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Market Assessment Study and Technical Analysis Support: India's Efficiency Policy Development for Pedestal Fans

Comprehensive Market Assessment

December 2022

Partners

CLASP

ICF Consulting India Pvt. Ltd.

Disclaimer

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List of abbreviation

AC	Air Conditioning
BEE	Bureau of Energy Efficiency
BIS	Bureau of Indian Standards
CAGR	Compound Annual Growth Rate
CGF	Competitive Grants Facility
DCs	Designated Consumers
EWS	Economically Weaker Section
GHG	Green House Gases
ICAP	India Cooling Action Plan
IEC	International Electrotechnical Commission
IFC	International Finance Corporation
IFMA	Indian Fan Manufacturers Association
INR	Indian Rupee
LIG	Low Income Group
MEPS	Minimum Energy Performance Standard
MOIT	Ministry of Industry and Trade
NABL	National Accreditation Board for Testing and Calibration Laboratories
S&L	Standards & Labeling
SEC	Specific Energy Consumption

US	United States

Acknowledgment

We express our sincere gratitude to CLASP for entrusting ICF with the project titled ‘Market Assessment Study and Technical Analysis Support of India’s Efficiency Policy Development for Pedestal Fans’.

We express our sincere thanks to CLASP for its support and guidance in the preparation of this Comprehensive Market Assessment Report.

Executive Summary

The fan industry in India has experienced remarkable growth over the years and is now well-established. Presently, the Indian fan industry produces more than 60 million units annually and is valued at approximately INR 8,000 crores ($1.07 billion; FY 2018–19). Between FY12 and FY17, the industry witnessed a compound annual growth rate (CAGR) of 9%. Furthermore, the electric fan market in India is projected to surpass $2 billion by 2023, driven by the expanding presence of organized retail outlets, increasing purchasing power, and growing preference for online sales platforms and modular homes.

Furthermore, government initiatives such as the Integrated Power Development Scheme ("IPDS") and the Deendayal Upadhyaya Gram Jyoti Yojna ("DDUGJY") are expected to have a positive impact on the country's electric fan market.

The fan industry will be boosted further by the India Cooling Action Plan (ICAP), which was launched in 2019 and has a long-term vision to address cooling demand across sectors and lists actions that can help reduce cooling demand. It aims to reduce cooling demand across sectors by 20% to 25% by 2037-3 and cooling energy requirements by 25% to 40% by 2037-38. These actions will have a significant impact on the environment.

Apart from the obvious environmental benefits, ICAP would provide the following societal benefits in addition to environmental benefits: (i) thermal comfort for all - provision for cooling in EWS and LIG housing; (ii) sustainable cooling - low GHG emissions associated with cooling; (iii) increased employment owing to domestic manufacturing of electric fans and other cooling equipment; and (iv) robust R&D on alternative cooling technologies - to spur innovation in the cooling sector.

CLASP collaborated with ICF Consulting India Pvt. Limited to conduct a thorough market assessment and technical analysis of pedestal fans. This study will support in the assessment of the pedestal fan market - to understand product sales, import and export trends, available Indian test standards and test facilities, international labeling program comparisons, and recommendations for developing energy efficiency metrics for pedestal fans.

Pedestal fans are common electrical appliances used to circulate cool breeze around a larger space and regulate temperature. Due to their portability and affordability, pedestal fans are in high demand in India. While domestic production of the fans are done by both 9norganiz and 9norganized manufacturers, a significant number of pedestal fans are also imported into India.

The report proposes service value as the energy performance metric, based on the minimum service values specified in Indian Standard (IS) IS 1169:1967. Based on an assessment of service values through market research for around 1000 models, the proposed energy efficiency metric can be used to develop energy efficiency policy by Bureau of Energy Efficiency(BEE). On implementation of this metric, associated energy savings and GHG savings are projected. The proposed labeling program focuses on pedestal fans of sweep sizes as per IS 1169 i.e., 300 mm, 400 mm, 500 mm & 600 mm.

According to the technical analysis, it is estimated that the Indian market for pedestal fan will grow upto 9.3 million by 2030. Implementation of policy based on this study is estimated to save 4.4 TWh of electricity and 3.5 MtCO2 emissions by 2030.

About Pedestal Fans

1. About Pedestal Fans

1.1 About the technology

In the tropical country of India, one is unable to picture a home without a fan. Fans, unlike air conditioning technology, do not lower the temperature or relative humidity of the air; rather, they improve convection and help sweat evaporate to produce a cooling effect. Fans are more common in areas where the weather is hot and humid. There are three broad categories of fan technology (Figure 1).

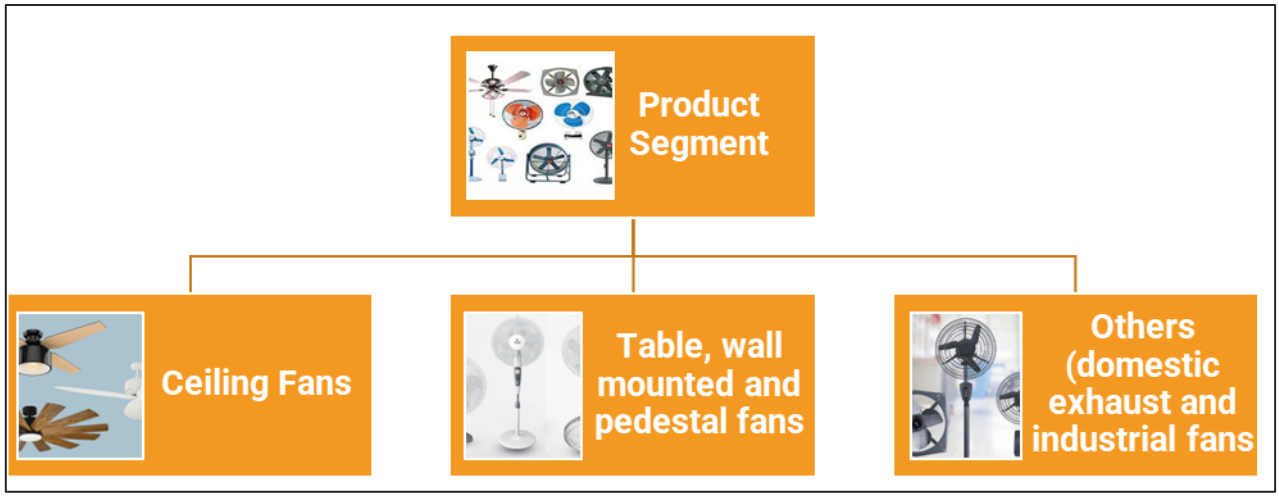


Figure 1: Electric fan product segmentation

India's fan industry is well-established and has grown significantly over the years. The industry currently produces over 60 million units per year and is worth approximately Rs. 8,000 crores ($1.07 billion; 2018-19). From FY12 to FY17, the industry grew at a 9% CAGR. By 2023, electric fan sales in India are expected to exceed $2 billion[1]. Figure 2 depicts the Indian Fan Market[2] by Product Type.

