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Perspective

Chinese policy leadership would cool global air conditioning impacts: Looking East

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ABSTRACT

The International Energy Agency expects the global stock of room air conditioners (RACs) to triple between today and 2050, with critical implications for energy use and greenhouse gas emissions. Because China produces approximately 70% of the world's RACs, it is in a unique position to lead a global transition to higher-efficiency RACs with substantially lower environmental impact. To date, however, Chinese policies have targeted relatively modest RAC efficiency increases. We recommend that China target production of RACs that use low global warming potential (GWP) refrigerants and are at least as efficient as the most efficient RACs produced today in China or on the global market. Specifically, we recommend that China set minimum energy performance standards for RACs at China annual performance factor (APF) 5.4 in 2025 and China APF 6.9 in 2030. This leadership would provide a longer-term policy signal to RAC manufacturers in China, enabling them to meet the efficiency targets cost-effectively by providing adequate time for investment planning. We project that full implementation of our recommended policy could result in global electricity consumption savings of 74 peta-watt-hours, CO_2 reductions of 49 billion metric tons, and bill savings of 6 trillion U.S. dollars (cumulative benefits 2020–2050). The policy is viable in China because of its provision of long-term certainty for manufacturers and their demonstrated ability to produce low-GWP RACs with the required efficiencies. Exploiting the parallel transition away from high-GWP refrigerants under the Kigali Amendment to the Montreal Protocol would provide manufacturing efficiencies and substantial savings opportunities.

1. The importance of Chinese room air conditioner policy

Global electricity consumption and greenhouse gas (GHG) emissions due to air conditioners (ACs) are soaring. According to the International Energy Agency, global electricity demand for ACs more than tripled between 1990 and 2016 from about 600 terawatt-hours (TWh) to 2,000 TWh. In China alone, demand increased by 68-fold during the same time frame, which accounted for over 30% of the increased global electricity demand in buildings between 1990 and 2016, more than 10% of electricity growth in China since 2010 and around 16% of its peak electricity load in 2017 [1,2]. Further, worldwide electricity demand from ACs is set to triple by 2050—from about 2,000 TWh in 2016 to 6,205 TWh in 2050—with emissions rising to 2,070 million metric tons of CO_2 ($MtCO_2$), from 1,135 $MtCO_2$ in 2016 [1,2]. These are the indirect emissions associated with the electricity generation. Direct emission from refrigerants add approximately 25% of them based on the information as of 2017 [2].

In 2016, the market penetration of room ACs (RACs) in urban Chinese households reached 124%, up from 5% in the mid-1990s (Fig. 1), although rural penetration remained below 47%. Today's rapidly rising incomes in populous, hot, and humid countries such as India and Indonesia (Fig. 2) are driving similarly staggering growth in RAC demand, with annual increases of 10%–15% [3,4]. Mitigating these impacts is a daunting proposition. Yet the key to global progress lies with a single country.

China is the world's largest exporter and consumer of RACs, producing approximately 70% of the world's RACs with an export share of 25%–37% in 2017 [7,8]. That year, China produced approximately 137 million RACs, sold about 89 million units domestically, and exported the remainder to other countries [8]. Four compressor manufacturing

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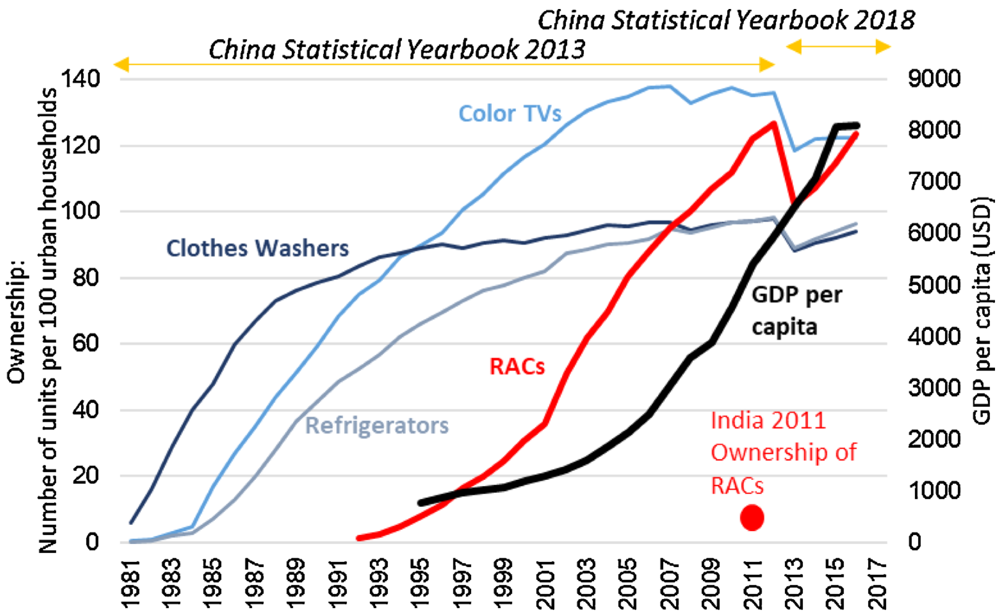

