



MODEL REGULATION GUIDELINES FOR ENERGY-EFFICIENT CEILING FANS

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ACRONYMS AND ABBREVIATIONS

AC	Alternating Current
BLDC	Brushless Direct Current Motor
DC	Direct current
IEC	International Electrotechnical Commission
MEPS	Minimum energy performance standard

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ABOUT UNITED FOR EFFICIENCY

U4E (united4efficiency.org) is a global initiative led by UNEP, supported by leading companies and organizations with a shared interest in transforming markets for lighting, appliances and equipment, by encouraging countries to implement an integrated policy approach to energy-efficient products so as to bring about a lasting, sustainable and cost-effective market transformation.

The approach focuses on the end-user market and targets the five main components of the value chain for an energy-efficient market:

- Standards and regulations.
- Supporting policies, including education, information and training.
- Market monitoring, verification and enforcement.
- Finance and financial delivery mechanisms, including incentives and public procurement.
- Environmentally sound management and health.

U4E provides countries with tailored technical support through its in-house international experts and specialized partners, to get the most out of countries' electricity by accelerating the widespread adoption of energy-efficient products, allowing monetary savings on consumer electricity bills, helping businesses thrive through greater productivity, enabling power utilities to meet growing demands for electricity and assisting governments in reaching their economic and environmental ambitions. The initiative is present in more than 30 countries worldwide.

Based on each country's circumstances, U4E works with any of the following products: Lighting, Refrigerators, Room Air Conditioners, Electric Motors and Distribution Power Transformers – the five products that together consume over half of the world's electricity. Such support is available at three levels: global, regional and national; providing tools and resources and supporting multiple stakeholders on international best practices, regional policy roadmaps and harmonization process recommendations through guidelines and publications, such as energy efficiency Policy Guides, Global Model Regulations Guidelines, Model Public Procurement Specifications and Financing Guidelines.

In addition, the initiative provides capacity-building and education, policy tools and technical resources which include Country Savings Assessments completed for more than 155 countries showing the significant available financial, environmental, energy, and societal benefits that are possible with a full transition to more energy-efficient electrical products. This growing suite of tools and resources equips policymakers to understand the significant opportunities and the steps needed to start transforming their markets to eco-efficient appliances and equipment.

1 INTRODUCTION

These “Model Regulation Guidelines for Energy-Efficient Ceiling Fans” provide voluntary guidance for governments in developing and emerging economies that are considering a regulatory or legislative framework that requires new ceiling fans to be energy efficient. It covers products commonly used in residential and light commercial applications. The accompanying [Supporting Information Annex](#)¹ describes the underlying rationale and methodologies.

Ceiling fans are a low-cost cooling option compared to air-conditioning that enhance indoor comfort with power consumption of typically less than 90 watts compared to room air-conditioning systems typically up to 1,500 watts. In countries such as India, ceiling fans make up a substantial portion of residential electricity demand. Ceiling fans offer a cooling effect through increased air movement that can offset demand for air-conditioning, allowing a higher temperature set point for air-conditioners and in some cases mitigating the need for air-conditioners altogether. Annual global sales of ceiling fans are around US\$8 billion, and in most markets these products are unregulated beyond basic safety requirements, so there is a great opportunity to reduce electricity waste, including peak energy demand on the electricity grid.

Minimum energy performance standards (MEPS) and energy labels, if well designed and implemented, are some of the fastest and most effective approaches to transition markets towards more energy-efficient products. While some countries have MEPS and/or labels for fans, many of these are outdated or unenforced. Inadequate MEPS and labels leave countries vulnerable as dumping grounds for products that cannot be sold elsewhere. Electricity consumption varies widely by type, size, age and maintenance of the unit. New units with direct current (DC) motors and advanced blade designs can save up to 60 per cent compared to conventional units. Such savings have profound impacts on the cost to own and operate these devices.