There are over 500 manufacturers of fans and associated fan components in India. The industry also boasts a nationwide

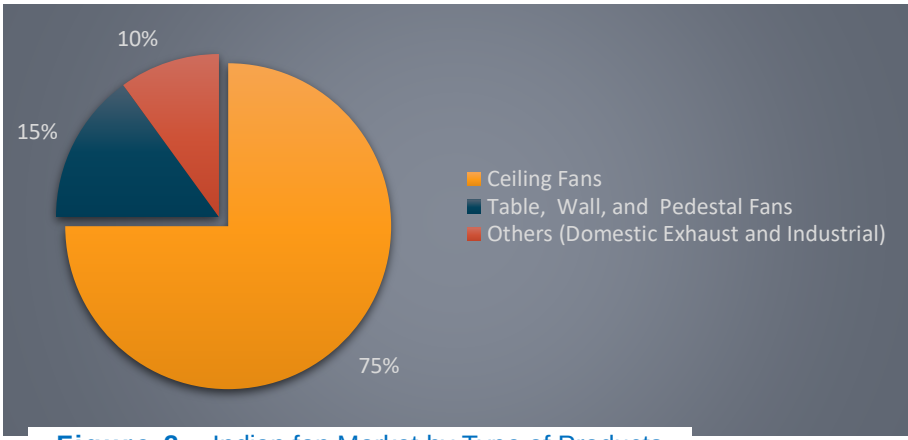


Figure 2 : Indian fan Market by Type of Products

[1] Source: India Electric Fans Market by Type, By Distribution Channel, By End User, Competition Forecast & Opportunities, 2013-2023

[2] Source: Frost & Sullivan Analysis (Reference year 2021-22)

distribution network with over 1.5 lakh retail outlets.

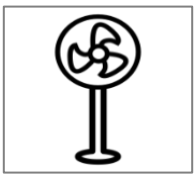
Several factors are driving the Indian fan market, including increased rural electrification, rapid urbanization, increased living spaces, the expansion of organised retail stores, increased purchasing power, and a growing preference for online sales channels and modular homes. This is backed up by several initiatives launched by the Government of India (GoI) to expand housing projects and develop smart cities across the country. In line with this, increased access to electricity, particularly in rural areas, is catalysing the market growth. Furthermore, rising disposable incomes and concept of nuclear families both in rural & urban areas are fueling a significant demand for fans with aesthetically pleasing designs and smart features, such as voice control and remote connectivity via smart devices, propelling overall product sales forward.

Pedestal fans are not only used for residential purposes but are more widely used in commercial & industrial establishments, office spaces, warehouses, institutions etc. Because of their portable design they are perfect fit for usage in all kinds of settings.

India's organised and unorganised markets dominate the electric fan market, resulting in a diverse range of electric fans. Owing to the competition between 14norganiz and 14norganized businesses, the industry's dynamics have shifted over time. While, the organised market has overall grown significantly in terms of both volume and revenue, the unorganised market has largely catered to the rural market.

Crompton Greaves Consumer Electricals Ltd., Usha International Ltd., Havells India Limited, Bajaj Electricals Ltd., Orient Electric Limited, V-Guard Industries Ltd., Metro Ortem Ltd., Vishva Electrotech Limited, Khaitan Electricals Ltd., Surya Roshni Limited, and few others are among the major players in the Indian electric fan market.

1.2 Pedestal Fans



A pedestal fan is a common electrical appliances used in houses, offices, and shops. It helps in air circulation and to cool down the temperature. Pedestal fans comprise of a propeller-type fan with two or more blades directly driven by an AC or DC electric motor, mounted on a pedestal , intended for use with a free inlet and outlet of air. The pedestal may be fixed in height or adjustable, depending on the product.

According to consumer behaviour research, while purchasing a fan, consumers prioritise three key elements (i) air delivery (cubic metres per minute or cubic feet per minute); (ii) sweep area (mm); iii) power consumption (watt). While many of the manufacturers in both the organised and unorganised sectors meet the performance requirements of the Indian Standard, IS 1169:1967,

some don't. The pedestal fan models available in India are classified based on their sweep size (Table 1).

Table 1: Sweep size of Pedestal Fans

S. No	Sweep Size (mm)
1	300
2	400
3	500
4	600

1.3 Major Components of Pedestal Fan

The primary electrical component of pedestal fans includes a single-phase induction motor and a capacitor that provides the starting torque to the motor that allows the fan to start and run. The other mechanical and electronic components include fan blades, bottom bulk, front grill, rear grill, cross leg bar, and motor housing. Table 2 summarizes the major pedestal fan components and their functions.

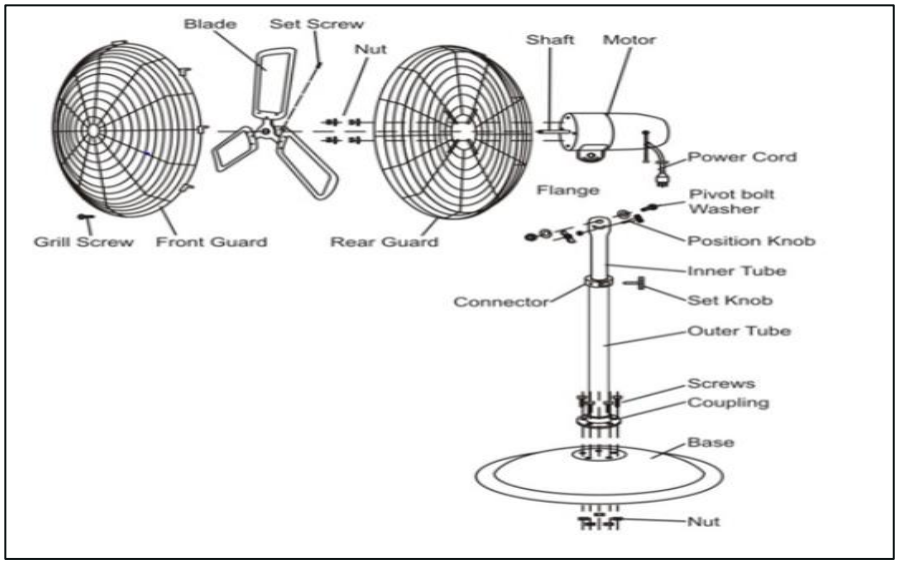


Figure 3 : Major Components of Pedestal Fan

Table 2: Major Components of a pedestal fan

Major Components
Motor: The heart of the fan as it converts electrical energy into mechanical output energy
Blades: They are connected to the motor which spin and creates airflow
Hub/motor housing: House motor which connects the fan blade with the motor
Guard: To protect against personal injury to consumers
Mounting/Base means attaching the fan system (motor & blades) & other components to its bottom.

