



中国标准化研究院
CHINA NATIONAL INSTITUTE OF STANDARDIZATION

房间空调能效标准标识研究和实施进展

Research and Implementation Progress of Energy Efficiency Standard and Labeling for Room Air Conditioners

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能效标准标识作用机制 Action mechanism of EE standards

Average energy efficiency level of the product improved

平均能效水平整体提升

Energy conservation assessment value (EE Grade 2)

minimum allowable value (EE Grade 3 or 5)

能效限定值 (3级或5级)



产品能效市场分布 (标准实施前)

Product EE distribution (before implementation of standards)

产品能效市场分布 (标准实施后)

Product EE distribution (after implementation of standards)



能效2级 (节能产品)



能效1级



EE Grade 1

“领跑者”

Top Runner

淘汰低效落后产品

Elimination of inefficient and outdated products

鼓励高效先进产品

Stimulate R&D and promotion of high-efficient products

房间空调能效标准和标识

EE standard and labeling of room ACs

标准号 Standard number	标准名称 Standard name	发布日期 Publication date	实施日期 Implementation Date	实施能效标识 Energy efficiency labeling
GB 21455-2019	房间空气调节器能效限定值及能效等级 Minimum allowable values of the energy efficiency and energy efficiency grades for room air conditioners	2019/12/31	2020/7/1	是



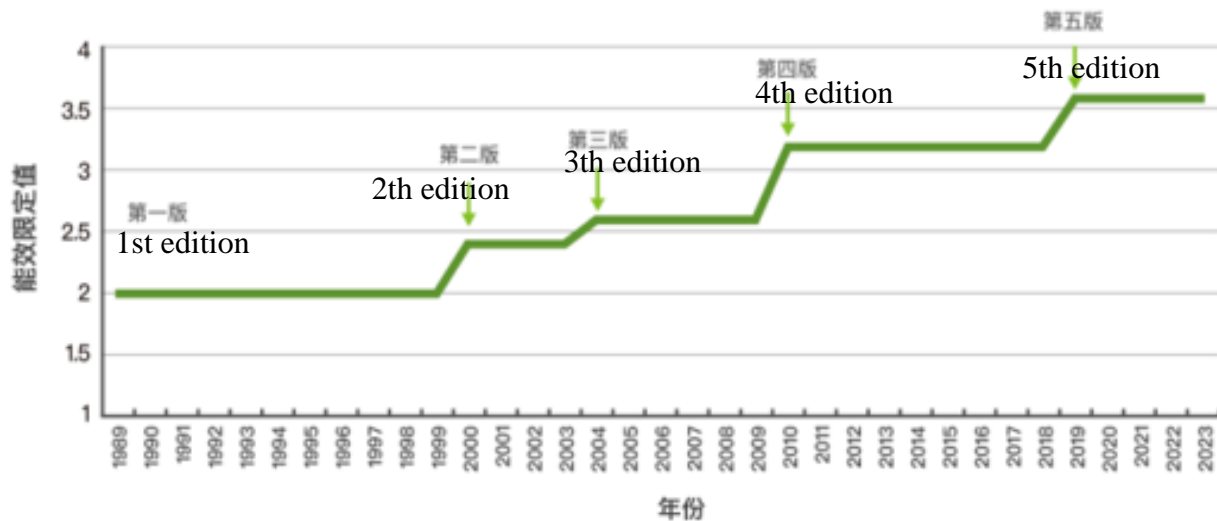
The energy efficiency label mainly includes the following contents:

- Producer name;
- Product specifications and models;
- Energy efficiency rating;
- EE performance related parameters
- QR code;