United for Efficiency (U4E) consulted many experts from various sectors and regions to assess best practices and new developments. The aim has been to balance ambitious energy performance while limiting adverse impacts on the upfront costs and availability of products. Further evaluations (e.g., market assessments and consumer, utility and manufacturer impact analyses) are needed before applying the guidance contained herein to a specific market. The contents were developed assuming that interested countries would put them into effect beginning in around 2024, but the timing and text should be adjusted to whenever and however is most appropriate. While commonly used standards are referenced, countries may be familiar with others that work well for their context.

Each country has unique characteristics. This guidance is intended as a starting point to inform policies and programmes rather than as a final template to adopt. Market transformation interventions should be undertaken transparently and with sufficient time to address local circumstances (e.g., availability and prices of products, income levels, utility tariffs, etc.). Such processes are typically led by an energy ministry with the support of a national standards body and conducted in consultation with many experts from the public and private sectors, and civil society.

Countries committed to market transformation and prepared to invest in the requisite market assessment, impact analyses, stakeholder consultations, monitoring, verification, enforcement, awareness raising and beyond should strongly consider mandatory MEPS and labels. Neighbouring

¹ Available at: <https://united4efficiency.org/resources/model-regulation-guidelines-for-energy-efficient-ceiling-fans/>

countries should align where practicable to reduce complexity and compliance costs for manufacturers and alleviate some of the challenges of oversight and enforcement for officials. Consistent approaches across countries help yield economies of scale for efficient products that save consumers money on electricity bills, reduce air pollution, mitigate greenhouse gas emissions, and enable greater electrical grid stability². U4E hopes this guidance is helpful in unlocking the many benefits of more energy-efficient and climate-friendly cooling.

² For an approximation of the electricity and greenhouse gas impacts of adopting the model regulation guidance, see the U4E Country Savings Assessments at <https://united4efficiency.org/countries/country-assessments>.

2 SUBJECT MATTER AND STRUCTURE

The Guidelines address the following elements for ceiling fan products:

- Energy efficiency and functional performance
- Product information reporting and labelling
- Demonstrating compliance
- Market surveillance and enforcement

The Guidelines do not address warranty matters since these are not primarily related to energy efficiency and functional performance. Typically, warranties are incorporated in other regulations, but if this is not the case in the market in question, consider including them.

The contents offer a draft framework to help policymakers and programme managers leapfrog directly to higher energy efficiency technologies. Few adjustment factors (for example, those typically given for different test conditions) are included to reduce loopholes to a minimum.

The contents are based on the best available information at the time of publication; however, the authors recognize that technology is evolving, as are the standards of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). It is recommended to investigate current standards and market dynamics when tailoring the Guidelines for use.

3 MODEL REGULATIONS

Article 1. Scope of covered products

1.1 Scope

This regulation applies to ceiling fans that are typically found in small- to medium-sized rooms in the residential sector and light commercial sector (e.g., up to around 30 square metres for a single ceiling fan). These products are permanent installations on room ceilings to provide cooling from increased air flow. Ceiling fans that use up to 90 watts and blade diameters between 900 and 1,800 millimetres are covered.³

Article 2. Terms and definitions

This document refers to standards listed below to specify the following:

- a) Energy efficiency requirements as a function of ceiling fan blade diameter
- b) Test conditions and methods for checking that those requirements have been satisfied
- c) Classifications
- d) Markings
- e) Characteristics to be declared by the manufacturer

This document refers to two International Electrotechnical Commission (IEC) standards:

- IEC 60879:2019 Comfort fans and regulators for household and similar purposes – Methods for measuring performance
- IEC 62301:2011 Household electrical appliances – Measurement of standby power

Table 1 provides the definitions of the relevant terms in this document. Unless otherwise specified, these definitions are harmonized with the reference standards above.