Oscillating mechanism allows the fan to be employed either as a stationary or in oscillating mode.
Supply cord: Connects to the electric power supply

Comprehensive Market Assessment

2. Comprehensive Market Assessment

A comprehensive market assessment study was conducted through questionnaires, consultation with the fan manufacturers' association, interviews of relevant stakeholders, and secondary research.

2.1 Pedestal Fans Market in India

Manufacturing of pedestal Fan has increased steadily between FY 2018-19 to FY 2019-20. In FY 2020-21 there is a decline due to COVID-19 pandemic. (Figure 4[3])

The information gathered for the study were both primary and secondary sources of data. Primary data was gathered through questionnaires, consultation with the fan manufacturers association, i.e., the Indian Fan Manufacturers Association (IFMA), interviews with fan manufacturers, and market surveys. Secondary research was done on the production market in India, the import and export market, a list of significant manufacturers, and the commercial products they manufacture.

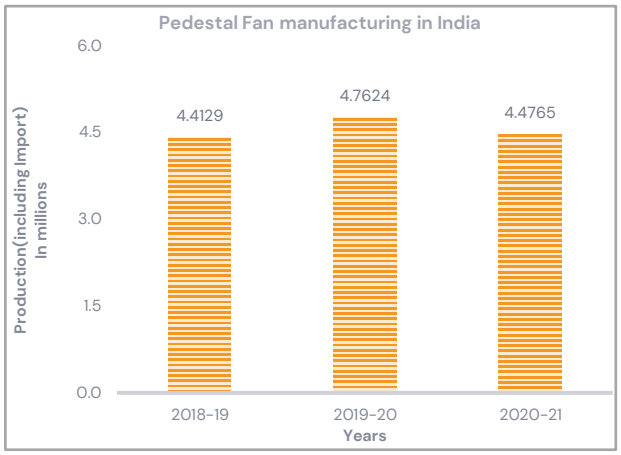


Figure 4 : Pedestal Fan Manufacturing in India as per IFMA members

2.2 Domestic Manufacturing vs Import in India

Based on the primary research, a significant proportion of the current market demand is met through import from external players. Some reasons for this are:

High domestic cost for raw materials such as iron, steel, and other metals
High domestic cost of fuel
Chinese manufactured fans are 15%-20% cheaper than domestically manufactured fans.

The scenario of domestic manufacturing (including import) and exclusively import for FY 2018-19 to FY 2020-21 is represented in Figure 5. The share of import in total domestic manufacturing is represented in Table 3[4].

[3] As per Indian Fan Manufacturers Association (IFMA)

[4] The reduction in import could be attributed to two factors: (i) Production Linked Incentive(PLI) scheme which aims to give companies incentives on incremental sales from products manufactured in domestic units. The scheme invites foreign companies to set up units in India, however, it also aims to encourage local companies to set up or expand existing manufacturing units and also to generate more employment and cut down the country's reliance on imports from other countries. (ii) Consumer behavior : The behavior of Indian consumer has been changing and its more focused towards products manufactured in India.

Table 3 : Share of import in domestic manufacturing of pedestal fan

Year	Share of Import in %
2018-19	65%
2019-20	62%
2020-21	51%

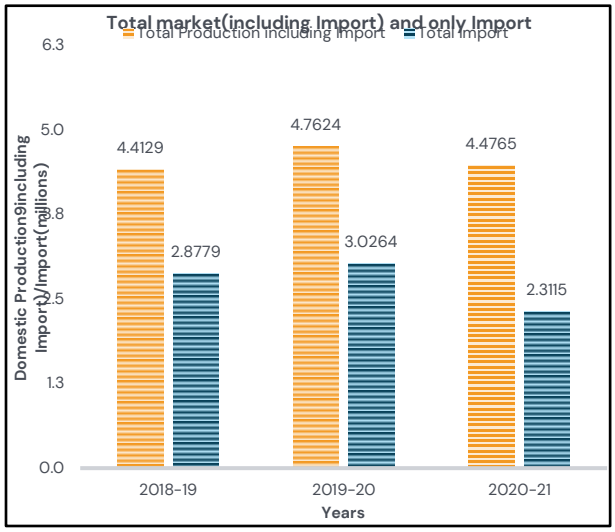


Figure 5 : Total market(including import) and import only

2.3 Import Vs Export

Import and Export data was collected from the Ministry of Commerce for the last 10 years as a part of the data collection.

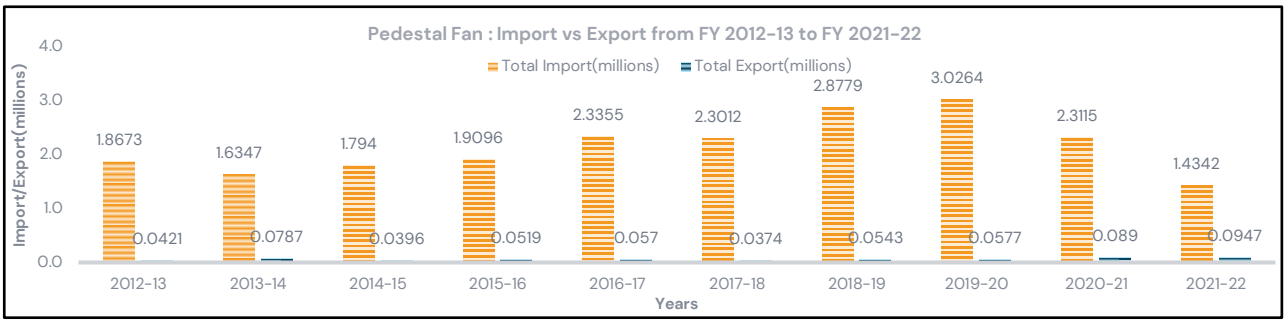
- In the case of import, a steady decline has been observed for Pedestal Fan CAGR of 3%.

- It is observed that Export for Pedestal Fan has been increasing steadily at a CAGR of 8%.

- The annual Export & Import numbers for Table Fans from FY 2012-13 to FY 2021-22 are represented in Figure 6.

The analysis revealed that over 50 manufacturers with more than 1000 pedestal fan variants are present in the Indian Market (Figure 7[5])

Figure 6 : Pedestal Fan : Import vs Export from FY 2012-13 to FY 2021-22



- The fan models are categorized based on the sweep size. The 400 mm sweep size fans have the highest market (63%) followed by 500 mm(17%) , 600 mm (14%) & 300 mm (6%).
- Famous big brands contribute to 80% of organised manufacturing sector.

