



# Transitioning to Super Energy-Efficient Room Air Conditioners

## Fostering ICAP Implementation

**Cooling has been linked to economic growth and is defined as a catalyst for good health, well-being, and better productivity for occupants residing in hot climate zones, along with being one of the essential cornerstones for achieving Sustainable Development Goals (SDGs), as per the India Cooling Action Plan (ICAP) 2019.**

### BACKGROUND

India is amongst the countries with the lowest access to cooling, with per capita energy consumption levels for space cooling at 69 kilowatt-hours (kWh), compared to the world average of 272 kWh. India has a tropical climate and is experiencing a rapid increase in average temperature, resulting in heat stress that could be effectively countered by room air conditioners (RACs), as they work well under such climatic conditions. However, RACs have a low penetration rate of 7-9% in the Indian residential sector. Despite their low penetration, they still contribute ~40-60% of India's peak load, as they are used mainly during peak hours of the day, especially in major metropolitan areas, and constitute a dominant share of space cooling energy consumption—around 44% in 2017-18, which is expected to increase up to 50% by 2037-38. It is projected that the RAC stock in households will be ~580 million units by 2037-38, and its market is projected to grow at a compound annual growth rate (CAGR) of 11% in the coming decade. The growth of RACs in the Indian appliance market is connected to multiple factors, including rapid urbanisation, the increasing purchasing power of middle-income group consumers, bulk procurement by private or public entities, leading to cost reductions for them, which in turn, drives further demand, increased access to electricity, rising temperatures, and heat stress. Therefore, with the majority of India's RAC stock yet to come, i.e. 21% by 2027-28 and 40% by 2037-38, and the increasing contribution of RAC to space cooling energy consumption, compounded with lack of access to cooling and rising heat stress, it is imperative for India to address space cooling requirements and provide thermal comfort for all without compromising on its environmental commitments. Hence, there is still a window to improve energy efficiency and develop policies to facilitate the transition towards environmentally-friendly technological interventions to reduce RAC-related space cooling energy consumption and greenhouse gas (GHG) emissions in the future.



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In 2019, the Ministry of Environment Forest and Climate Change (MoEF&CC) launched ICAP, which highlights the extensive dependence on space cooling appliances and provides information on the amount of energy consumed and refrigerant leakage at the end of the space cooling appliance's lifecycle in order to contribute to achieving thermal comfort, reduce thermal loads, and enhance space cooling appliances' energy efficiency. One of ICAP's recommendations—ratcheting up minimum energy performance standards (MEPS) for RACs—has been extensively discussed in various forums, and there is a consensus to ratchet up the current level of RAC MEPS in India. Therefore, in alignment with the ICAP recommendations, this report provides insights into