房间空调能效标准标识实施情况

Implementation of Energy Efficiency Standard Labeling for Room ACs

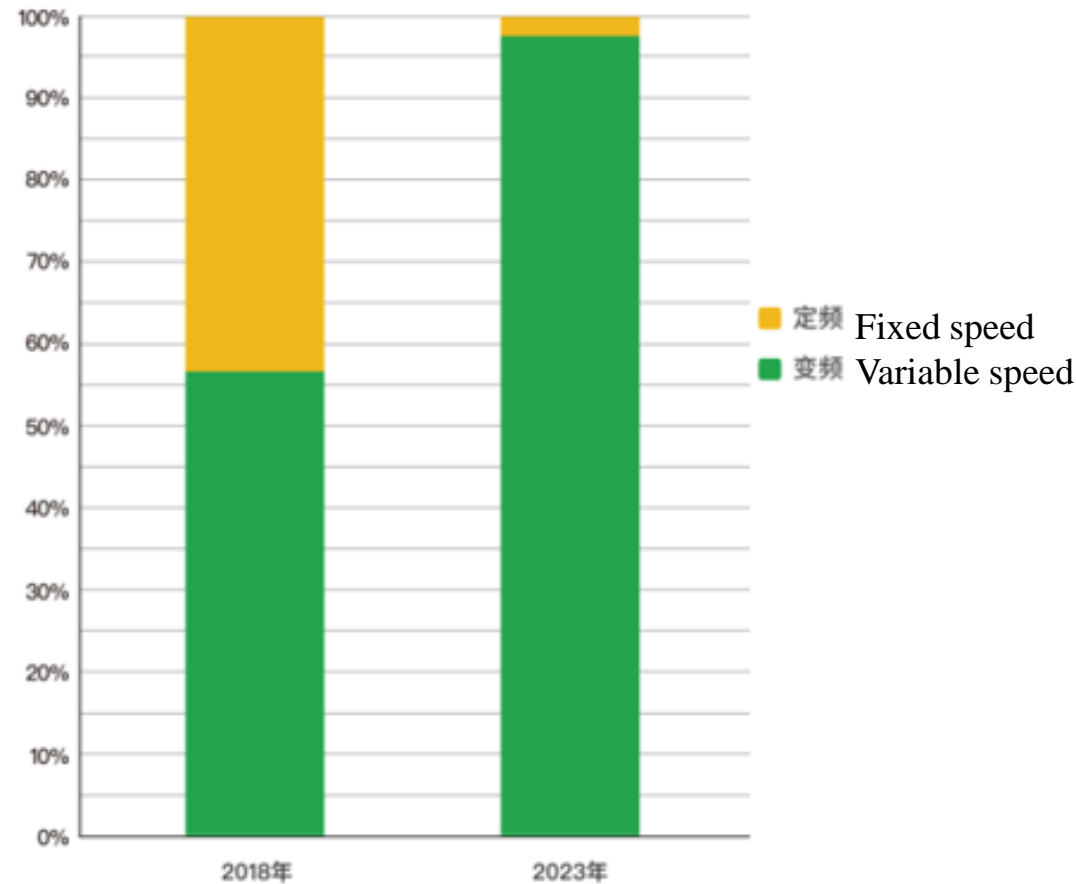
房间空调器相对于第一版能效标准，能效限定值有近80%的提升，能效1级水平实现国际“领跑”。
Compared to the first edition of energy efficiency standards, the minimum allowable value of RAC has increased nearly 80%, and made the grade 1 level world-leading.



MEPS level based on minimum cooling seasonal performance factor (CSPF) required for a split system air conditioner with 7 kW (24,000 Btu/h or 2 refrigeration ton) cooling capacity

