours (entire night), and assuming that 30-60% of these systems are in operation,

SLS_GWh_lo = 9,44,802 * 30% * 50 W * 12 h * 365/10^9 = 62 GWh

SLS_GWh_hi = 9,44,802 * 60% * 50 W * 12 h * 365/10^9 = 124 GWh

Thus, *SLS_GWh* is estimated to be **62-124 GWh** in 2024-25, also a negligible share of the total electricity consumed.

2.3 Agri solar pumps (off-grid)

The following parameters are needed to estimate the consumption of electricity in solar water pumps:

a. Number of systems, *N*,
b. % of operational systems, *InUseShare*,
c. average annual consumption in kWh per pump set, *AvgAnnualConskWh*

Following is the calculation of *SP_GWh*, the annual self-consumption in GWh from agri solar pumps:

$$SP\_GWh = (N * InUseShare * AvgAnnualConskWh)/10^6$$

CEA General Review 2025 reports the average consumption per pump set in 2023-24 as 9987.23 kWh (Table 11.3). Thus, we assume 10,000 kWh consumed on average per pump set. We also assume that 50-75% of the solar pumps are in operation, higher than home lighting systems and street lighting systems since solar agri pumps are generally of a more recent vintage.

SP_GWh_lo = 10,86,333 * 50% * 10,000 kWh / 10^6 = 5,432 GWh

SP_GWh_hi = 10,86,333 * 75% * 10,000 kWh / 10^6 = 8,148 GWh

Thus, *SP_GWh* is estimated to be in the range of **5,432-8,148 GWh** in 2024-25, i.e., 0.335-0.5% of the total electricity consumed in the country.

2.4 Agri solar power plants and solar feeders

Agriculture solar power plants (KUSUM A) and agriculture solar feeders (KUSUM C) are grid-connected and the consumption from these plants is assumed to be recorded by the distribution utilities and hence included in the electricity consumption statistics. However, if the electricity generated from these systems is also consumed on-site, an approach similar to grid-connected rooftop solar PV needs to be taken, as detailed in Section 2.6.

Agrivoltaic systems are at a pilot stage and could increase in capacity in the future. However, these systems are also assumed to grid-connected, and their generation measured by the distribution utilities.

2.5 Rooftop solar PV (off-grid)

The electricity generated from these systems is consumed locally, hence it is estimated based on:

a. Installed Capacity in MW, *CapacityMW*,
b. % of operational systems, *InUseShare*,
c. average expected yield in kWh/kW, *SpecificYield*.

*RTPV_Offgrid_GWh = (CapacityMW * InUseShare * SpecificYield)/10^3*

Since off-grid solar PV systems were largely installed in the initial days of the rooftop solar program and since these are likely to be located in remote areas without sufficient repairing services, it is assumed that only 30-50% of these systems are currently operational. The average CUF is considered to be 1400 kWh/kW (see note in Annexure). Given these assumptions, the generation from these systems in 2024-25 is estimated to be:

RTPV_Offgrid_GWh_lo = 316.816 MW * 30% * 1400 kWh/kW / 10^3 = 133 GWh

RTPV_Offgrid_GWh_hi = 316.816 MW * 50% * 1400 kWh/kW / 10^3 = 222 GWh

This *RTPV_Offgrid_GWh* is estimated to be in the range of **133-222 GWh** in 2024-25, which is a negligible share of the national electricity consumption in FY 2024-25.

2.6 Rooftop solar PV (grid)

The electricity generated from these systems is either consumed locally or sent to the grid. It is assumed that energy that was sent to the grid from these systems is accounted for in consumption statistics in CEA General Review, hence we estimate electricity consumed locally. These systems could be in residential, commercial and industrial consumers, and their self-consumption patterns are likely to be different, hence we estimate them separately. For the purposes of this note, government buildings are included in commercial category.

The electricity generated from grid-connected rooftop solar systems that is consumed locally is estimated based on:

a. Installed Capacity in MW, $CapacityMW_i$,
b. Self-consumption share, $SelfConsShare_i$,
c. average expected yield in kWh/kW, $SpecificYield_i$.

$$RTPV\_grid\_GWh = \sum_i (CapacityMW_i * SelfConsShare_i * SpecificYield_i)/10^3$$

where $i \in [residential, industrial, commercial]$

Installed capacity

Data on consumer category-wise installed capacity of rooftop solar PV systems is not readily available. By the end of 2023-24, installed capacity of rooftop solar in the country was 11,869.63 MW[3], and 4,533 MW of (>0.5 MW) captive solar capacity is installed in the industrial sector[4]. Due to the PM Surya Ghar Yojana, rooftop solar installations have picked up pace in the residential sector from 2024-25 onwards, with 3.2 GW being added under this program in calendar year 2024 and 7.1 GW being added in 2025[5]. In 2025, the residential sector has accounted for 76% of the rooftop solar capacity installed, whereas industrial sector accounted for 18% and the remaining 6% in commercial and government institutions. By March 2025, installed rooftop solar capacity reached 17,017.44 MW

[3] Table 6.3 in MNRE Renewable Energy Statistics 2023-24 report downloaded from https://cdnbbsr.s3waas.gov.in/s3716e1b8c6cd17b771da77391355749f3/uploads/2024/10/2024102951232546 4.pdf on April 1 2026
[4] Table 5.4 in Central Electricity Authority All India Electricity Statistics-General Review
[5] Article published by Mercom India at https://www.mercomindia.com/product/rooftop-solar-market-report-q4-2025 accessed on April 1 2026

(see Table 1), i.e., 5,147.81 MW was added in the FY 2024-25. Applying the above shares across consumer categories, we get additions of 3,912.34 MW added in residential, 926.6 MW in industry and 308.87 MW in commercial. PM Surya Ghar Yojana was launched in February 2024 and the majority of the capacity would have been installed during the second half of the FY 2024-25. As mentioned above, it is reported that 3.2 GW was added under in calendar year 2024, thus about 3.9 GW being added in the residential sector in FY 2024-25 seems reasonable. By end of FY2024-25, it is estimated that 66% of the installed rooftop solar capacity share is with commercial and industrial (C&I) consumers[6], implying 34% of 17,017.44 MW, or 5,785.93 MW of installed rooftop solar capacity in the residential sector. Assuming the installed capacity in industrial and commercial sectors to be in the ratio of 3:1 in line with the shares that were added in 2024-25, we get 8,423.63 MW and 2,807.88 MW in industrial and commercial sectors.

Self-consumption share

Data on self-consumption of decentralised renewable systems is not available in the public domain, and often not even with DISCOMs since it is not needed for billing purposes.

Residential consumers with smaller systems are likely to consume a higher share of generation locally and the size of the system is measured by capacity per housing unit (in the case of multi-unit housing societies). We assume small systems to be <= 500 W per housing unit and further assume that these account for 50% of the grid-connected rooftop solar capacity. For small systems, we assume that all electricity generated is consumed locally. For large systems, we assume that 20-60% of the electricity is consumed locally, assuming most of them will not be accompanied by battery storage systems (see note in Annexure).