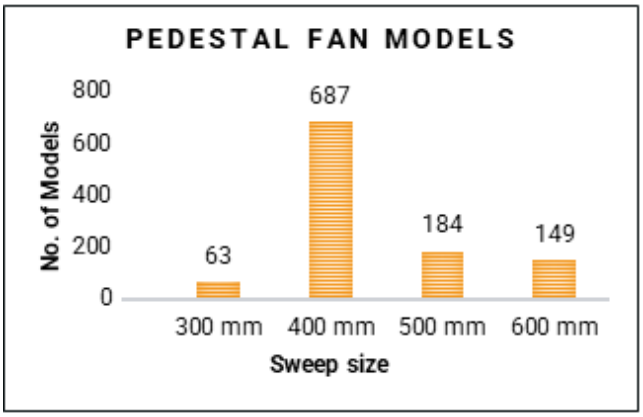


FIGURE 7: No. of models based on sweep size

[5] As per findings from market study (consultations, questionnaire-based survey & secondary research)

Review of Performance Standards and Available Test Facilities in India

3. Review of Performance Standards

This chapter reviews and compares the performance test standards for pedestal fans. Table 4 below provides the relevant Indian standard.

TABLE 4 : RELEVANT INDIAN STANDARDS FOR PEDESTAL FANS

Standard	Published Year	Title
IS 1169	1967	Electric pedestal type fans and regulators

3.1 Assessment of Performance Standards

The table below provides an assessment of the Indian Standard for pedestal fans i.e., IS 1169.

TABLE 5 : ASSESSMENT OF INDIAN STANDARD FOR PEDESTAL FANS

Parameter	IS 1169
Scope	Ac capacitor type and non-capacitor type pedestal fans, oscillating or non-oscillating, and their associated regulators intended for use on single-phase ac circuits at voltages not exceeding 250 volts suitable for normal domestic and similar uses.
Definition	A propeller type fan having two or more blades directly driven by an AC or DC electric motor mounted on a pedestal of fixed or variable height and intended for use with free inlet and outlet of air.

Test Type	**a. Type Tests:** 1. Air delivery 2. Temperature-rise 3. Moisture proofness (for regulators only) 4. Cord grip test 5. Mechanical endurance (for regulators only) 6. Power factor 7. Ac leakage test 8. All acceptance tests 9. Oscillating mechanism (under consideration). 10. Speed regulation **b. Acceptance Tests:** 1. Starting 2. High voltage 3. Earthing continuity 4. Electrical input 5. Fan speed **c. Routine Tests:** 1. Flash test 2. Insulation-resistance 3. A simple running test
Service value	The air delivery in cubic meters per minute (m3 /min) divided by electrical power input to the fan in watts at the rated voltage and frequency specified for the test. In the event of the fan comprising an oscillating mechanism, the electrical input in watts is measured with the fan under normal full speed conditions, that is with an oscillating mechanism in action, whereas the air delivery is determined with the oscillating mechanism out of action

3.2 Comparison of Test Standards

This is a comparison between Indian and global test standards for Pedestal Fans. Table 6 below provides a comparison of different test standards for Pedestal Fans. Most of the standards adopted by various countries are in-line with IEC standard.

TABLE 6 : COMPARISON OF TEST STANDARDS ADOPTED BY DIFFERENT COUNTRIES

	India	IEC	Indonesia	Malaysia	China	Vietnam	South Korea
Test Standard	IS 1169 : 1967	IEC 60879: 2019	SNI IEC 60879:2013	MS 2574:2014 MS 1220:2010	GB/T 13380-2018 GB 12021.9-2008	TCVN 7827: 2007	KS C 9301
Scope	Pedestal of fixed or variable height	Ceiling fan, table fan, pedestal fan	Desk fan, floor fan, wall fan, ceiling fan, combo fans	Moving louver fan, Ceiling fan, Pedestal fan, Table fan, Wall fan	Ceiling fan, table fan, pedestal fan	Ceiling fan, table fan, pedestal fan	Household electric fan, desktop, or stand
Test parameters on performance	Air delivery Fan speed Power factor & power input	Air flow performance Fan speed Power factor & power input	Air flow performance Fan speed Power factor & power input	Air delivery Input power & power factor Noise RPM	Air flow performance Fan speed Power factor & power input	Air flow performance Fan speed Power factor & power input	Air flow performance Fan speed Power factor & power input
Test conditions	Test Chamber for testing total air delivery Measured at rated power & max speed Ambient temperature is not mentioned	Chamber for testing total air delivery Measured at rated power & max speed Ambient temperature 20 ^{0}C	Chamber for testing total air delivery Measured at rated power & max speed Ambient temperature 20 ^{0}C	Chamber for testing total air delivery Measured at rated power & max speed Ambient temperature 20 ^{0}C	Chamber for testing total air delivery Measured at rated power & max speed Ambient temperature 20 ^{0} C	Chamber for testing total air delivery Measured at rated power & max speed Ambient temperature not specified	Ambient temperature 25 ^{0}C

3.3 Comparison of Test Standard Requirements between Indian Standard (IS) and International Standard (IEC)

Below table gives a comparison between IS & International Standard (IEC) for Pedestal fans.

TABLE 7 : COMPARISON OF TEST STANDARD REQUIREMENTS BETWEEN IS & IEC

	IS 1169	IEC 60879
Fan power input	• Power input of the fan operating at its maximum flow rate, measured with the oscillation mechanism, if any, turned off	• Power input of the fan operating at its maximum flow rate, measured with the oscillation mechanism and the moving louvre, if any, turned off
Maximum fan flow rate	• Air flow rate of the comfort fan at its maximum setting [m3/min], measured at the fan outlet with the oscillating mechanism if any, turned off	• Air flow rate of the comfort fan at its maximum setting [m3/min], measured at the fan outlet with the oscillating mechanism if any, turned off
Dimension of Chamber	• Length: 6.0 m, width: 4.50 m, height: 3 m	• Length: 6.0 m, width: 4.50 m, height: 3 m
Air movement	• low velocity rotating vane anemometer having an internal diameter of 70 mm, suitable for the range of velocity to be measured. Rotating vane anemometers having a diameter up to 100 mm may also be used alternatively.	• The air movement shall be measured by means of a rotating vane anemometer having an internal diameter not exceeding 100 mm suitable for the range of velocities to be measured
Air velocity	• Readings shall start at a point 20 mm from the axis of the fan blades and shall progress along the horizontal line in each direction, by increments of 40 mm width. Readings shall be continued in each direction until the true air velocity falls below 24 m per minute. • When using an anemometer to measure the speed of airflow, each reading should be based on the time it takes for an air movement of 200 mm. If this air movement takes longer than two minutes, then the reading should be based on a different quantity of air that takes approximately two minutes to move. Regardless of the quantity of air used, the reading should last for at least one minute.	• Air velocity readings shall be commenced at a point 20 mm from the axis of the fan blades and shall progress along the horizontal line in each direction, by increments of40 mm wide. Readings shall be continued in each direction until the true air velocity falls below 24 m/min. • When using an anemometer to measure the speed of airflow, each reading should be based on the time it takes for an air movement of 300 mm. However, if this air movement takes more than two minutes, then the reading should be based on a different quantity of air that takes approximately two minutes to move. Regardless of the quantity of air used, the reading should last for at least one minute.