Year

房间空调器相对于第一版能效标准，能效限定值有近80%的提升，超越美国、日本等能效标准，实现国际“领跑”。

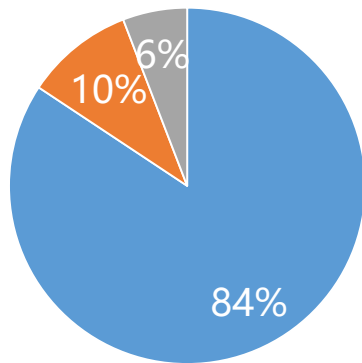


房间空调能效标准标识实施情况

Implementation of Energy Efficiency Standard Labeling for Room AC_s

Distribution of subcategories with different cooling capacity

■ CC ≤ 4500 ■ 4500 < CC ≤ 7100 ■ 7100 < CC ≤ 14000



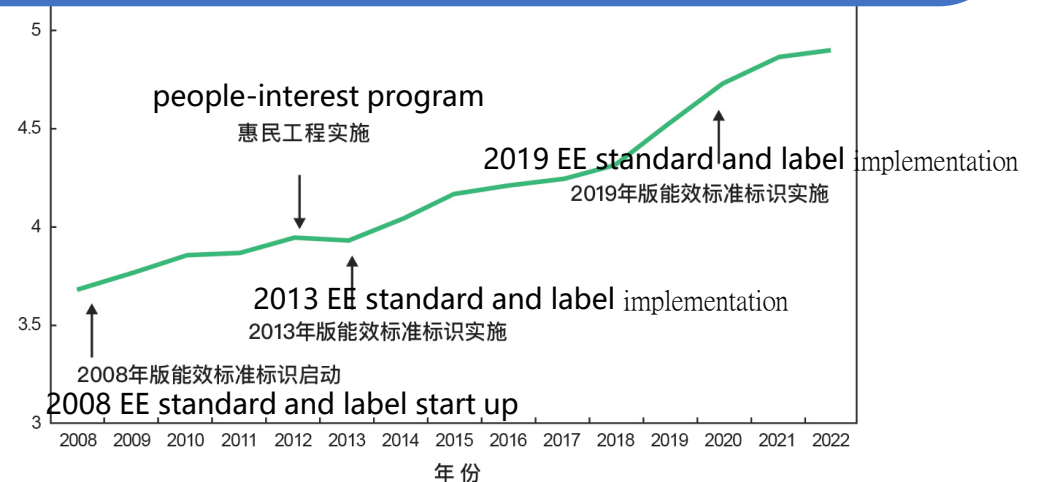
✓ 制冷量在4500 W以下的产品市场占比84%

Products with cooling capacity below 4500W occupy market share of 84%

✓ 能效2级及以上节能产品占比达到55.8%

The proportion of energy-saving products with energy efficiency graded 2 or above reaches 55.8%

从空调产品能效水平来看，以3500~4500W制冷量的热泵型变频房间空调调节器为例，从2008年能效标准标识启动实施到2020年新标准标识生效实施，由于高效变频压缩机、高效翅片片形和换热管、高效制冷剂等技术的应用推广，变频空调产品能效水平明显提升，进行能效标识备案的变频房间空调的能源消耗效率（统一换算为APF）加权平均值提升近33%，提升幅度显著。Taking the heat pump type variable frequency room AC with a cooling capacity of 3500-4500W as an example, due to the promotion and application of technologies such as high-efficiency variable frequency compressors, high-efficiency finned and heat exchange tubes, and high-efficiency refrigerants, APF of registered inverter-AC had significant increased nearly 33% during the year of 2008-2020 that carry out the EE standards and labeling.



变频房间空调典型产品（3500~4500 W制冷量、热泵型）历年能效水平（APF）变化情况
Evolution of APF OF typical AC products (3500-4500 W cooling capacity, heat pump type)

研究完善房间空调新能效测评方法并适时修订能效标准

Research and improve new EE evaluation methods for room ACs and timely revise EE standards

我国目前房间空调器的能效评价指标为APF (SEER)，是以稳态测试为主。房间空调现有基于实验室特定负荷稳态工况的能效测试方法不能真实反映产品智能控制功能和实际使用状况能效。

The current EE evaluation index for room ACs in China is APF (or SEER), which is tested under stable operating conditions. The existing energy efficiency testing methods for room air conditioning based on laboratory specific load steady-state conditions cannot truly reflect the energy efficiency of actual usage and the product's EE with intelligent control function.