For commercial consumers, we assume that the entire electricity generated is consumed locally since they largely operate during the day and are likely to size their systems as per their day time demand.

For industrial consumers, we assume the 20-60% local consumption range that is assumed for large residential rooftop systems.

It is assumed that hybrid solar+battery installations have a negligible share in rooftop systems in FY 2024-25. However, battery energy storage systems are likely to be increasingly paired with rooftop solar systems in the future due to declining storage prices and changes in metering regime (for example to switch from net metering to gross metering). Hence, this needs to considered in estimations for future years.

Table 2 summarises the consumer category-wise estimated capacity and self-consumption of grid-connected rooftop solar generation for the year FY 2024-25.

Table 2: Estimated self-consumption of rooftop solar PV generation in 2024-25

Consumer category	$CapacityMW_i$	$SelfConsShare\_lo_i$	$SelfConsShare\_hi_i$	$RTPV\_grid\_GWh_i$
Residential Small	2893	90%	100%	3,645-4,050
Residential Large	2893	20%	60%	810-2,430
Industrial	8423.5	50%	80%	5,896-9,434
Commercial	2808	70%	90%	2,752-3,538

[6] India's Rooftop Solar Market report published by CareEdge Advisory, downloaded from https://www.careratings.com/uploads/newsfiles/1744630708_India's%20Rooftop%20Solar%20Market%20-%20CareEdge%20Advisory%20Report.pdf on April 1 2026

Total	17017.5	47%	73%	**13,103-19,452**

This estimate is 0.81-1.2% of the consumption reported in 2024-25.

2.7 Bagasse co-generation

Electricity generated from bagasse co-generation systems is consumed within the factory and the remaining electricity is exported to the grid. The electricity exported to the grid is accounted for in CEA statistics, however, the electricity consumed within the premises is not. The following parameters are considered:

a. Installed Capacity in MW, *CapacityMW*,
b. Average annual capacity factor after considering auxiliary consumption, *AvgCUF*, and
c. Self-consumption share of generation, *SelfConsShare*.

The energy consumed within the premises of the bagasse co-generation facility is defined as:

*Bagasse_GWh = (CapacityMW * 8760 * AvgCUF * SelfConsShare)/10^3*

As per CEA Monthly RE Generation Report for March 2025[7], electricity exported to the grid from bagasse systems in 2024-25 was 9335.32 GWh. Installed capacity was 9821.32 MW (see Table 1).

Self-consumption share

It is assumed that at least 51% of the electricity generated is consumed for captive use as per rules governing captive power plants. We now calculate the resultant capacity utilisation factors assuming a *SelfConsShare* of 70%.

Capacity utilisation factor

The resultant annual capacity factor is 9335.32 GWh/(9.82132 GW * 8760 h * 30%) = ~36%. Bagasse projects typically run for 9 months, with a crushing season of about 4 months and post-crushing season of about 5 months. Thus, the capacity factor during the operational 9 months is 36% *12/9 = 48%, which is quite low. By the end of FY 2023-24, bagasse capacity was 9433.56 MW; i.e., ~400 MW of capacity was added in FY 2024-25, which may not have contributed much to the generation. In addition, 10,825.59 GWh of electricity was exported to the grid in 2023-24, which implies 10825.59 GWh/(9.43356 GW * 8760 h * 30%) = ~44% annual CUF, which results in a capacity factor of 44%*12/9 = ~58% during the operational months. This is still on the lower side, indicating either some of the bagasse capacity being non-operational/retired, or there not being sufficient feedstock to operate the plants, or the share of electricity exported to the grid is significantly lower than the 30% assumed, or some of the bagasse plants are connected at the distribution level and hence their generation is not captured in the CEA monthly generation reports.

In the absence of this information, we assume that the some of the bagasse capacity is connected to the distribution network and not captured in the CEA generation reports. To account for this, we assume a capacity utilisation factor is 50-80%. With these assumptions, the range of self-consumption of bagasse plants is estimated as follows:

Bagasse_GWh_lo = (9,821.32 MW * (8760) h * 50% * 70%)/10^3 = **30,112 GWh**

[7] CEA Monthly Renewable Electricity Generation report for March 2025 downloaded from https://cea.nic.in/wp-content/uploads/resd/2025/03/RE_Monthly_Generation_report_March_2025.xlsx on April 1 2026

Bagasse_GWh_hi = (9,821.32 MW * (8760) h * 80% * 70%)/10^3 = **48,179 GWh**

This estimate is 1.86-2.97% of the consumption reported in 2024-25.

2.8 Biomass-based electricity generation

It is assumed that all of the electricity generated from biomass-based electricity plants is directly exported to the grid, and hence accounted for in the CEA consumption statistics. This was 3738.67 GWh in 2024-25 as per CEA Monthly RE Generation Report for March 2025 from an installed capacity of 921.79 MW (see Table 1), implying an annual CUF of 46.3%, which is low, but could be due to issues related to biomass (fuel) supply.

2.9 Waste to energy

It can be assumed that all of the electricity generated by grid-connected waste to energy projects is directly exported to the grid, and hence accounted for in the CEA consumption statistics. Hence, only the electricity generated in off-grid waste to energy projects needs to be estimated.

Following parameters are considered to estimate generation (and self-consumption) of off-grid waste-to-energy plants:

a. Installed Capacity in MW, *CapacityMW*,
b. average expected yield in MWh/MW after considering auxiliary consumption, *SpecificYield*.

*Waste_Offgrid_GWh = (CapacityMW * SpecificYield)/10^3*

In CEA's Renewable Monthly Generation Report for March 2025, the 'Others' category has an installed capacity of 840.21 MW which is exactly the installed capacity of off-grid and grid-connected waste-to-energy plants. However, the monitored capacity is reported to be higher at 934.99 MW! Nevertheless, we calculate the specific yield for the 'Others' category based on the reported generation and use this for off-grid waste-to-energy projects. The generation reported for 2024-25 is 2869.73 GWh. Thus, the specific yield is (2869.73*1000/934.99) = 3,069.26 MWh/MW. Using this, we estimate the self-consumption from off-grid waste-to-energy plants as follows:

Waste_Offgrid_GWh = 530.87 MW * 3069.26 MWh/MW / 10^3 = **1,629 GWh**

2.10 Total self-consumption from decentralised electricity generation plants

Following table summarises the estimates of self-consumption that is not tracked in CEA electricity consumption statistics.