Fig. 1. Penetration of key appliances in urban Chinese households.
Household appliance ownership grew rapidly owing to rising incomes and urbanization in China. RAC saturation in urban China rose from nearly zero in 1992 to about 100% 15 years later. India's RAC ownership in 2011 is shown for comparison. Figure is updated from [2]. The 1981–2012 data and the 2013–2017 data are based on China Statistical Yearbook 2013 and 2018, respectively [5,6]. The ownership decrease between 2012 and 2013 may be due to different statistical methods and data collection between the two versions.

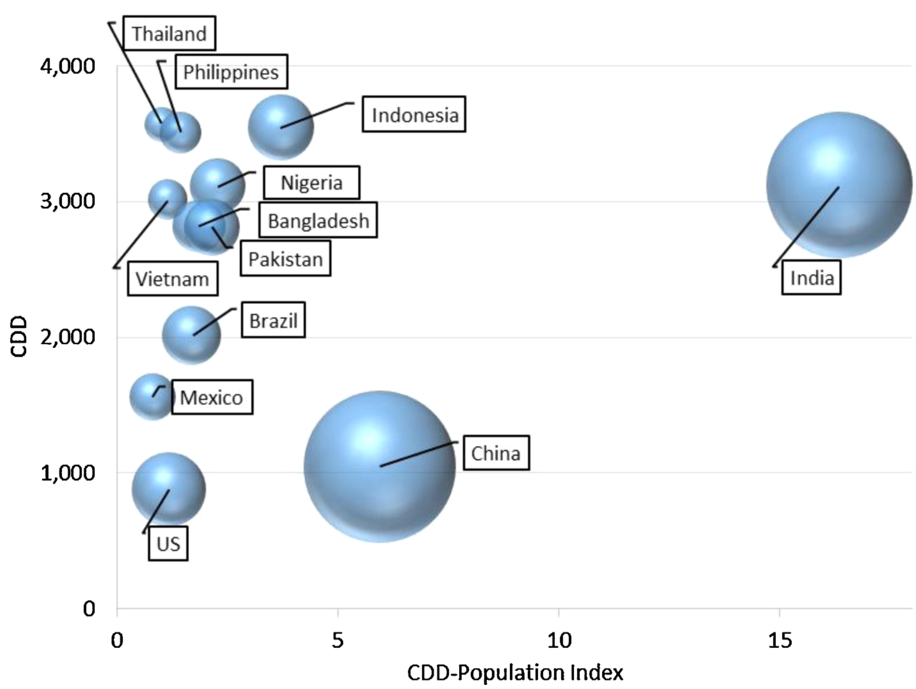

Fig. 2. CDD and population metrics for selected economies.
Top 12 countries by potential cooling demand measured in cooling degree days (CDD), which is an index of the energy demand to cool buildings. The CDD in this figure is calculated by subtracting 18°C (65°F) from the average daily temperature and summing only positive values over an entire year, for the representative cities of the countries. The bubble size indicates the total population of each country. The x-axis is the CDD-Population Index, which is calculated as CDD × Population/Population$_{\text{Thailand}}$. Figure is adjusted from [3].

companies in China account for over 60% of the current global production capacity of rotary compressors that are most commonly used in RACs as a key efficiency technology [9]. Further, 42% of the 167 million rotary compressors produced in 2017 were of variable-speed type that make ACs highly efficient and already dominant in major economies [9]. A typical RAC requires more than 130 times the power of a typical light-emitting diode (LED) bulb and five times the power of a refrigerator (Fig. 3a). Assuming a typical RAC unit has 1.1 kW of rated power consumption,[1] the 137 million RACs produced in China represent 151 GW of connected load—1.5 times higher than the 100 GW of solar generation capacity installed worldwide in 2017 (Fig. 3b) [10]. Clearly, ambitious Chinese RAC-efficiency policies could have an outsized influence on global energy use and emissions in the coming decades, given the dominance of China in manufacturing AC systems and key components such as compressors that largely determine energy efficiency of those systems. In this Perspective, we review China's current RAC policies and recommend policies that could produce greater economic and environmental benefits for China and the rest of the world.