目前，欧盟、加拿大、美国、日本和中国等国家都在研究动态测试方法，提出了基于动态负荷的空调（热泵）测试方法。通过工况机模拟实际负荷，空调（热泵）设备自身的控制系统响应，测量系统记录其响应过程，从而测试空调（热泵）设备的能效。

At present, countries such as the European Union, Canada, the United States, Japan, and China are researching dynamic testing methods and proposing air conditioning (heat pump) testing methods based on dynamic loads. The actual load was simulated by a working machine, and the control system of the ACs (heat pump) responded. The measurement system recorded its response process to test the energy efficiency.

房间空调新能效测评方法研究

Research on the New EE Evaluation Method for Room ACs

我院已组织行业开展基于房间空调新能效测评方法研究。由于目前大多数国内厂商和检测机构实验室为焓差实验室，因此，选择采用“焓差实验室+虚拟负荷法”作为国内动态运行测试的研究方向。

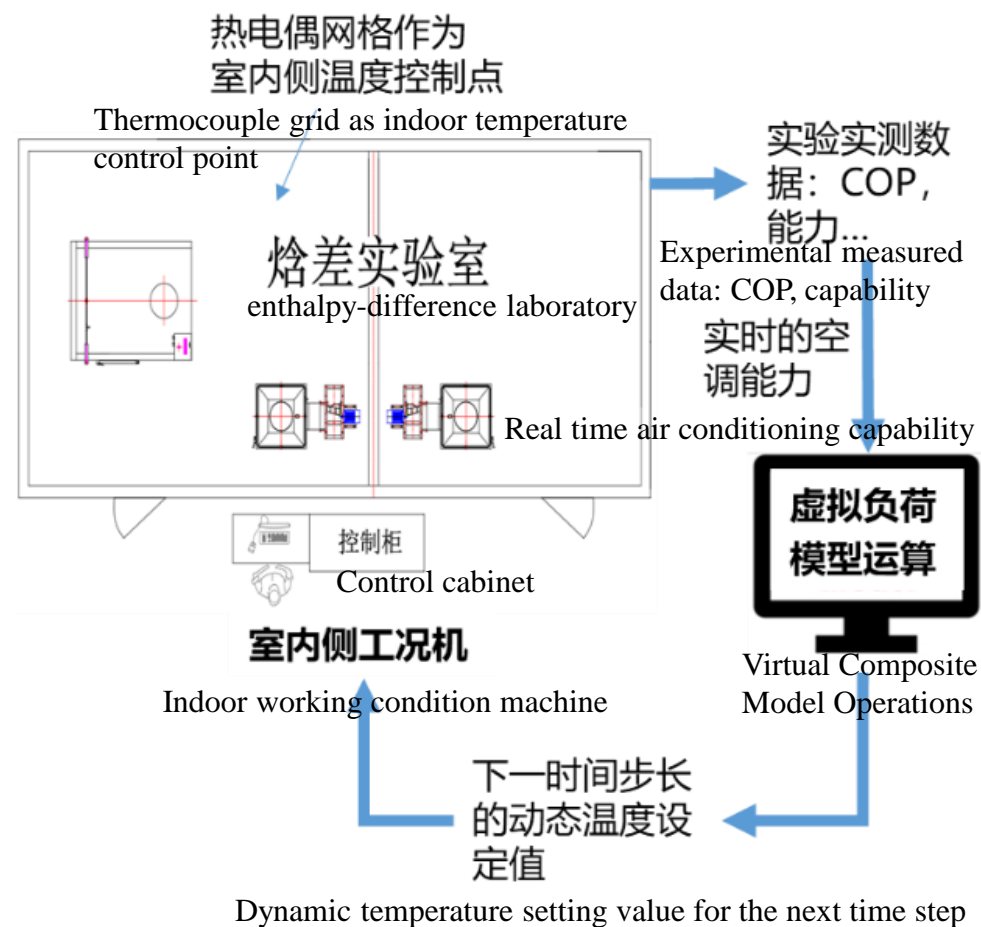
CNIS have organized industry research on new energy efficiency evaluation methods for room air conditioning. Due to the fact that most domestic manufacturers and testing institutions currently use enthalpy difference laboratories, choosing "enthalpy-difference laboratory+virtual load method" as the research direction for dynamic operation testing in China

测试方法遵循实验方法可操作性强、测试周期时长合理、测试结果的重复性及测试精度可靠的原则。

Follows the principles of strong operability of experimental methods, reasonable testing cycle duration, repeatability of test results and reliable accuracy.