Test methodology in IS 1169 and IEC 60879 are aligned except for air delivery where the time taken for air movement of 200 mm is taken against 300 mm specified in IEC 60879.

3.4 Performance requirement as per Indian Standard

The specification of minimum Air Delivery, minimum Service Value, and maximum Input for Electric Pedestal Type Fans as per IS 1169-1967 are given in Table 8.

TABLE 8 : Specification for electric pedestal type fans in is 1169-1967

FAN SIZE (mm)	TYPE	AIR DELIVERY (m^3/min.)	SERVICE VALUE (m^3/min./W)	MAXIMUM INPUT (W)
300	Capacitor AC	30	0.75	40
400	Capacitor AC	65	1.08	61
500	Capacitor AC	90	1.0	90
600	Capacitor AC	150	1.1	137

3.5 Testing facilities in India

There are about five NABL-accredited third-party laboratories for Pedestal Fans which are used for performance testing and quality checks requested by the user. Here is a list of accredited testing laboratory for pedestal fans in India .

TABLE 9 : List of Testing laboratories for pedestal fans in India

S. No.	Name of Laboratory	Accreditation Body	Location
1.	Akshat Test Lab & Calibration Services	NABL	Ghaziabad, Uttar Pradesh
2.	Classic Testing & Research Centre	NABL	Noida, Uttar Pradesh
3.	Delhi Test House	NABL	Sonipat Kundli Haryana
4.	Emtac Laboratories Private Limited	NABL	Keesara Hyderabad, Telangana
5.	Poweronic Test & Research Centre	NABL	Greater Noida, Uttar Pradesh

Comparison of International Labelling Programs for Pedestal Fan

4.International Labeling Programs

This section provides an overview of International Labeling Programs for Pedestal Fans, including their scope, energy efficiency parameters, voluntary or mandatory status, endorsement, MEPS or comparative label, and other relevant information. Most countries have a common rating plan, but India has different standards for each type of fan, which means labeling programs either do not exist or are in development.

This would help to develop the Star Labeling program for Pedestal Fans according to best practices across the globe.

4.1 Thailand

The Energy Labeling Scheme in Thailand, also known as Label No. 5, was introduced in 1993 through the state-owned utility - the Electricity Generating Authority of Thailand (EGAT). The scheme was part of a larger Demand-Side Management project which started in 1991 and was in line with the policies, established by the Ministry of Energy including the Energy Conservation Promotion Act (1992).

Scope

This labeling program covers tabletop, floor standing, wall mounted, orbit fan, and ventilation type electric fans but excludes ceiling fans.

Energy Efficiency Level

The energy efficiency levels or Service Value are given below.

TABLE 10 : ENERGY EFFICIENCY LEVEL

Type	Propeller size (inch)	Min. Ventilation rate (m^3/min)	No. 5	No. 5 (1 star)	No. 5 (2 star)	No. 5 (3 star)
Table-top, floor-standing, wall-mounted wind fan	12(300 mm)	30	1.10 - 1.15	1.16-1.21	1.22 -1.27	≥ 1.28
	16(400 mm)	60	1.30 - 1.39	1.40 -1.49	1.50 -1.59	≥ 1.60
	18(450 mm)	75	1.25 - 1.34	1.35 -1.44	1.45 -1.54	≥ 1.55

4.2 Vietnam

Ministry of Industry and Trade (MOIT), Vietnam has introduced mandatory MEPS as well as a comparative label for electric fans.

Scope

The scope of the labeling program covers table fans, stand(pedestal) fans, wall fans, and ceiling fans (hereinafter referred to as electric fans) for household and similar purposes. It specifies the minimum energy efficiency and energy efficiency classification of electric fans.

Status

The labeling program became effective in 2007 and was revised in 2015. The revision upgraded the energy efficiency limits and revised the minimum efficiency values for fans of different sizes.

Minimum Energy Efficiency Requirements

All the fans covered under the labelling program are mentioned below:

TABLE 11 : MINIMUM ENERGY EFFICIENCY FOR ELECTRIC FAN

Nominal blade diameter(D), Mm	Minimum energy efficiency m^3/min/W
D < 230	0.54
230 ≤ D < 250	0.64
250 ≤ D < 300	0.74
300 ≤ D < 350	0.8
350 ≤ D < 400	0.9
400 ≤ D < 450	1
450 ≤ D < 500	1.1

Energy Efficiency Grades

Table 12 outlines energy efficiency classes for electric fans, with grade 5 as the most efficient and grade 1 as the least efficient. The Energy Efficiency Index (R) is the ratio of Measured Energy efficiency (Service value) to Minimum Energy efficiency (Service value), and Energy Efficiency grades range from Grade 5 (most efficient) to Grade 1 (least efficient).

TABLE 12 : Energy Efficiency class of electric fans

Energy Efficiency Grade	Energy Efficiency Index , R
1	1.00 ≤ R < 1.15

2	1.15 ≤ R < 1.30
3	1.30 ≤ R < 1.45
4	1.45 ≤ R < 1.60
5	R ≥ 1.60

4.3 Malaysia

Suruhanjaya Tenaga - ST (Energy Commission), Malaysia has introduced mandatory MEPS as well as a comparative label for electric fans.

Scope

The scope of the labeling covers the wall, desk, pedestal, and ceiling fans.

Status

The standard that regulates the testing and performance of electric fans in Malaysia is MS 1220-2010. The test procedure is very similar to IEC 60879. “Coefficient of Performance (COP)” is used instead of, but is equivalent to, service value.

Minimum Energy Efficiency Requirements

The 2-star rating[6] is the minimum energy efficiency requirement for electric fans.