Table 3: Estimated self-consumption from decentralised electricity generation

Technology	Estimated self-consumption (GWh)	
	Low	High
Home solar lighting, Solar lanterns	29.7	89.2
Solar street lighting	62	124
Agri solar pumps (off-grid)	5,432	8,148
Rooftop solar PV (off-grid)	133	222
Rooftop solar PV (grid)	13,103	19,452
Bagasse	30,112	48,179
Waste to energy (off-grid)	1,629	1,629
Total	**50,501**	**77,843**

The self-consumption from decentralised electricity generation capacity that is not included in the electricity consumption statistics is estimated to be in the range of 50,501-77,843 GWh in 2024.25. In this year, the total consumption reported is 1622.969 TWh[8]. The self-consumption is estimated to increase the electricity consumption by roughly 3.1-4.8%. The range of the estimate is wide at over 27 TWh, with the high estimate being more than 50% higher than the low estimate. But as can be seen in Table 3, about two-thirds of the range (18,067 GWh) is attributed to the uncertainty with respect to self-consumption of bagasse generation. If accurate data is available regarding behind-the-meter consumption, the accuracy of the estimates can be improved.

3 Way forward

The methodology proposed in this report provides a way to compute electricity consumption that is currently not recorded in official statistics, and an attempt has been made to estimate such consumption. These estimates are based on several assumptions due to data gaps, and can be improved with better data collection and reporting of data on operational status, average yields and self-consumption in technologies that have high installed capacity and are likely to be continue to be significant going forward. As can be seen in Table 3, these systems are off-grid solar pumps, grid-connected rooftop solar and bagasse power plants. In addition, as mentioned in Section 2.4, data needs to be collected regarding self-consumption in grid connected farm solar systems (KUSUM A and KUSUM C IPS) and agri-voltaic systems, if applicable.

3.1 Improving self-consumption data of grid-connected systems

A major data gap is the electricity consumed locally from electricity generated from grid-connected captive systems such as decentralised (farm and rooftop) solar and bagasse power plants. Electricity generated from many of these systems is already metered. However, these meter readings are either not visible to the distribution companies (DISCOMs) or even if they are visible, the readings are not recorded systematically and reported. To fill this gap, measures should be put in place to meter either the generation from these systems or the portion that is consumed locally, and automatically report this meter data to the DISCOMs, and mandating the DISCOMs to publish this data by technology and consumer category at an appropriate frequency, say on a monthly basis.

In addition to the above, even though the electricity sent to the grid from these systems is already recorded by distribution companies, this data is not published by the DISCOMs. In addition to the self-consumption data, electricity sent to the grid should also be reported by technology and consumer category at the same frequency by the DISCOMs. Together, this data would give a good insight not only into the self-consumption patterns, but also on the annual yield of these systems.

3.2 Improving yield and utilisation data of off-grid and grid-connected systems

Annual yield and utilisation estimates from these decentralised solar and bagasse power plants vary widely based on on-field parameters such as quality of the systems, maintenance practices, environmental factors such as cloud cover and shading in the case of solar systems and feedstock availability in the case of bagasse systems. Thus, it is important periodically measure the yields from these systems and understand the underlying determinants of the yields.

As indicated in the previous section, it may be mandated that this data be reported to the DISCOMs who in turn report this data at an aggregate level by technology and consumer category at a monthly frequency. In addition, there may be many systems, especially off-grid systems, which will need to be covered through periodic surveys. These surveys would also provide information on

[8] CEA Growth of Electricity Sector 2025 report downloaded from https://cea.nic.in/wp-content/uploads/pdm/2025/11/Growth_Book_2025.pdf on April 1 2026

working status of these systems, which is also not available currently. These surveys could be commissioned by MNRE or other suitable institution, and published by technology and consumer category at an appropriate frequency.

4 Conclusion

In this note, we propose a methodology to estimate the electricity consumed at the premises of the decentralised renewable electricity systems. Several gaps were identified and assumptions were made to fill gaps in the available data, and self-consumed electricity was estimated. Suggestions have been made for addressing data gaps related to operational status, self-consumption and yields, especially for technologies that have a substantial share of consumption from decentralised systems, i.e., off-grid and grid-connected rooftop and farm solar systems and bagasse power plants.

5 Annexure

A Brief Note on Estimation of Self-Consumption by Distributed Solar PV Systems in India by Pratik Joshi

A Brief Note

on

Estimation of Self-Consumption by Distributed Solar PV Systems in India

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(May, 2026)

CONTENTS

1. Introduction

The rapid expansion of distributed solar photovoltaic (PV) systems in India has led to a growing share of electricity generation occurring at the point of consumption. Unlike utility-scale grid-connected power plants, a substantial portion of the electricity generated by rooftop PV systems is consumed on-site by households, commercial establishments, industries, institutions, and other consumers. This electricity, commonly referred to as self-consumption, does not pass through the electricity grid and is therefore not directly captured in conventional electricity supply statistics that are based primarily on metered grid transactions. As the penetration of distributed solar generation increases, the absence of a systematic mechanism to measure self-consumed electricity may lead to an underestimation of actual electricity use in national energy statistics and related analytical exercises.

At present, comprehensive data on on-site electricity generation and consumption by rooftop PV systems in India are not centrally available, particularly at the level required for national energy accounting. While information on installed rooftop PV capacity is reported periodically, other key parameters, such as generation profiles, exported electricity, and on-site consumption, are not uniformly recorded or aggregated across all distribution utilities. In this context, the present note proposes a first-order estimation approach to approximate the magnitude of electricity self-consumption from rooftop solar PV systems in India.

The objective is to provide an initial indicative estimate or plausible range using available information and reasonable assumptions, which can serve as a starting point for incorporating distributed solar self-consumption into national electricity statistics and for refining the methodology as more comprehensive data become available.

2. Literature Search on International Approaches

As the deployment of distributed rooftop solar photovoltaic (PV) systems has expanded in many countries, a growing portion of electricity generation occurs behind the consumer meter. It is therefore not directly recorded in conventional electricity supply statistics. Since national energy balances and demand indicators typically rely on grid-supplied electricity, several international statistical and modelling approaches have been developed to estimate on-site electricity generation and consumption by distributed PV systems. These approaches rely on available information, such as installed capacity, solar resource data, export measurements, demand profiles, or energy system models, depending on each country's data infrastructure.

The approaches summarized below illustrate the main estimation frameworks currently used in different national statistical systems and energy modelling exercises to approximate self-consumption from rooftop solar PV installations.

1. **Generation minus exports (residual method)**

   Self-consumption = Estimated/Measured PV Generation − Measured Exports. *Used by:* Switzerland (official), Spain (conceptually), Germany (research).

2. **Capacity stock × specific yield (engineering model)**

   Generation = Installed Capacity × Yield; combine with exports or overlap to infer self-consumption.
   Used by: Switzerland, Australia, the UK.

3. **Weather/irradiance time-series PV models**

   Physics-based simulation calibrated to real systems; supports energy and peak analysis. *Used by:* Australia (AEMO), UK (HEM).

4. **Load–generation temporal overlap**

   Self-consumption is the coincident portion of PV generation and demand. *Used by:* UK (HEM); also common in scenario models.

5. **Statistical integration of distributed generation into national models**

   Behind-the-meter PV is estimated and embedded within energy balances and scenarios. *Used by:* the United States (EIA/NEMS) and the EU statistical system.