³ This regulation does NOT apply to the following equipment: (1) Other types of electric fans such as table, wall, stand, and pedestal fans. These generally have much smaller fan diameters with smaller, less energy efficient motors, may have different usage patterns than ceiling fans, and thus efficiency standards for these products are typically treated separately from ceiling fans; (2) Ceiling fans with light kits. These are more common in the U.S. but less common in other parts of the world; and (3) Large diameter industrial fans e.g., those with diameters of greater than 1801 mm (BEE (2022))

Table 1: Definitions of select terms in residential and light commercial sector ceiling fans

Term	Definition
Brushless DC (BLDC) motor	Electronically commutated, synchronous motors with permanent magnets embedded in or on their rotors.
Ceiling fan	Conventional fan provided with a device for suspension from the ceiling of a room so that the blades rotate in a horizontal plane with the diameter of the blade larger than 900 millimetres, up to and including 1,800 millimetres.
Conventional fan	Comfort fan having two or more blades, with free inlet and outlet of air.
Flow rate, or rated fan flow rate	Air flow rate assigned to the fan by the manufacturer, expressed in cubic metres per minute.
Fan power input	Power input of the fan operating at its maximum flow rate, measured with the oscillation mechanism and the moving louvre, if any, turned off. The power inputs for other functions, such as lighting, are not included.
Life-cycle cost	Includes the initial equipment and installation cost, subsequent operating and maintenance costs, and any end-of-life recovery costs.
Manufacturing production cost	Refers to the factory production costs of ceiling fans, including factory costs and shipping but not including any retailer mark-ups, distributor mark-ups or contractor mark-ups.
Service value	The ratio of the calculated maximum fan flow rate to the measured fan power input, in units of cubic metres per minute per watt or $m^3/(min-W)$. The service value is also known as the “coefficient of performance (COP).”

Article 3. Requirements

Ceiling fans falling within the scope of Article 1 shall meet the energy consumption requirements of Article 3.

3.1 Test method

Compliance with the energy performance requirements shall be tested according to IEC 60879:2019 for the fan power input and fan air flow rate at maximum fan speed. The atmospheric conditions may be found in Table 2. For repeatability and reproducibility, temperature and humidity are required to be within the specified ranges. The fan standby power shall be tested according to IEC 62301:2011.

Table 2: Atmospheric conditions for test procedures and measurements

Temperature	Relative humidity	Air pressure
20°C ± 5°C ^a	50% ± 30%	86 kPa to 106 kPa

^a In case of doubt, the temperature shall be 23°C ± 2°C.

3.2 Energy performance

Ceiling fan service value (or energy efficiency rating) is defined as the total air flow at a specified horizontal plane below the ceiling fan divided by the fan power at full speed (highest speed setting).

$$\text{Ceiling Fan Service Value } \left(\frac{\text{m}^3}{\text{min} - \text{watt}} \right) = \frac{\text{Air flow}_T}{P_{\text{full speed}}}$$

where

Air flow_T is the total air flow below the ceiling fan in m³/min and

P_{full speed} is the fan power in watts at full speed (or the highest fan speed setting).

The total air flow is calculated per the IEC 60879 test protocol, which specifies the details for the testing chamber, environmental conditions, the distance between the ceiling fan and the air velocity sensors, and the method for calculating the air flow (refer to details in the Supporting Information Annex).

Ceiling fans shall meet or exceed the minimum air flow delivery and service value levels in Table 3, depending on the appropriate dimensions.

Table 3: Minimum requirement for service value level

Blade Dimension ¹ (mm)	Min Air Flow Delivery (m ³ /min)	Service Value Level (m ³ /(min-W))
750 – 900	130	3.1
900 – 1 050	130	3.1
1 050 – 1 200	150	3.1
1 200 – 1 400	210	4.0
1 400 – 1 500	245	4.1
Greater than 1 500	270	4.3

¹ Blade dimension refers to the diameter of the circular area swept by the outer tips of the fan blades.

3.3 Safety requirements

Safety of electric fans for residential and light commercial purposes shall comply with

- IEC 60335-2-80: 2015 Household and similar electrical appliances – Safety – Part 2-80: Particular requirements for fans

or a subsequent revision, or a nationally modified edition of the above standards.

3.4 Product information

A label shall be affixed on the product in a location that is readily visible for the consumer. The label can include a QR code that, once scanned, can provide detailed information related to the product.