基于动态负荷的房间空调能效测试评价方法是一种考虑了空调运行过程中负荷随时间变化的测试和评价方式。通过模拟真实的室内环境和负荷变化，获取空调在动态过程中的各项性能参数，进而对其能效进行综合评价。

The dynamic load-based method is a method that considers the changes in load over time during AC operation. By simulating real indoor environments and load changes, various performance parameters of ACs during dynamic processes are obtained, and its energy efficiency is comprehensively evaluated.



动态运行测试实验室原理图

Schematic diagram of

dynamic operation testing laboratory

房间空调新能效测评方法研究

Research on the New EE Evaluation Method for Room ACs

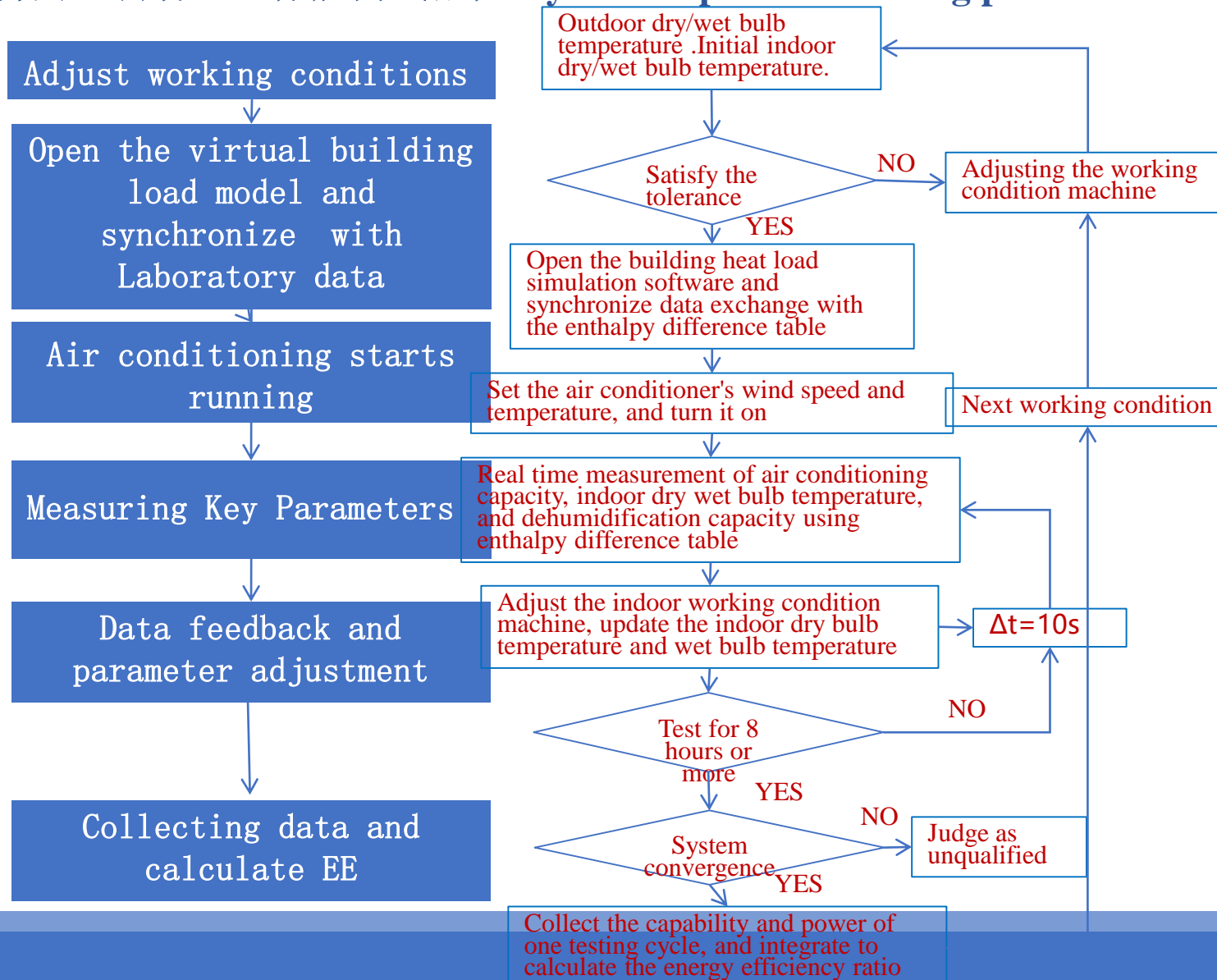
依据格力、美的、艾默生等实验室对比实验，具有智能型技术的房间空调器产品，若采用动态能效测试方法，能效指标测试结果可提升5%~30%。