3. Methodology

In the absence of metered data on generation and exported units at a granular level, estimation based on the capacity utilisation factor and a self-consumption factor can be used as an initial approximation.

$$\textit{Self-Consumption} = \textit{Installed Capacity} \times \textit{Specific Yield} \times \textit{Self-Consumption Ratio} \quad \text{..Eq. (1)}$$

Where,

- The installed capacity of rooftop PV systems as of 31 March 2024 is considered.
- Average annual specific yield (kWh/kW/year) is assumed based on academic literature.

- Two values of the self-consumption ratio are considered to represent lower and upper levels, based on evidence from literature and international benchmarks.

4. Data Collection

4.1 Installed Capacity

India's Ministry of New and Renewable Energy (MNRE) periodically publishes physical achievements associated with cumulative capacity addition. The installed capacity of rooftop PV systems is considered 17.017 GW, as of 31 March, 2025 (Source: MNRE[1]).

4.2 Specific Yield

Specific Yield and Capacity Utilization Factor (CUF) are widely reported in academic studies as a measure of PV generation. Capacity Utilization Factors represent the ratio between the actual energy generated and the maximum possible energy if the plant operated at full capacity for the entire period. For a year, CUF is calculated as follows.

$$CUF = \frac{Actual\ generation\ (kWh)}{Installed\ Capacity\ (kW) \times Hours\ in\ a\ year\ (8760)} \quad \text{Eq. (2)}$$

Specific yield expresses energy generation per unit of installed capacity over a period. It is calculated as follows.

$$Specific\ Yield = \frac{Actual\ Generation\ (kWh)}{Installed\ Capacity\ (kW)} \quad \text{Eq. (3)}$$

The relationship between CUF and Specific Yield can be shown as:

$$Specific\ Yield = 8760 \times CUF \quad \text{Eq. (4)}$$

MNRE in its Frequently Asked Questions[2] (FAQ) indicates that the daily yield across India is between 4 and 5.5 kWh/kW/day, which translates to 1460-2007.5 kWh/kW/year. Table 1 shows a specific yield reported in academic literature.

[1] MNRE | Renewable Energy Statistics 2024-25 (Tables 8.3 and 8.4) downloaded from https://cdnbbsr.s3waas.gov.in/s3716e1b8c6cd17b771da77391355749f3/uploads/2025/11/202511061627678782.pdf

[2] MNRE| FAQ: Grid Connected Solar Rooftop System. https://api.solarrooftop.gov.in/pdf/faq_new.pdf

Table 1 Specific Yield of Rooftop Solar PV Systems in India

Sr. No.	Location	System Capacity (kW)	Specific Yield (kWh/kW/Year)	Source
1	Bhubaneswar, Odisha	11.2	1339.55	Sharma, R., & Goel, S. (2017). Performance analysis of a 11.2 kWp roof top grid-connected PV system in Eastern India. *Energy Reports*, *3*, 76–84. https://doi.org/10.1016/j.egyr.2017.05.001
2	Lucknow, Uttar Pradesh	5	1456.35	Yadav, S. K., & Bajpai, U. (2018). Performance evaluation of a rooftop solar photovoltaic power plant in Northern India. *Energy Sustainable Development/Energy for Sustainable Development*, *43*, 130–138. https://doi.org/10.1016/j.esd.2018.01.006
3	Delhi	12	1481.9	Mudgil, K., Yadav, R. K., & Tiwari, G. N. (2019). Performance evaluation of 12 kW P rooftop grid-connected photovoltaic plant installed under net metering in Delhi, India. *International Journal of Ambient Energy*, *43*(1), 788–794. https://doi.org/10.1080/01430750.2019.1670253
4	Imphal, Manipur	5	1231.51	Singh, T. S. D., Shimray, B. A., Singh, A. B., & Meitei, S. N. (2023). Performance measurement of 5 kWp rooftop grid-connected SPV system in moderate climatic region of Imphal, Manipur, India. *Energy Sustainable Development/Energy for Sustainable Development*, *73*, 292–302. https://doi.org/10.1016/j.esd.2023.02.009
5	Bangalore, Karnataka	20	1496.5	Vasisht, M. S., Srinivasan, J., & Ramasesha, S. K. (2016). Performance of solar photovoltaic installations: Effect of seasonal variations. *Solar Energy*, *131*, 39–46. https://doi.org/10.1016/j.solener.2016.02.013

According to the academic literature, the average specific yield for grid-connected rooftop PV systems in India is about 1,401.16 kWh/kW per year. For this study, a value of 1400 kWh/kW per year is assumed.

4.3 Self-Consumption Ratio

The self-consumption ratio of a rooftop PV system mainly depends on the temporal overlap between PV generation and electricity demand, as well as factors such as PV system size relative to load, household load profile, and the presence of technologies like battery storage, electric vehicles, or demand-side management that shift consumption toward periods of solar generation.

Commercial and industrial consumers typically exhibit higher self-consumption ratios because a larger share of their electricity demand occurs during working hours that coincide with solar generation. In contrast, residential consumers often have lower self-consumption ratios as a significant portion of household electricity use occurs in the evening and night when solar generation is unavailable.

Due to limited empirical data on self-consumption from rooftop PV systems in India, values reported in international studies of residential PV systems are used as indicative ranges.

Literature[3] on residential grid-connected PV systems indicates that 20–60% of generated PV electricity is typically self-consumed without storage, while battery storage can increase this to roughly 60–85%. Hence, we consider 20% and 85% as lower and upper levels of self-consumption, respectively.

[3] Sources:

1. Luthander, R., Widén, J., Nilsson, D., & Palm, J. (2015). Photovoltaic self-consumption in buildings: A review. *Applied Energy*, *142*, 80–94. https://doi.org/10.1016/j.apenergy.2014.12.028
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3. Self-Consumption of electricity by households, effects of PV system size and battery storage. (2014). In *29th European Photovoltaic Solar Energy Conference and Exhibiton (EU PVSEC 2014)* (Vol. 29). https://doi.org/10.4229/EUPVSEC20142014-7AV.6.8

4.4 Total Electricity Generation

According to data from the India Climate and Energy Dashboard (ICED)[4]The total electricity consumption in India in FY 2024-25 is 1622.97 TWh (1,622,969 MU). This value is used to estimate the share of self-consumed electricity in the total national electricity consumption.

5. Calculations

The self-consumption of grid-connected rooftop PV systems is calculated with the help of

Self-Consumption = *Installed Capacity* × *Specific Yield* × *Self-Consumption Ratio* ..Eq. (1).