Energy Efficiency Level

The energy efficiency class of all electric fans covered under the scope is specified in Table 13 where grade 5 has the highest efficiency and grade 1 has the lowest efficiency. Energy efficiency is based on Coefficient of Performance(COP) which is Service value(m3/min/W)

TABLE 13 : Energy Efficiency class of electric fan

Star Rating	Coefficient of Performance (COP) m^3 /min/W
1	0.93 ≤ COP ≤ 1.00
2	1.01 ≤ COP ≤ 1.07
3	1.08 ≤ COP ≤ 1.11

[6] 1-star rating is freezed (i.e) no model can be registered under 1-star rating.

4	1.12 ≤ COP ≤ 1.19
5	COP ≥ 1.20

4.4 China

China has introduced mandatory comparative label for electric fans.

Scope

Labeling program for fans with single phase rated voltage below 250V and other rated voltage below 480V includes electric fans including table fans, rotary fans, wall-mounted fans, pedestal fans, and ceiling fans..

Status

The labeling program came into effect in 1989 and was first revised in 2008 followed by the second revision in 2021. In 2021, China's State Administration for Market Regulation issued a revised version of mandatory national standards (GB standards) called the "Minimum allowable values of energy efficiency and energy efficiency grades for electric fans", which came into effect on November 1, 2022.

Minimum Energy Efficiency Requirements

The energy efficiency of electric fans is categorized into 3 levels, , with level 1 being the most energy efficient and level 3 being the least energy efficient. The minimum energy efficiency for each level is specified in a table. The updated standards replace "service value" with "energy efficiency grade" as the equivalent term..

TABLE 14 : Minimum Energy Efficiency grades of fans

Dimension (mm)	Energy efficiency grade 1	Energy efficiency grade 2	Energy efficiency grade 3
200	≥ 1.00	≥ 0.70	≥ 0.60
200 < X ≤ 230	≥ 1.10	≥ 0.84	≥ 0.70
230 < X ≤ 250	≥ 1.30	≥ 0.95	≥ 0.79
250 < X ≤ 300	≥ 1.50	≥ 1.05	≥ 0.86
300 < X ≤ 350	≥ 1.65	≥ 1.15	≥ 0.98
350 < X ≤ 400	≥ 1.85	≥ 1.35	≥ 1.06
400 < X ≤ 450	≥ 2.15	≥ 1.50	≥ 1.19
450 < X ≤ 500	≥ 2.40	≥ 1.55	≥ 1.25
500 < X ≤ 600	≥ 2.65	≥ 1.70	≥ 1.40

4.5 Republic Of Korea

The Republic of Korea has mandatory MEPS and comparative labels for electric fans.

Scope

This scheme pertains to household electric fans, including desktop and pedestal fans, with an axial single-wing powered by an induction motor, and a blade sweep range of 20-41 cm, for general use on tables, pedestals, and other similar surfaces. Ceiling fans are not within the scope of this scheme.

Status

KEMCO introduced the "Energy Efficiency Grade Label" and "MEPS" labeling programs for electric fans in 2009

Minimum Energy Efficiency Requirements

MEPS of **Service value i.e. P** for electric fans is calculated by the formula given below.

$P \geq (0.0304A + 0.1518)*0.9$ (if diameter(A) is greater than 40 cm)

Where, P = Airflow rate efficiency (m3 /min /W), A = Diameter of blade (cm);

Multiply the compensation factor of 0.9 if 40cm or more.

For MEPS, P is rounded off to two decimals.

The minimum energy efficiency for table and pedestal fans as per the above formula is in Table 15 .

TABLE 15 : Minimum energy efficiency for table and pedestal fans

Diameter of Wing (mm)	Energy Efficiency Ratio (m^3/min/W)
200	0.76
250	0.91
300	1.06
400	1.25

Energy Efficiency Level

Table 16 specifies the energy efficiency classes for table and pedestal fans, with a 5-star rating representing the highest efficiency and a 1-star rating representing the lowest. The Energy Efficiency Index level (R) is calculated as the ratio of the Measured Energy Efficiency (Service value) to the Minimum Energy Efficiency (Service value).

TABLE 16 : Minimum energy performance standard for table and fan

Level	Energy Efficiency Level Index, R
1	R ≤ 1.00
2	R ≤ 1.01
3	1.00 < R ≤ 1.40
4	1.40 < R ≤ 1.80
5	1.80 < R ≤ 2.20

Energy Efficiency Metric for Star Label of Pedestal Fan

5. Market Characteristics of Pedestal Fan

Pedestal Fans are available in different sweep sizes (300 mm, 400 mm, 500 mm & 600 mm) with different power consumption, air delivery and service value.

Efficiency of a Pedestal fan is determined by how efficiently air flow is generated by the fan. It is ascertained by determining the fan's service value.

The market assessment report captures the distribution of Service value, Air Delivery and Input power of pedestal fan models captured in the study. A total of 1083 number of models were analysed in this study.

Input Power

The range of the "Input Power" from the models' data analysis for different sweep sizes is provided in Figure 8 and Table 17.

TABLE 17: Input Power range distribution according to sweep size

S. No	Sweep Size	Input Power		Max Input Power as per IS 1169:1967
		Minimum	Maximum	
1	300 mm	20	90	**40**
2	400 mm	30	137	**61**
3	500 mm	40	165	**90**
4	600 mm	40	200	**135**

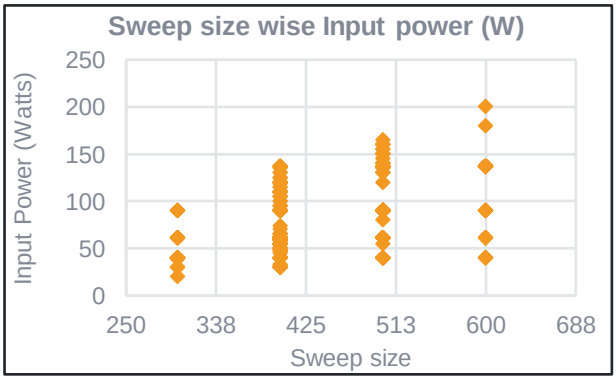


FIGURE 8 : Range of Input Power based on sweep size for pedestal fans

Air Delivery

Figure 9 and Table 18 present the range of "Air Delivery" obtained from model data analysis for different sweep sizes.