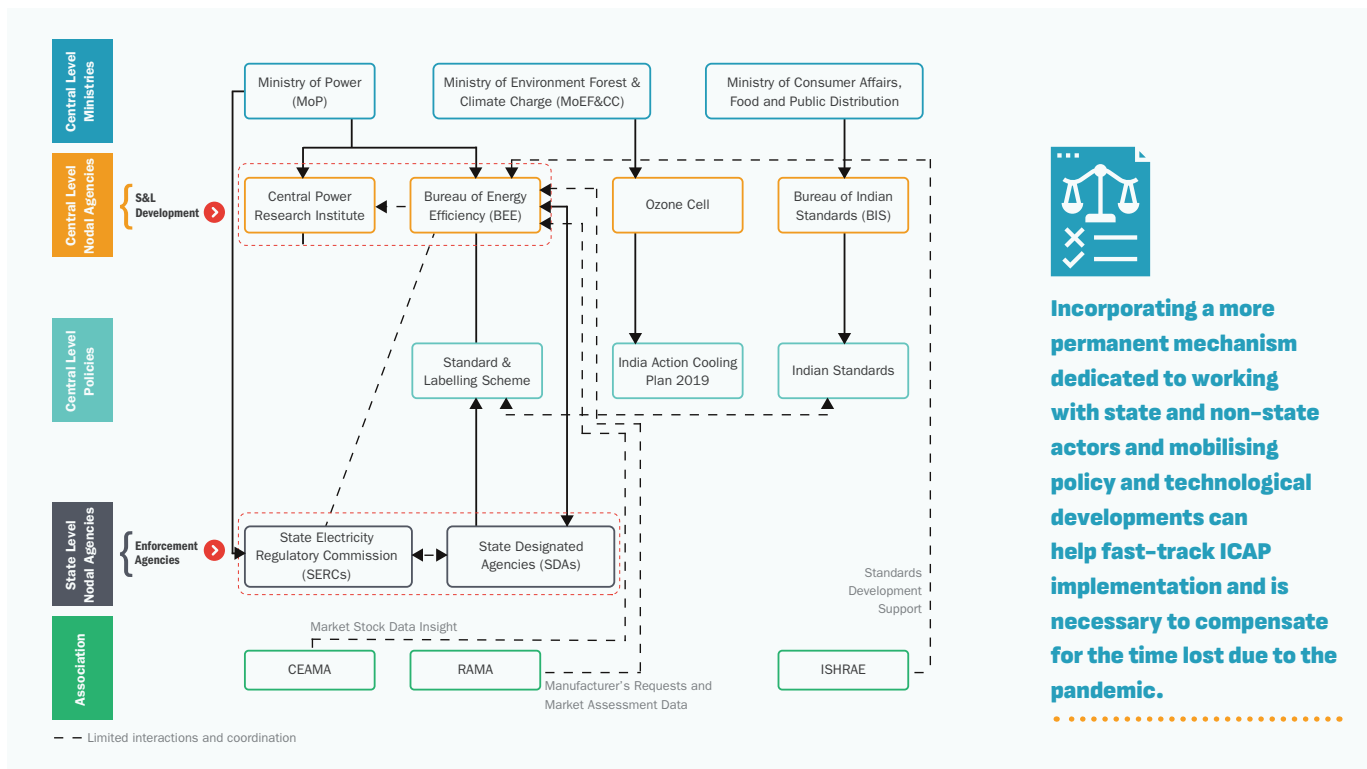
the institutional and regulatory frameworks, market transformation strategies, and key initiatives adopted nationally and internationally to increase the performance and promote the use of super energy-efficient RACs. The report also presents detailed information regarding India's S&L programme and RAC scenario. Furthermore, the report provides recommendations on how to eliminate the identified barriers and move forward, based on the learnings from the review of RAC MEPS adopted in selected countries.

## KEY HIGHLIGHTS AND OBSERVATIONS

The report has provided several observations related to institutional & policy advocacy aspect, market scenario, and RAC MEPS adopted nationally and internationally; some of those key observations are mentioned below:

### • Institutional & Policy Advocacy Aspect

The report has mapped various ministries, regulatory bodies, and associations and their roles in increasing appliance efficiency in India, as shown in Figure 1.



**Incorporating a more permanent mechanism dedicated to working with state and non-state actors and mobilising policy and technological developments can help fast-track ICAP implementation and is necessary to compensate for the time lost due to the pandemic.**

**Figure 1: Institutional framework governing S&L of Appliances in India**

Source: The authors' analysis

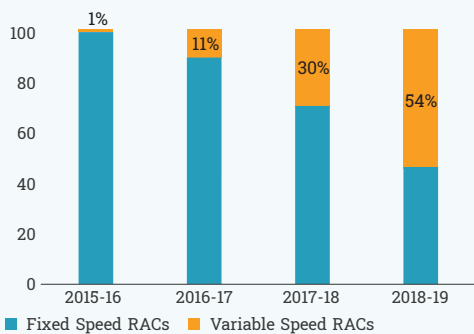
There are multiple institutions involved in the S&L program of RACs, as shown in Figure 1. These organisations work independently on different aspects related to RACs and provide various recommendations to the government; two-way communication only happens between a few entities. Moreover, the implementation of ICAP recommendations for the space cooling sector has been somewhat slow. There are thematic working groups formed under the purview of ICAP, but these groups only convene as and when required to suggest the next steps. Therefore, there is a need for a more permanent mechanism to coordinate various actions between the entities, mapped in Figure 1, in order to successfully implement the ICAP recommendations.