The label shall indicate:

- a) QR code
- b) Brand
- c) Type of equipment
- d) Model number
- e) Family model name
- f) Country where the product was manufactured
- g) Name and address of the supplier
- h) Size of product (blade diameter (mm))
- i) Rated energy performance in cubic metres per minute per watt ($\text{m}^3/\text{min-watt}$) and minimum air delivery in m^3/min
- j) Yearly energy consumption in kWh based on typical operating hours
- k) Motor type
- l) Power input
- m) Lifetime

All representations of energy performance shall indicate that the performance rating is an indicative value, and not representative of actual annual energy consumption in all situations.

The label shall be affixed on the product in a location that is readily visible for the consumer.

Instruction manuals for installers and end users, and free-access websites of manufacturers, importers and authorized representatives shall include the following information:

- a) Electrical requirements (operating voltage, grounding requirement, electrical outlet box, etc.).
- b) Requirements for minimum height above the floor, minimum distance from the ceiling, and guidance for ceiling fan placement, e.g., centred in room.
- c) Structural requirements for installation, e.g., structural mounting or reinforcement requirements for large fan-diameter units and regulator connection specifications.
- d) Usage limitations: e.g., for indoor use, and avoid placement in excessively humid indoor environments or a location with excessive dust.
- e) Other considerations for fan placement such as interactions with fire alarms and/or sprinkler systems.

Selection of fan size according to room size is also important as this will avoid undersizing and oversizing, which can have an adverse impact on performance and power consumption.

Article 4. Entry into force

This regulation shall enter into force no earlier than [date] and at least [six months /one year] after adoption.

Article 5. Declaration of conformity

Compliance with the requirements of Article 3 and any additional optional claims shall be demonstrated in the conformity assessment report (CAR), which:

- 1) Demonstrates that the product model fulfils the requirements of this regulation
- 2) Provides any other information required to be present in the technical documentation file; and
- 3) Specifies the reference setting and conditions in which the product complies with this regulation

The CAR shall be submitted to [agency name] for review prior to making the product available for sale. If the CAR for the designated model is approved, which is confirmed by written correspondence from [agency name]⁴ and listing of the product on any applicable [product registration system], the model may be sold in the market. If a CAR is rejected, a written explanation will be provided to the submitter. All aspects identified in the written explanation shall be addressed in a revised CAR. Until the CAR is approved, the product is ineligible for sale in the market.

The CAR is valid for the designated model for 24 months. An updated CAR or a notice of withdrawal shall be submitted to [agency name] at least 90 days prior to the change in specifications of or cancelation of production of the currently certified product.

Consumers or even other manufacturers should have a process to challenge or complaint against a particular manufacturer. Annual publication of all the product tests done and compliance rates will also help build credibility among consumers.

Article 6. Market surveillance

The designated authority implementing this regulation shall develop a programme to check compliance with this standard and monitor the market for non-compliance. The programme should include details on sample size, lab accreditation requirements (ISO/IEC 17025 certified), and a challenge process that manufacturers can utilize if the initial testing of their product is found to be out of compliance⁵.

[Agency name] will be responsible for enforcement activities that include potential assessment of penalties for non-compliant products in the country. [Agency name] shall establish written policies that clearly spell out its authority, procedures and penalties. All testing done for compliance and market surveillance testing purposes shall be done using the measurement and calculation methods set out in this regulation.

For market surveillance purposes, manufacturers should be allowed to refer to the product database if the technical documentation as per [national standard title] contains the same information.

⁴ Responsibilities are often split across various agencies, so list whichever are appropriate for each step.

⁵ For further guidance on how to develop and implement compliance certification, market surveillance and enforcement programmes please refer to the U4E's Policy Guide, "Ensuring Compliance with MEPS and Energy Labels", <https://united4efficiency.org/wp-content/uploads/2021/01/U4E-Compliance-Guidance-20210115.pdf>. Additional stipulations regarding such protocols are often included in MEPS and labelling legislation/policy documents, but given the variance in approaches based on national context, a specific example is not provided here.

Article 7. Revision

This regulation shall be strengthened by an administrative rulemaking based on an updated market assessment conducted on the cost and availability of new technologies once every two to three years after this regulation enters into force.

A review of this regulation should assess the appropriateness and effectiveness of its provisions in achieving its goals. The timing of the review should allow for all provisions to be implemented.



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