According to comparative experiments conducted in laboratories such as Gree, Midea, Emerson, etc. If dynamic energy efficiency testing method is adopted, the energy efficiency test results can be improved by 5%~30%.

测试偏差已控制在5%以内，后续需继续优化虚拟建筑负荷模型和测试工况及流程，在时间成熟时探讨纳入能效标准的可行性。

The test deviation has been controlled within 5%, and it is necessary to continue optimizing the virtual building load-based model and testing conditions and processes.

房间空调动态运行能测试流程/Dynamic operation Testing process



中国-东盟绿色高效制冷标准标识协调和提升技术路线图研究/Research on technical roadmap for energy standard and label harmonization of green and efficient cooling products of China-ASEAN

- Research on the Current Status of Energy Efficiency Standards and Labeling of Room Air Conditioners in China and ASEAN Countries
- Comparative Analysis of Energy Efficiency Standard and Labels, such as Scope, Testing Methods, Energy Efficiency Evaluation Indicators, Labelling
- Technical Roadmap for Energy Efficiency Standard and Labeling Harmonization of Room Air Conditioners

典型制冷产品能效标准协调和提升技术
路线图研究报告

Research Report on Technical Roadmap for
Energy Efficiency Standard and Labeling
Harmonization of Typical cooling product

2024年6月
June 2024

Comparative Analysis

印度尼西亚、马来西亚房间空调能效标准只针对分体壁挂式房间空调，新加坡规定了在2024年新增便携式空调产品类型的能效要求/The EE standards in Indonesia and Malaysia only apply to split wall room ACs, while Singapore has set EE requirements for portable ACs since 2024.

随着变速空调的不断普及，许多市场越来越重视对部分负荷和季节性能效的评估，不断完善测试标准和能效指标/With the continuous popularization of variable speed ACs, many markets are paying more and more attention to the evaluation of partial load and seasonal energy efficiency, constantly improving testing standards and energy efficiency indicators

泰国、印度尼西亚、马来西亚、菲律宾、越南等东盟国家能效指标都采用CSPF，测试方法采用ISO 5151和ISO 16358-1/Thailand, Indonesia, Malaysia, the Philippines, and Vietnam adopted CSPF for EE indicators, and the testing methods use ISO 5151 and ISO 16358-1.

	中国China	泰国Thailand	印度尼西亚Indonesia	马来西亚Malaysia	菲律宾The Philippines	越南Vietnam	新加坡Singapore	文莱Brunei
Scope/Product type	1) Window type or Unitary type 2) Split type	1) Window type or Unitary type 2) Split type	Split type	Split type	1) Window type or Unitary type 2) Split type	1) Window type or Unitary type 2) Split type	1) Window type or Unitary type 2) Split type 3) portable type	1) Window type or Unitary type 2) Split type
Maximum cooling capacity	≤14kW	≤18kW	≤7kW	≤7.1kW	≤9.99kW	≤12kW	1) ≤8.8kW (Window type) 2) ≤17.6kW (Split type)	≤7.1kW
Test standard	GB/T 7725-2022 GB 21455-2019	TIS 2710-2558 TIS 2714 : 1-2558 (equivalent ISO 5151 : 2010和 ISO 16358-1 : 2013)	ISO 5151 : 2015 ISO 16358-1 : 2013	MS ISO 5151:2012 ISO 16358-1 : 2013	PNS ISO 5151:2014 PNS ISO 16358-1:2014	ISO 5151-2017 ISO 16358-2013	ISO 5151:2017	ISO 5151-2010
EE index	APF SEER (Single cooling) HSPF (Single heating)	CSPF	CSPF	CSPF	CSPF	CSPF	COP	COP