For the lower estimate of self-consumption by grid-connected rooftop solar PV systems:

$$Self\text{-}Consumption = 17.017 \times 10^6\, kW \times 1400\ kWh/kW \times 0.2 = \mathbf{4.76\ TWh}$$

For the upper estimate of self-consumption by grid-connected rooftop solar PV systems:

$$Self\text{-}Consumption = 17.017 \times 10^6\, kW \times 1400\ kWh/kW \times 0.85 = \mathbf{20.25\ TWh}$$

6. Result and conclusion

Based on the estimation approach adopted in this study, the total electricity self-consumed by rooftop solar PV systems in India is estimated to range from **4.76 TWh to 20.25 TWh** annually. Compared with the total national electricity consumption of 1622.97 TWh in FY 2024–25, the estimated self-consumption from grid-connected rooftop solar PV systems accounts for approximately **0.29% to 1.25%** of that total. This indicates that although rooftop solar PV installations have expanded significantly in recent years, the electricity generated and consumed on-site currently constitutes a relatively small share of the country's overall electricity use.

The estimated range nevertheless highlights an important emerging component of the electricity system that is not fully captured in conventional grid-based statistics. Even at the lower bound, several terawatt-hours of electricity are generated and consumed directly at the point of use, effectively reducing the amount that would otherwise have been supplied through the grid. As rooftop solar deployment continues to expand under programmes such as the PM

[4] ICED | Electricity Consumption for FY 2024-25 (Original Source: CEA) https://iced.niti.gov.in/energy/electricity/distribution/pages/consumer-profile#electricity-consumption

Surya Ghar: Muft Bijli Yojana and other distributed solar initiatives, the share of behind-the-meter generation in total electricity consumption is likely to increase. This underscores the importance of developing improved data collection mechanisms and statistical methodologies to systematically account for self-consumed electricity from distributed solar PV systems in national energy statistics.

7. Limitations and Future Scope

7.1 Limitations of the methodology

- The estimation is based on aggregate installed rooftop PV capacity, and does not incorporate plant-level operational data on generation or exports.
- Annual performance degradation of PV systems has not been considered; older installations may produce less electricity than newly commissioned systems.
- The self-consumption ratios used in the estimation are not primarily derived from India-specific empirical studies, due to the limited availability of measured data for rooftop PV systems in India.
- The methodology assumes uniform performance (CUF/specific yield) across all rooftop PV systems, whereas actual generation varies depending on system design, orientation, shading, equipment quality, and maintenance.
- Regional variations in solar resource and climatic conditions across India have not been explicitly incorporated in the estimation.
- Differences in consumer categories (residential, commercial, industrial, institutional), which influence self-consumption behaviour, have not been fully represented due to limited data availability.
- The estimation does not account for changes in operational performance due to system downtime, inverter losses, or maintenance practices.
- Possible electricity exports from rooftop PV systems to the grid could not be explicitly separated because comprehensive export data from distribution utilities were not available for aggregation.

7.2 Future scope for improving the methodology

The present approach provides an initial approximation intended to indicate the possible magnitude of self-consumed electricity from distributed solar PV systems. The methodology can be improved as more comprehensive data become available. Future work could incorporate generation and export data from rooftop PV systems collected by distribution utilities, net meters, or smart meters, enabling more accurate estimation of self-consumption. The use of India-specific empirical studies on rooftop PV performance and self-consumption behaviour, differentiated by consumer category and geographic region, would also improve parameter selection.

In addition, future methodologies may account for system age and performance degradation, regional differences in solar resource, and evolving deployment patterns under national programmes such as PM Surya Ghar. With improved data availability and monitoring infrastructure, the estimation framework can gradually evolve from the current approximation toward data-driven measurement of distributed solar generation and self-consumption in national electricity statistics.

INDIA EV ELECTRICITY DEMAND ASSESSMENT REPORT

(Category-wise National Electricity Demand Evaluation of Electric Vehicles)

1. Introduction

India is witnessing rapid electrification of the transportation sector across two-wheelers, three-wheelers, passenger cars, buses, and freight vehicles. The increasing penetration of electric vehicles (EVs) introduces additional electricity demand on the national grid, making it essential to quantify category-wise energy consumption for future infrastructure planning.

This report presents a national-level electricity demand assessment for EVs using operational vehicle characteristics, penetration levels, annual travel behavior, and specific energy consumption metrics.

The electricity demand for each vehicle category is computed using:

$$E_{cat} = N_{veh} \times P_{EV} \times D \times e$$

Where:

- N_{veh}= National vehicle fleet size
- P_{EV}= EV penetration rate
- D= Average annual distance travelled
- e= Specific energy consumption (kWh/km)

The assessment covers:

- ✓ Electric Two-Wheelers (2W)
- ✓ Electric Three-Wheelers (3W)
- ✓ Electric Light Motor Vehicles (LMV)
- ✓ Electric Medium Motor Vehicles (MMV)
- ✓ Electric Heavy Motor Vehicles (HMV)

2. Dataset and Modeling Parameters

Vehicle Category	Vehicle Segment Description	National Fleet Size (Nveh)	Assumed Share of National Fleet	EV Penetration Rate (PEV)	Estimated EV Population	Average Annual Distance D (km/year)	Specific Energy Consumption e (kWh/km)	Annual Energy per EV (kWh/year)	Total Annual Electricity Demand (kWh/year)	Total Annual Electricity Demand (Million kWh)	Primary Data / Reference Basis
2W	Electric Two-Wheelers	307440000	70%	1.42%	4365648	12000	0.04	480	2095511040	2095.51	NITI Aayog E-2W Penetration Framework
3W	Electric Three-Wheelers	17570000	4%	23.57%	4144490	35000	0.085	2975	12320683225	12320.68	CEEW Vehicle Ownership Cost Analysis
LMV	Electric Light Motor Vehicles / Cars	74660000	17%	0.57%	425562	20000	0.15	3000	1276686000	1276.6	Indian Techno-Economic EV Assessment Studies
MMV	Electric Medium Motor / Goods Vehicles	17570000	4%	0.03%	5271	30000	0.18	5400	28463400	28.46	LBNL Freight Electrification Profiles
HMV	Electric Heavy Motor Vehicles / Buses / Trucks	21960000	5%	0.15%	32940	120000	1.1	132000	4348080000	4348.08	NITI Aayog & RMI Zero-Emission Trucking Reports
TOTAL	Aggregate National EV Demand	439200000	100%	-	8973911	-	-	-	20069423665	20069.43	Integrated National EV Demand Assessment

3. Category-Wise Electricity Demand Analysis

The total estimated EV population across all analyzed categories is approximately **8.97 million vehicles**. The computed national EV electricity demand is:

- Equivalent to **20.07 TWh/year**

This demand corresponds to approximately 1.1% of India's annual electricity generation (~ 1829.7 TWh/year), indicating that current EV penetration remains manageable for the national power grid.