2. Current Chinese RAC policies

To date, China's RAC-efficiency policies have been incremental, targeting modest, short-term (1- to 3-year) efficiency improvements of around 10%–15% and giving a relatively weak and uncertain signal to RAC manufacturers. China did not change the MEPS for fixed-speed RACs from 2010 to 2019, instead implementing a separate set of MEPS for variable-speed RACs in 2013; both sets of MEPS subsequently

[1] This equates to 3.5 kW of rated cooling capacity (CC) and an efficiency equivalent to energy efficiency ratio (EER) 3.2.

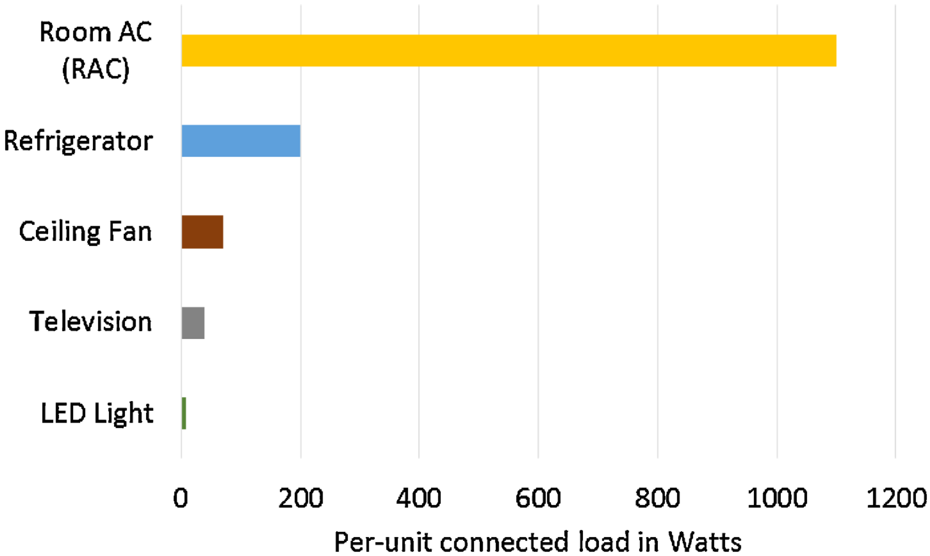

Fig. 3a. (a) **Per-unit connected load of an RAC and other end-uses.**
We assume unit power consumption of typical products as follows, based on [11] and [12]. The RAC is a 3.5-kW cooling-capacity, fixed-speed, split AC unit that meets EER 3.2, the current Chinese minimum energy performance standard (MEPS) level for fixed-speed RACs, translated into 1.1-kW rated power consumption. The refrigerator is a 250-L refrigerator-freezer combination unit that consumes 200 W. The 48-in ceiling fan consumes 70 W. The 42-in TV has an LED-backlit liquid crystal display (LCD) and consumes 40 W in "on" mode. The LED light emits 800 lm at 8 W (i.e., 100 lm/W of luminous efficacy).