FIGURE 9: Range of air delivery based on sweep size for pedestal fans

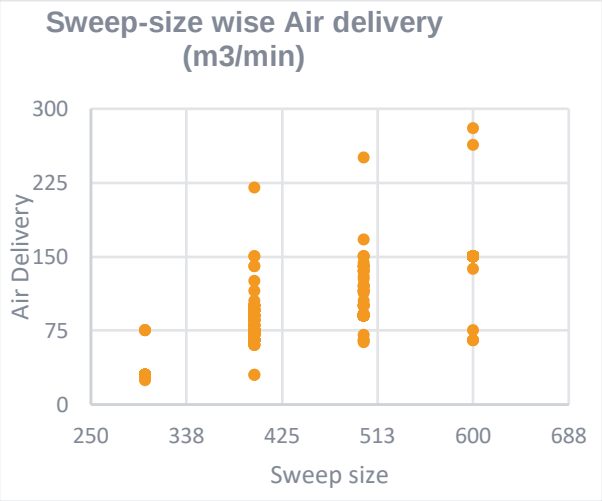


TABLE 1 : Air delivery range distribution according to sweep size

S. No	Sweep Size	Air delivery		Min. Air delivery as per IS 1169:1967
		Minimum	Maximum	
1	300 mm	24	75	**30**
2	400 mm	30	220	**65**
3	500 mm	63	250	**90**
4	600 mm	65	280	**150**

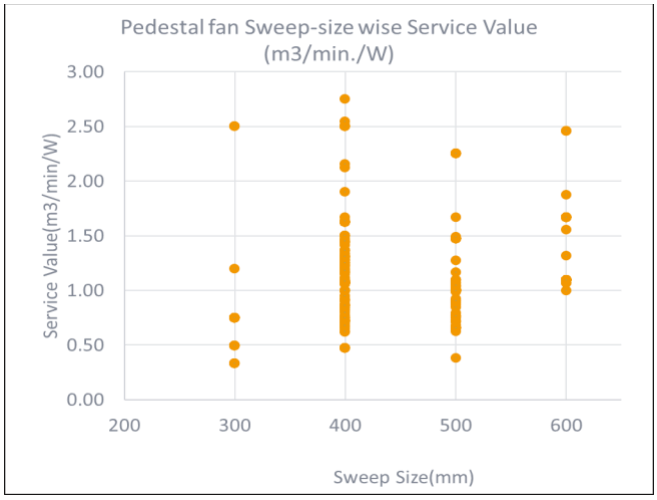
Service value

The service value is the amount of air delivered per unit power consumed to provide human comfort. It is derived from air flow or air delivery and the power consumption..

The Service value is measured as air delivery(m3/min) per Watt i.e., air delivery divided by input power(W)s at the voltage and frequency specified for the test.

S. No	Sweep Size	Service Value		Minimum Service as per IS 1169:1967
		Minimum	Maximum	
1	300 mm	0.33	2.5	**0.75**
2	400 mm	0.47	2.75	**1.08**
3	500 mm	0.38	2.25	**1.0**
4	600 mm	1	2.46	**1.1**

Figure 10 and Table 19 display the range of "Service Value" obtained from model data analysis for different sweep sizes



5.1 Energy Efficiency Metric for Star Label of Pedestal Fans

In India, the labeling program for pedestal fans follows the guidelines set out in IS 1169:1967 with all amendments, which specify the minimum and maximum values for service value, power input, and air delivery. Manufacturers were asked to provide performance data on various parameters through a structured questionnaire and secondary research.

The following testing parameters were collected for pedestal fan models:

- Air Delivery (m3/min)
- Power Input (Watt)

- Service value (m3/min/W)

The market assessment collected 1,083 data points for the parameters mentioned above.

Table 20 shows the summary of the performance data analyzed for to determine suitable efficiency parameters for the labeling program and to propose energy performance metrics

TABLE 20: Summary of energy performance for pedestal fan

Type of Fan	No. of models	Service value (m3/min/W)		Air Delivery(m3/min)		Power Input(W)	
		Min	Max	Min	Max	Min	Max
Pedestal Fan	1,083	0.33	2.75	24	280	20	200

The energy efficiency of a pedestal fan is indicated by its service value, as determined by a review of national (Indian) and international (IEC) standards, global labeling programs, and analysis of the performance of 1,083 pedestal fan models. A unified rating plan covering all sweep sizes included in the Indian standard is being proposed based on this analysis.

The proposed labeling program for pedestal fans is intended to cover the following:

- Pedestal fan
- AC and BLDC motor-driven models with capacitor-type and non-capacitor-type
- Sweep sizes of 300 mm, 400 mm, 500 mm, and 600 mm
- Single phase, 50 Hz, AC, rated voltage not exceeding 250 volts suitable for domestic & similar use.

After analysing the energy performance data and the minimum service value specified in IS 1169, two options for star rating level have been proposed for the voluntary labeling program for pedestal fans. The proposed star rating levels are shown in tables 21 and 22, and they specify the upper and lower thresholds of the service value for each star rating for all sweep sizes. Both options are aligned with the performance and service value specified in IS 1169:1967 with all amendments.

Table 21 : Proposed star rating for pedestal fan-voluntary phase (Option 1)

(Valid from 01 March 2023 to 31 December 2024)	
Star rating band	**Service Value (m3/min/W)**
1 Star	0.75 ≤ Service Value < 0.94
2 Star	0.94 ≤ Service Value < 1.17
3 Star	1.17 ≤ Service Value < 1.46
4 Star	1.46 ≤ Service Value < 1.83
5 Star	1.83≤ Service Value

Table 22 : Proposed star rating for pedestal fan-voluntary phase (Option 2)

(Valid from 01 March 2023 to 31 December 2024)	
Star rating band	**Service Value (m3/min/W)**
1 Star	0.75 ≤ Service Value < 0.90
2 Star	0.90 ≤ Service Value < 1.08
3 Star	1.08 ≤ Service Value < 1.30
4 Star	1.30 ≤ Service Value < 1.56
5 Star	1.56≤ Service Value

The graphs in Figure 11, 12, 13, and 14 classify the 1,083 pedestal fan models into star-rating slabs based on their current market performance level. These graphs also include models in the non-qualified (NQ) category that fail to meet the minimum 1-star level. Although these models are allowed to be sold during the voluntary phase of the labeling program, they will be disqualified once the program becomes mandatory.