3.1 National Electricity Demand by Vehicle Category

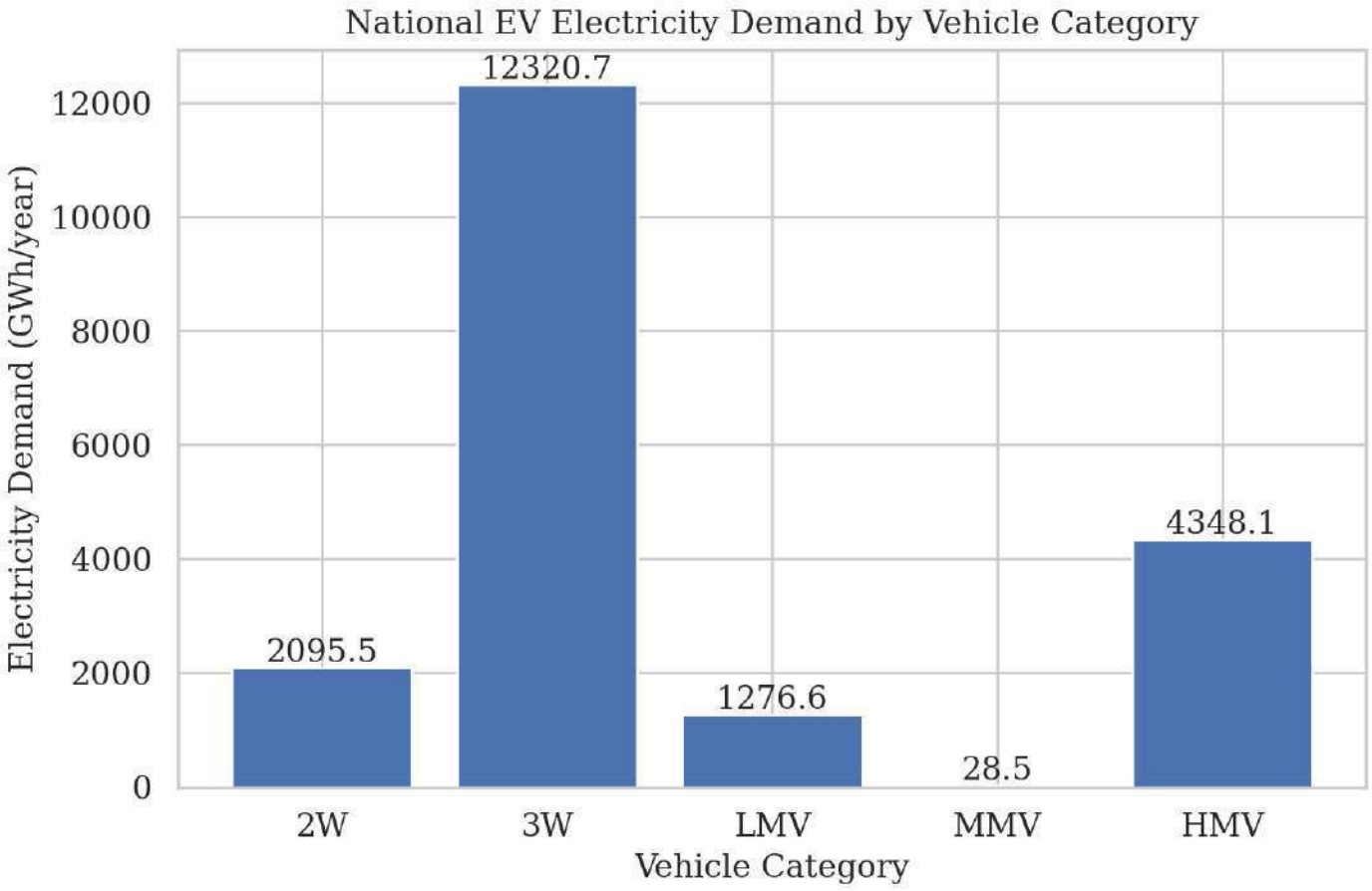

Fig. 1: Electric 3W vehicles contribute the highest electricity demand (12,320.68 GWh/year), followed by HMV (4,348.08 GWh/year), despite significantly smaller fleet sizes than 2W vehicles. This indicates that commercial utilization and annual driving distance.

3.2 EV Population Distribution by Vehicle Category

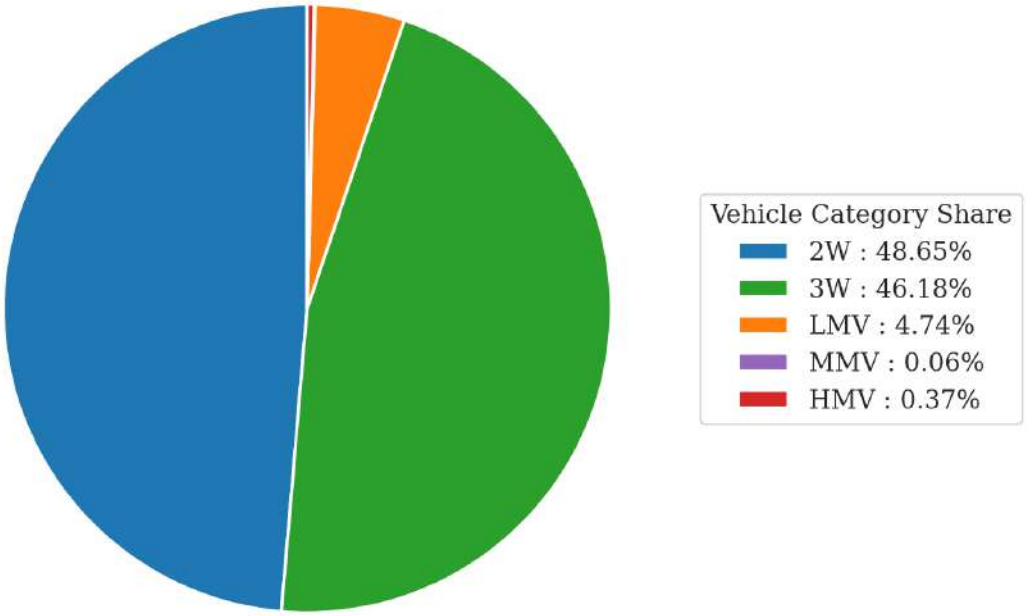

Fig. 2: Electric 2W vehicles represent the largest EV population (4.37 million vehicles), closely followed by 3W vehicles (4.14 million vehicles), while MMV and HMV segments remain at early electrification stages.