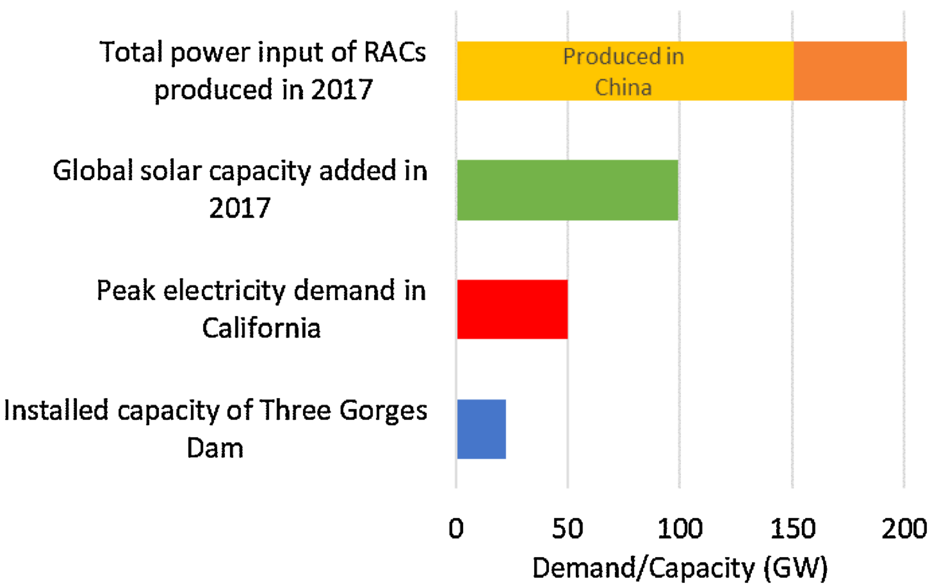

Fig. 3b. Total connected load of RACs produced in China in 2017 with electricity demand/capacity examples for comparison.
We estimate the total power input of RACs in 2017 by multiplying 1.1 kW per unit times 196 million units (global RAC sales) and 137 million units (RACs produced in China), assuming the average RAC CC is 3.5 kW [11]. About 100 GW of solar capacity were added globally in 2017 according to SolarPower Europe [13]. In California, the peak load on September 1, 2017, was about 50 GW, according to the California Independent System Operator [14].

Table 1
China's efficiency-grade thresholds for RACs since 2010/2013
Source: [18]

	Type	CC	Grade 1	Grade 2	Grade 3 (MEPS)
Fixed speed	**All (EER)**	CC ≤ 4.5 kW	3.60	3.40	3.20
		4.5 kW < CC ≤ 7.1 kW	3.50	3.30	3.10
		7.1 kW < CC ≤ 14.0 kW	3.40	3.20	3.00
Variable speed	**Cooling Only (SEER)**	CC ≤ 4.5 kW	5.40	5.00	4.30
		4.5 kW < CC ≤ 7.1 kW	5.10	4.40	3.90
		7.1 kW < CC ≤ 14.0 kW	4.70	4.00	3.50
	Reversible (APF)	CC ≤ 4.5 kW	4.50	4.00	3.50
		4.5 kW < CC ≤ 7.1 kW	4.00	3.50	3.30
		7.1 kW < CC ≤ 14.0 kW	3.70	3.30	3.10

remained unchanged until 2019 (Table 1). China recently revised its RAC MEPS and efficiency labels, and the revisions will go effective on July 1, 2020 [15].[2] The new standard imposes five grades covering fixed and variable RACs (Table 2), with Grade 5 as the MEPS for fixed-speed units and Grade 3 as the MEPS for variable-speed units. According to the Green and High-Efficiency Cooling Action Plan [16] and input from the Chinese National Institute of Standardization, the MEPS is expected to be combined for both RAC types and require 30% higher efficiency by 2022, compared to the 2010/2013 MEPS. If the new Grade

[2] As of September 30, 2019, the draft standard was posted on the World Trade Organization's Technical Barriers to Trade system for a 60-day review period.

Table 2
China's efficiency-grade thresholds for RACs, effective July 2020
Source: [15]

Type	CC	Grade 1	Grade 2	Grade 3 (MEPS, variable speed)	Grade 4	Grade 5 (MEPS, fixed speed)
Cooling only (SEER)	CC ≤ 4.5 kW	5.80	5.40	5.00	3.90	3.70
	4.5 kW < CC ≤ 7.1 kW	5.50	5.10	4.40	3.80	3.60
	7.1 kW < CC ≤ 14.0 kW	5.20	4.70	4.00	3.70	3.50
Reversible (APF)	CC ≤ 4.5 kW	5.00	4.50	4.00	3.50	3.30
	4.5 kW < CC ≤ 7.1 kW	4.50	4.00	3.50	3.30	3.20
	7.1 kW < CC ≤ 14.0 kW	4.20	3.70	3.30	3.20	3.10

In 2020, Grade 5 would become the MEPS for fixed-speed units, and Grade 3 would become the MEPS for variable-speed units.