Comparative Analysis



China



Vietnam



Philippines



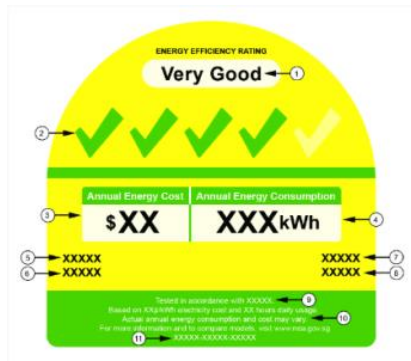
Brunei



Thailand



Indonesia



Singapore



Malaysia

Example of Energy Efficiency Labeling in Various Countries

Comparative Analysis

Comparison of Energy Efficiency Labels

对比内容 contents	中国 China	泰国 Thailand	印度尼西亚 Indonesia	马来西亚 Malaysia	菲律宾The Philippines	越南Vietnam	新加坡 Singapore	文莱 Brunei
强制/自愿Compulsory/Voluntary	强制	自愿	强制	强制	强制	强制	强制	强制
生产者名称或品牌Producer name or brand	√	√	-	√	√	√	√	√
产品型号Product model	√	√	√	√	√	√	√	√
能效等级EE grades	5级	5级+5★	5★	5★	5★	5★	5√	5★
额定制冷量 cooling capacity	√	-	-	-	√	√	√	√
能效指标EE indicators	√	√	√	-	√	√	√	√
耗电量Power consumption	√	-	-	√	√	-	√	√
电费electricity fees	-	√	-	-	-	-	√	√
碳减排量Carbon emission reduction	-	√	-	√	-	-	-	-
制冷剂相关信息Refrigerant related information	-	-	-	-	√	-	-	-
能效标准EE standard	√	-	-	√	-	√	-	-
测试标准Test standard	-	-	-	√	-	-	√	-
二维码QR code	√	√	-	√	√	-	√	-
能效领跑EE top runner	√	-	-	-	-	-	-	-
环保认证Environmental certification	-	√	-	-	-	-	-	-

房间空调能效标识信息展示发展趋势

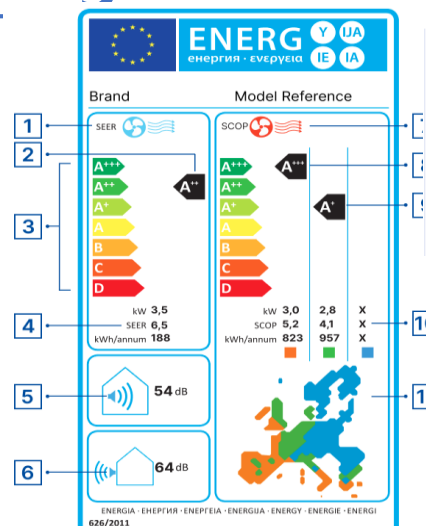
Development Trend of EE Labeling Information Display

能效标识本体展示内容除了产品型号、能效等级、核心能效指标等基本信息外，东盟国家开始试点展示更多能碳、绿色、环保等信息（more information on carbon, green, and environmental protection）

- 能源消耗量和节能量信息 Energy consumption and energy saving information
- 能源使用费用信息 Energy usage cost information
- 碳排放或碳减排信息 Carbon emissions or carbon reduction information
- 制冷剂、环保认证等绿色环保信息、安全认证信息等 Green environmental information such as refrigerants and environmental certifications, safety certification information, etc
- 噪音等其他重要性能信息 Noise and other important performance information