3.3 Annual Energy Consumption per EV

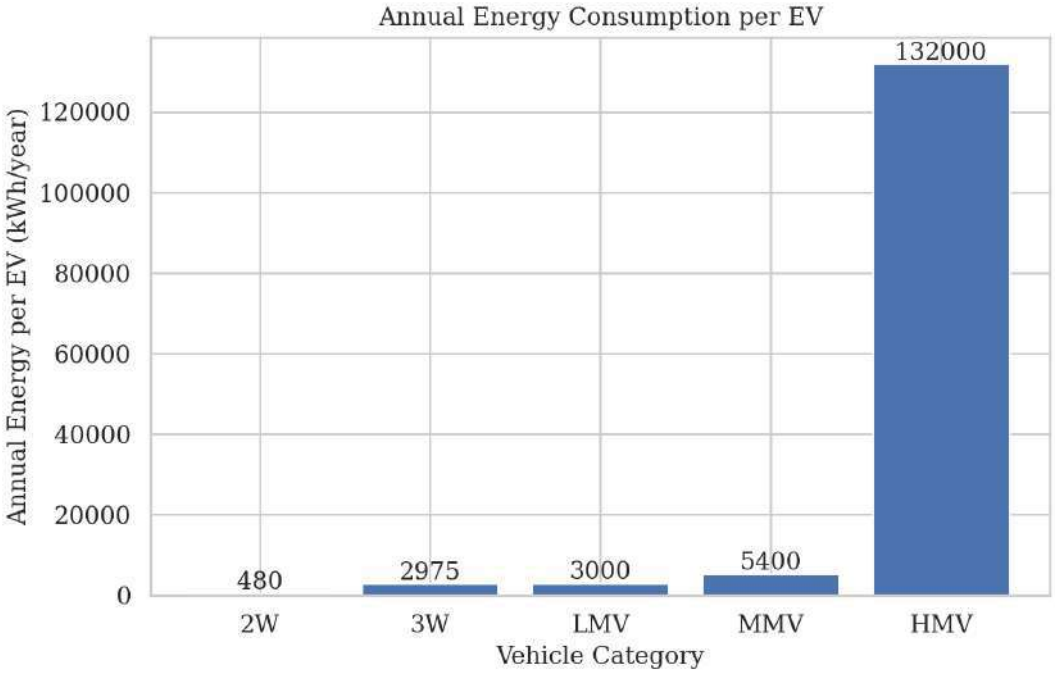

Fig. 3: Annual energy consumption increases significantly with vehicle size, ranging from 480 kWh/year for 2W vehicles to 132,000 kWh/year for heavy commercial vehicles due to higher payload and long-distance operation.

3.4 Energy Consumption Characteristics

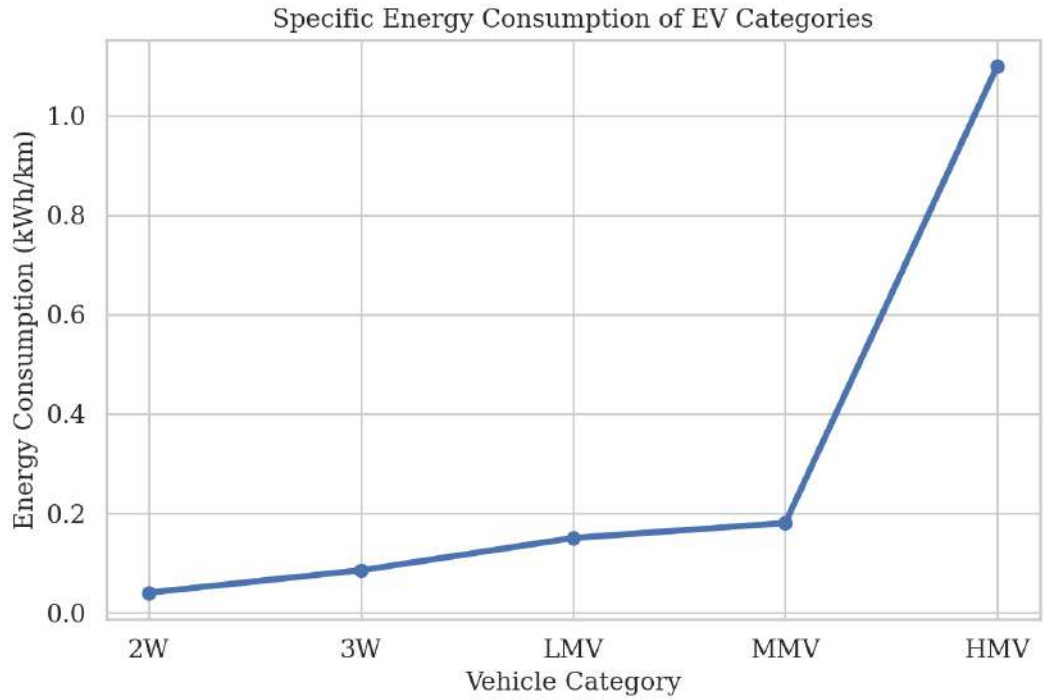

Fig. 4: Specific energy consumption rises from 0.04 kWh/km for 2W vehicles to 1.10 kWh/km for HMV vehicles, demonstrating the direct impact of vehicle mass and operational load on energy intensity.

3.5 Vehicle Utilization Analysis

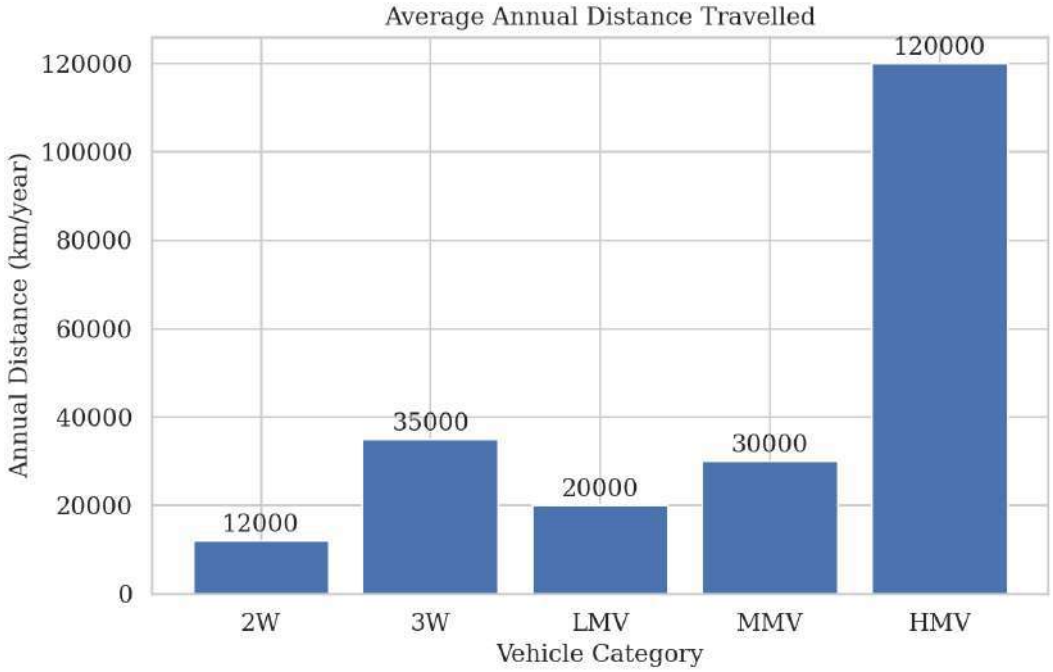

Fig. 5: Commercial EV segments show substantially higher annual utilization, with HMV vehicles travelling nearly 120,000 km/year compared to 12,000 km/year for 2W vehicles, leading to higher electricity demand concentration.