## Market Scenario

The report has highlighted that, in 2015–16, the variable speed RACs market share was less than 1% in India, which increased to 54% of total sales by 2018–19; in contrast, the share of fixed speed RACs decreased from around 99% in 2015–16 to 46% in 2018–19 as shown in Figure 2.

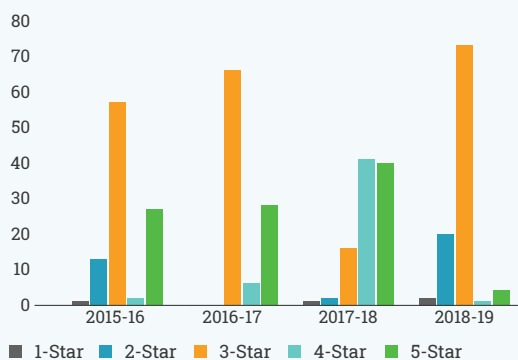


**To facilitate market transformation and improve the energy performance of RACs, it is essential to introduce market mechanisms that can incentivise the purchase of super energy-efficient RACs and implement regulations that mandate the stocking up of a certain percentage of 5-star or super energy-efficient RACs.**

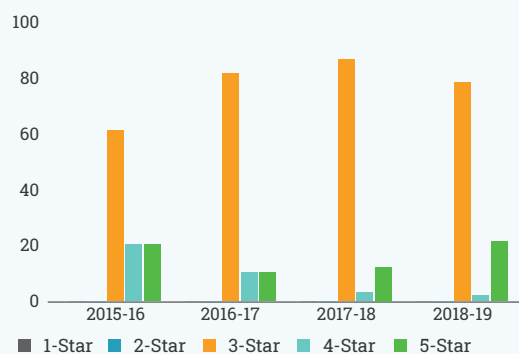


**Figure 2: Market share of fixed and variable speed RACs**

Source: The authors' analysis is based on data extracted from the Bureau of Energy Efficiency, "Room Air Conditioners," accessed March 5, 2020, [http://www.beestarlabel.com/Content/Files/AC\\_Notification.pdf](http://www.beestarlabel.com/Content/Files/AC_Notification.pdf).



**Figure 3: Star rating wise sales data for fixed speed RACs**



**Figure 4: Star rating wise sales data for variable speed RACs**

Figure 3 and Figure 4 depicts the star rating wise sales trends derived from BEE labelling data. The 3-Star band leads the sales in the overall RAC market, in both the fixed and variable speed RAC segments, from 2015–16 to 2018–19. Hence, the fixed and variable speed RAC sales trends indicate that consumers prefer 3-Star RACs over higher-star-rated RACs.

## RAC MEPS COMPARATIVE

To compare the RAC MEPS improvement rate of other countries to that of India, the report examines and provides a comparison of the RAC MEPS adopted by select countries - Japan, South Korea, Brazil, and China to that of India as summarised in Table 1.

**Table 1: Energy efficiency improvement rates – country wise**

Country	Rated capacity/ type	Period considered (No. of years)	Base MEPS	Revised MEPS during the standard upgrade	Annual energy efficiency improvement rate in RAC MEPS (approximate)
Japan	< 3.2 kW	2005-2010 (5)	4.90 (COP in 2005)	5.8 (APF in 2010)	3.43%
South Korea	< 4.0 kW	2012-2021 (9)	3.37 (CSPF in 2012)	4.5 (CSPF in 2021)	3.27%
Brazil	< ~2.5 kW	2022- 2025 (3)	3.14 (CSPF expected in 2022)	3.5 (CSPF expected in 2025)	3.68%
China	< 4.5 kW VSD & FSD	2020-2022 (2)	3.70	5.00 (SEER in 2022)	16.25%
	< 4.5 kW VSD	2013-2020 (7)	4.30 (SEER in 2013)	5.00 (SEER in 2020)	2.18%
	< 4.5 kW FSD	2010-2020 (10)	3.20 (EER in 2010)	3.70 (SEER in 2020)	1.46%
India	Unitary RAC	2018-2021 (3)	2.5 (ISEER in 2018)	2.7 (ISEER in 2021)	3.92%
	Split RAC		3.1 (ISEER in 2018)	3.3 (ISEER in 2021)	3.18%