为能效标识增加二维码，通过扫码页面展示更多信息 Add a QR code to the energy efficiency label to display more information

- 技术规格信息（如尺寸、间室类型和容积、光源）
- 其他性能信息（如噪音）
- 相关销售和使用信息（如生产企业和销售商联系方式、售后保证、电子说明书）
- 获取EPREL数据库API密码，多维度查询筛选信息
- 下载电子标识



1. 能效星级，5级+5星的能效等级
2. 产品类型
3. 产品信息
4. 年电费（电费按照每天使用空调8小时，一年使用2920小时）
5. 能效指标值
6. CO2年减排量（kgCO2/年，与MEPS标准相比）
7. 二维码（扫描以显示更多信息），让消费者更容易获得使用、安装和维护等信息，以及各种有用的信息。
8. 环保产品认证信息

建议 Suggestions

丰富能效标识信息展示 Display more Information

- 增加显示产品类型（单冷、热泵、定频、变频）、尺寸、功率等基本信息 Add basic information such as product type (single cooling, heat pump, fixed frequency, variable frequency), size, power, etc.
- 对标市场领跑水平，显示能效对标达标率信息 Displaying information on EE benchmarking and compliance rate that compared to market leading level,
- 增加显示噪音等性能 Add performance of noise display etc.
- 增加显示制冷剂信息，包括制冷剂类型、充注量、GWP值、CO2当量以及相关解读等 Add performance of refrigerant information, including refrigerant type, charge amount, GWP value, CO2 equivalent, and related interpretations, etc.
- 试点展示年能耗、年节电量、碳排放量、减碳量、碳效比等信息 Pilot demonstration of annual energy consumption, annual electricity savings, carbon emissions, carbon reduction, carbon efficiency ratio and other information.
- 试点展示绿色低碳和品质认证信息，如领跑者认证、节能认证、绿色产品认证、低碳产品认证等信息 Pilot demonstration of green, low-carbon and quality certification, such as top runner certification, energy-saving certification, green product certification, low-carbon product certification, and other information.
- 试点展示产品使用、清洗、回收等使用指导信息 Pilot demonstration of product usage, cleaning, recycling and other guidance information.
- 试点展示质量符合性信息，检测实验室信息等 Pilot demonstration of quality compliance and testing laboratory, and other information.

建议 Suggestions

能效标准标识协调技术路径建议/Suggestions on technical roadmap for energy standard and labeling harmonization :

- 建立房间空调标准标识协调工作机制：区域行动倡议、区域协调技术工作组、双方/多方合作备忘录、长期政策对话和信息交流平台等/Establish a coordination mechanism for room AC EE standard and labeling: regional action initiatives, regional coordination technical working groups, bilateral/multi-party cooperation memorandums, long-term policy dialogues, and information exchange platforms ;
- 推动房间空调能效测试方法协调：测试方法对比分析研究、能效测试验证分析、能效检测实验室能力评估和建设、统一测试协议等/Promote the coordination of room AC EE testing methods: comparative analysis of testing methods, verification and analysis of EE testing, evaluation and construction of EE testing laboratory capabilities, unified testing protocols, etc ;
- 推进房间空调能效标准协调：市场现状和能效水平调研、能效评价指标统一、能效评价体系一致等/Promote the coordination of room AC EE standards: research on market status and EE grades , unified EE evaluation indicators, consistent EE evaluation system, etc ;
- 推进房间空调能效标识协调：能效标识需求及实施情况调研、能效标识展示内容协调等/Promote coordination of room AC EE labeling: research on EE labeling demands and implementation, coordination of EE labeling display content, etc ;
- 加强能效标准标识协调的效果评估和推广：效果分析和评估、信息共享平台等/Evaluation and promotion of the effectiveness of strengthening the coordination of EE standard and labeling: analysis and evaluation of effectiveness, information sharing platform, etc..

Thank you!