3.6 Fleet Size versus Electricity Demand

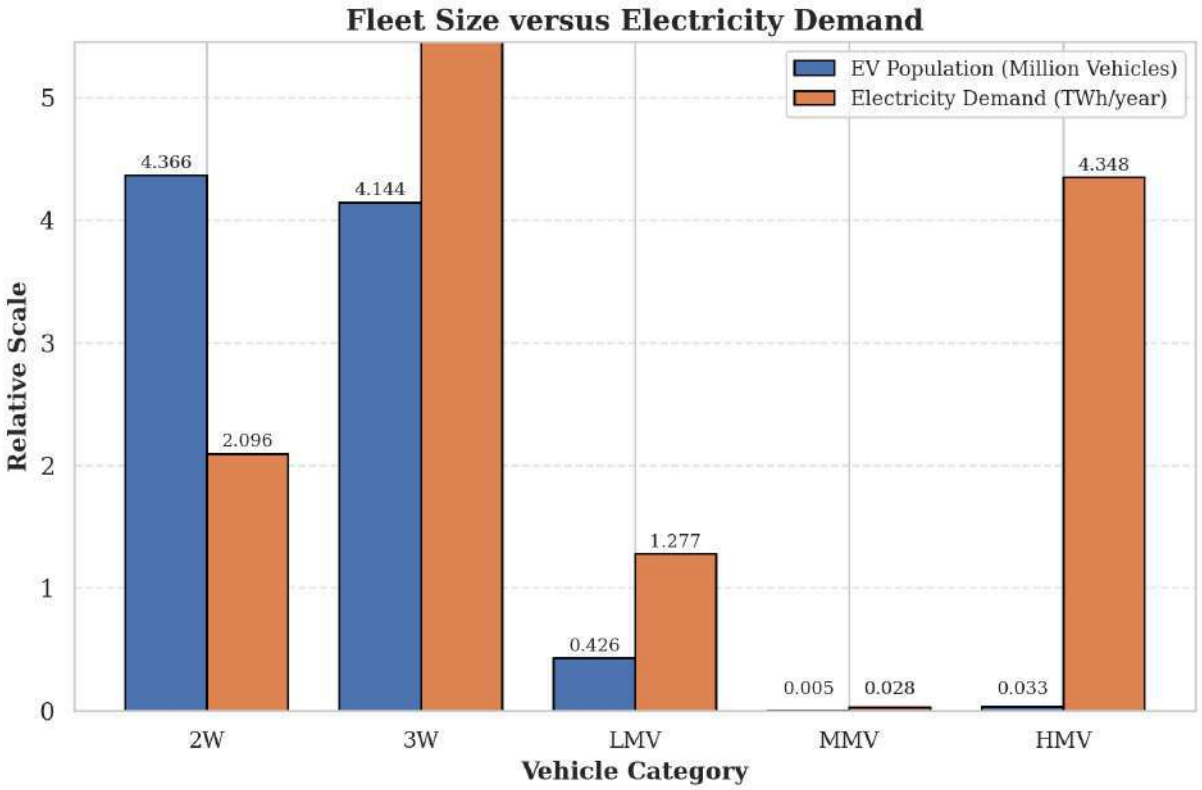

Fig. 6: Although 2W vehicles dominate fleet population, their electricity demand remains lower than 3W and HMV categories because of lower annual distance and lower per-kilometer energy consumption.

3.7 Share of Total National EV Electricity Demand

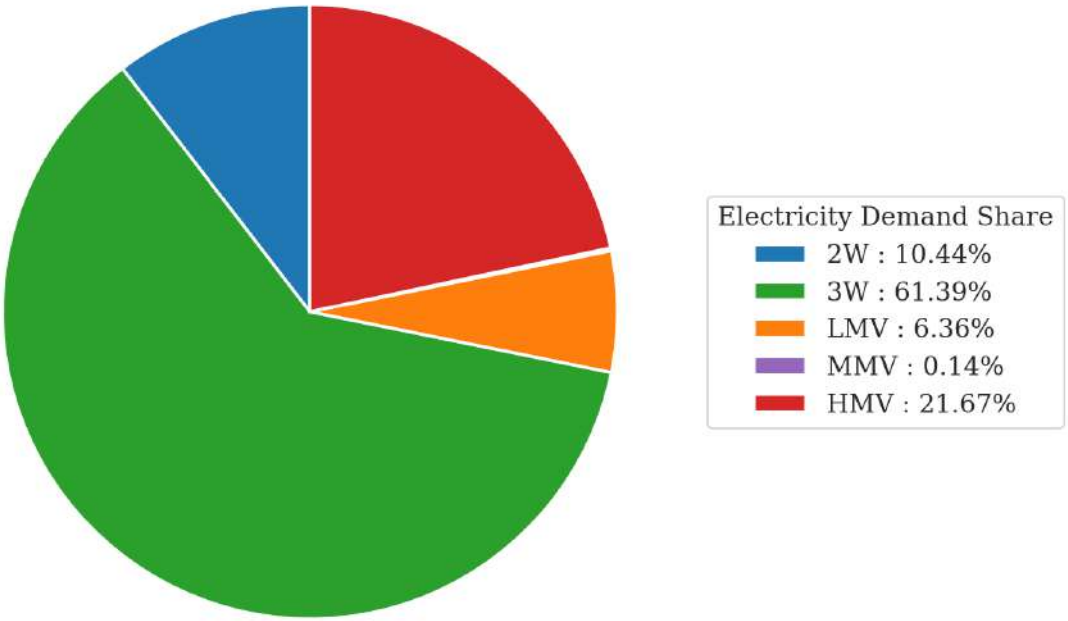

Fig. 7: Electric 3W vehicles account for the dominant share of national EV electricity demand (~61%), while HMV vehicles contribute ~22% despite very low EV penetration levels, highlighting the strong impact of commercial transport electrification.

4. Key Insights

S. No.	Key Insight	Observation
1	Largest EV Population Segment	Electric Two-Wheelers (2W)
2	Largest Electricity Demand Segment	Electric Three-Wheelers (3W)
3	Highest Per-Vehicle Energy Consumption	Heavy Motor Vehicles (HMV)
4	Most Energy Efficient Category	Electric Two-Wheelers
5	Major Driver of Grid Demand	Commercial EV Fleets
6	Current Grid Impact	Approximately 1.1% of national generation

5. Infrastructure Planning Implications

The results indicate that future EV charging infrastructure deployment should prioritize:

- Commercial three-wheeler charging corridors
- Urban fleet charging stations
- Bus depots and freight charging hubs
- Fast-charging infrastructure for heavy-duty transportation

Residential charging associated with two-wheelers is comparatively manageable because of lower charging power and lower annual electricity consumption.

6. Conclusion

This study presents a category-wise national assessment of EV electricity demand in India using operational energy consumption modeling. The analysis demonstrates that:

- Electric three-wheelers currently dominate electricity demand.
- Two-wheelers dominate total EV population.
- Heavy-duty EVs exhibit extremely high energy intensity.
- Current national EV electricity demand remains within manageable grid limits.

The presented framework can support future planning of charging infrastructure, grid expansion studies, urban energy management, and transportation electrification policy development.

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