# RECOMMENDATIONS

The report maps and analyses the existing barriers in India’s RAC and appliance sector and provides detailed recommendations for ratcheting up RAC MEPS and enhancing the appliance ecosystem in India; that key stakeholders could adopt to circumvent those barriers in the near future. A glimpse into the detailed recommendations mentioned in the report is shown Table 2:

**Table 2: Identified barriers and recommendations**

Barriers and policy gaps	Recommendations
<b>To support the ratcheting up of RAC MEPS</b>	
<b>Regulatory barriers:</b> Frequent standards revision	Harmonised standards at par with global standards and test procedures Consider the adoption of ecolabels for RACs
<b>Market barriers:</b> Need for innovative business & financial models	Adoption of new business models: servitisation, on-bill financing, or an on-wage financing mechanism Know your consumers: undertaking consumer purchase perception studies to understand the barriers and create an enabling mechanism
<b>Market barriers:</b> Absence of incentives/tax rebates for efficient products	Tax reforms: reduction in GST paid for super energy-efficient RACs (5-star rated appliances and above). Leveraging existing incentives and market mechanisms: cashbacks and zero per cent interest, a carbon cashback or a carbon reward payback system can be integrated or developed.
<b>To enhance the appliance ecosystem</b>	
<b>Enforcement barriers:</b> Limited SDA capacity	Periodic capacity building and strengthening of SDAs Stock study of the existing test labs in India and their gap assessment
<b>Enforcement barriers:</b> Limited testing capacity	Development of a technology transfer platform
<b>Financial barriers:</b> Absence of financial mechanisms to promote RAC R&D infrastructure	Support required from existing or new programmes for innovative, disruptive, super-efficient, and eco-friendly technology development, supporting the 'Make in India's' initiative.

## WAY FORWARD

With the need of the hour to ratchet up RAC MEPS in India, all eyes are on India to see how it executes this ICAP recommendation. Based on the literature review of India’s policy, regulatory, and institutional framework for appliances and the learnings gathered from the review of MEPS adopted in selected countries; it is clear that India’s S&L programme is robust, well-designed, and highly impactful. However, there are some challenges and issues related to its consistent and coordinated implementation; there is substantial scope for improvement in India’s S&L programme and its implementation, from coordinating the efforts at the central level with state and non-state actors to supporting SDAs in enforcement and implementation. Furthermore, the availability of super energy-efficient technologies nationally and internationally as a result of the GCP offers India a unique opportunity to ratchet up its RAC MEPS. The GCP announced two winners in April 2021, which both met the prize criteria of five times lower climate impact compared to the average RACs available on the Indian market, indicating the global market is continuing to innovate, and the efficiency of all products is increasing, as RAC costs continue to fall. Consumer behaviour studies could also provide a way forward to better understand consumer perceptions, barriers, and the demand scenario, in order to tailor strategies to current end-user requirements. Furthermore, with the new S&L notification and MEPS target for RACs in India yet to be developed beyond 2023, this could be the first significant policy action post ICAP development and could position India as a nation that is upholding its commitment through strong action and staying true to the course of action established in ICAP.

For more information/any query, please reach out to tarun@aeee.in

### Alliance for an Energy Efficient Economy

37 Link Road, Ground Floor, Lajpat Nagar III, New Delhi, 110 024  
+91-11-41235600  
info@aeee.in  
www.aeee.in



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