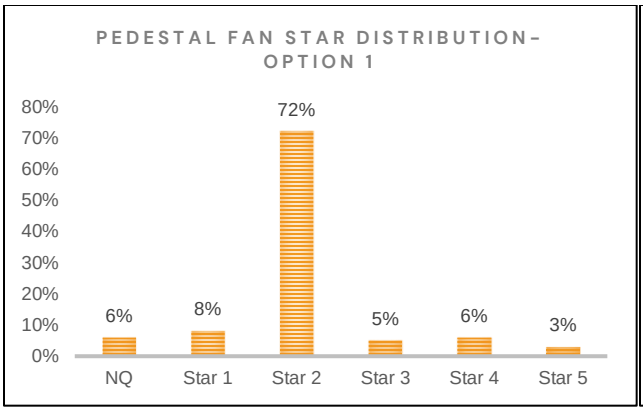


Figure 1: MODEL WISE DISTRIBUTION(%) INTO STAR RATING-OPTION 1

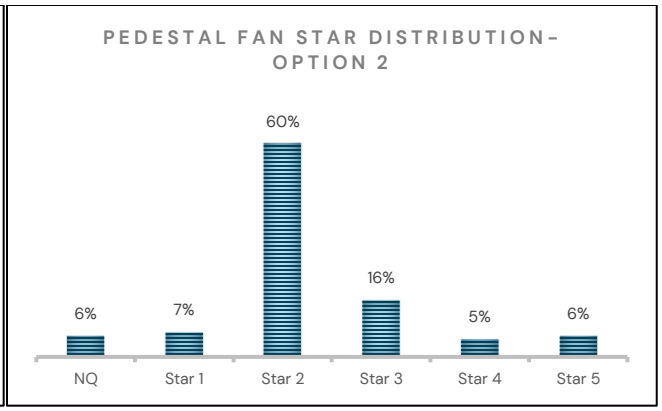


Figure 2:MODEL WISE DISTRIBUTION(%) INTO STAR RATING-OPTION 2

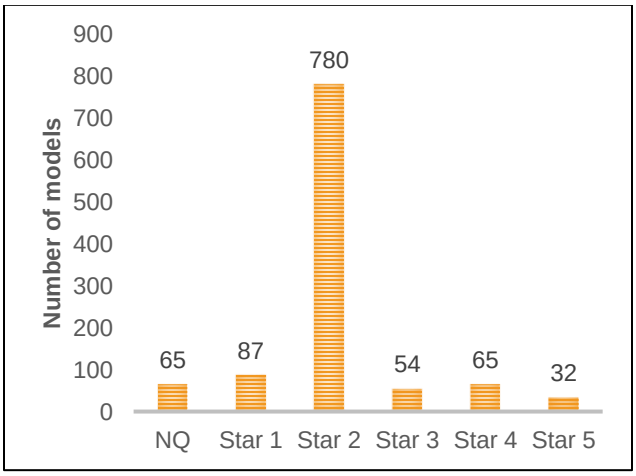


Figure 4 : MODEL WISE DISTRIBUTION INTO STAR RATING-OPTION 1

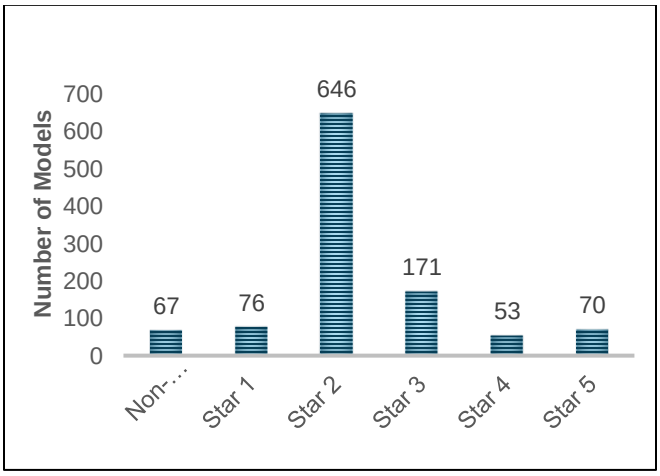


Figure 3:MODEL WISE DISTRIBUTION INTO STAR RATING-OPTION 2

The above star rating plans as shown in Table 22 & 23 were proposed to the BEE's Technical Committee for Pedestal fans. Further, **the Technical Committee agreed to the Star Rating plan as depicted in Table 23 i.e. Option 2.**

Potential Energy Savings and GHG reductions for Pedestal Fan

6. Potential Energy Saving and GHG reduction

Savings by 2030	Electricity Savings (TWh)	CO2 savings (MT CO2)
Pedestal Fan	4.4	3.5

This chapter presents estimates of energy and greenhouse gas (GHG) savings from the proposed labeling program, based on the following assumptions:

1. 8% compound annual growth rate (CAGR) based on production data provided by IFMA,
2. A voluntary phase of 1 year and 9 months followed by a mandatory phase,
3. The elimination of non-qualified (NQ) models, and
4. The calculations also assume an average of 290 days per year of operation and 9 hours of operation per day, with savings based on average performance parameter values.

The cumulative savings as a result of the proposed pedestal fan labeling program is estimated to be 4.4 TWh and 3.5 MtCO2 by 2030.

Figures 15 and 16 show the cumulative energy and GHG saving potential by 2030 from the pedestal fan labeling program in India.

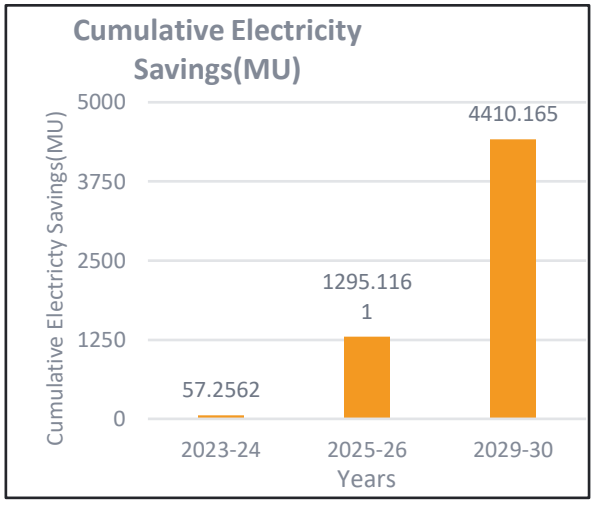


FIGURE 16 : Cumlative Energy Savings for Pedestal fans till 2030

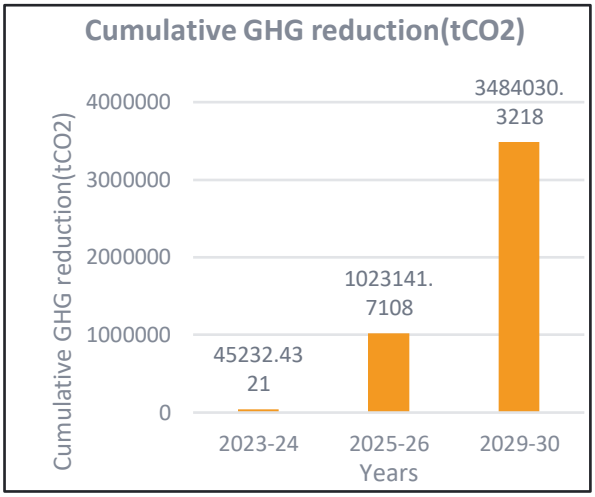


FIGURE 15 : Cumulative GHG reduction for pedestal fans till 2030

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