Table 3
China's potential efficiency-grade thresholds for RACs in 2022
Source: [16] and input from the Chinese National Institute of Standardization

Type	CC	Grade 1	Grade 2	Grade 3 (MEPS)
Cooling only (SEER)	CC ≤ 4.5 kW	5.80	5.40	5.00
	4.5 kW < CC ≤ 7.1 kW	5.50	5.10	4.40
	7.1 kW < CC ≤ 14.0 kW	5.20	4.70	4.00
Reversible (APF)	CC ≤ 4.5 kW	5.00	4.50	4.00
	4.5 kW < CC ≤ 7.1 kW	4.50	4.00	3.50
	7.1 kW < CC ≤ 14.0 kW	4.20	3.70	3.30

In 2022, Grade 3 would potentially become the MEPS for fixed-speed and variable-speed units.

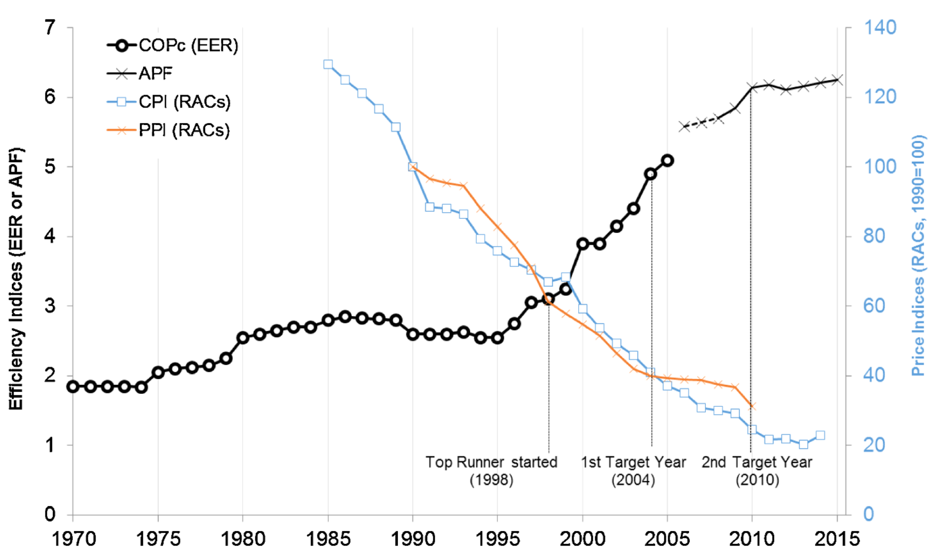

Fig. 4. RAC efficiency and price trends in Japan, 1970–2015.
The figure shows trends in RAC efficiency reported as coefficient of performance for cooling (COPc) and APF for products with 2.8 kW CC, along with RAC prices represented by the CPI and producer price index (PPI) of RACs. RAC efficiency in Japan improved more than threefold during this period. For RAC energy-efficiency metrics, Japan originally used COPs for cooling and heating; however, for the second target year (2010), Japan modified test methods and replaced the COP metric with an APF that reflects actual outdoor temperature changes and corresponding indoor thermal loads. Figure is from [20].

3 becomes the MEPS for both types in an amendment form for easy adoption, the level would be 21%–38% more stringent (for reversible heat pumps) and 32%–54% more stringent (for cooling-only products) than the 2010 MEPS for fixed-speed RACs in China annual performance factor (APF) or seasonal energy efficiency ratio (SEER) (Table 3). Therefore, this policy would achieve the national goal of a 30% RAC MEPS improvement by 2022 [16] while remaining consistent with *Made in China 2025* goals related to energy savings and environmental protection [17].

Since 2015, China has been running the Top-Runner Program for End-Use Energy Consuming Appliances and Products, a voluntary program that differs from the Japanese Top Runner program (discussed below), to help distinguish super-efficient models on the China Energy Label and create a framework for potentially subsidizing super-efficient products [18]. Qualifying products that are recognized as Energy Efficiency Top Runners based on their score ranking receive an “Energy Efficiency Top Runner” designation on the China Energy Label for that product [18].[3]

3. A more ambitious Chinese RAC policy

To drive more ambitious Chinese and global RAC efficiency improvements, we recommend that China target production of RACs that use low global warming potential (GWP) refrigerants and are at least as

[3] For RACs, a total of 100 points is possible, including 70 points for the product's energy performance beyond Grade 2 efficiency criteria, 15 points for the product's technical components, and 15 points for the manufacturer's energy conservation-related activities. Specifically, under the points for the product's technical components, RACs that use refrigerants with ozone depletion potential (ODP) > 0 will receive 0 out of 3 points, those with ODP = 0 and GWP ≥ 750 will receive 2 points, and those with ODP = 0 and GWP < 750 will receive 3 points [17].

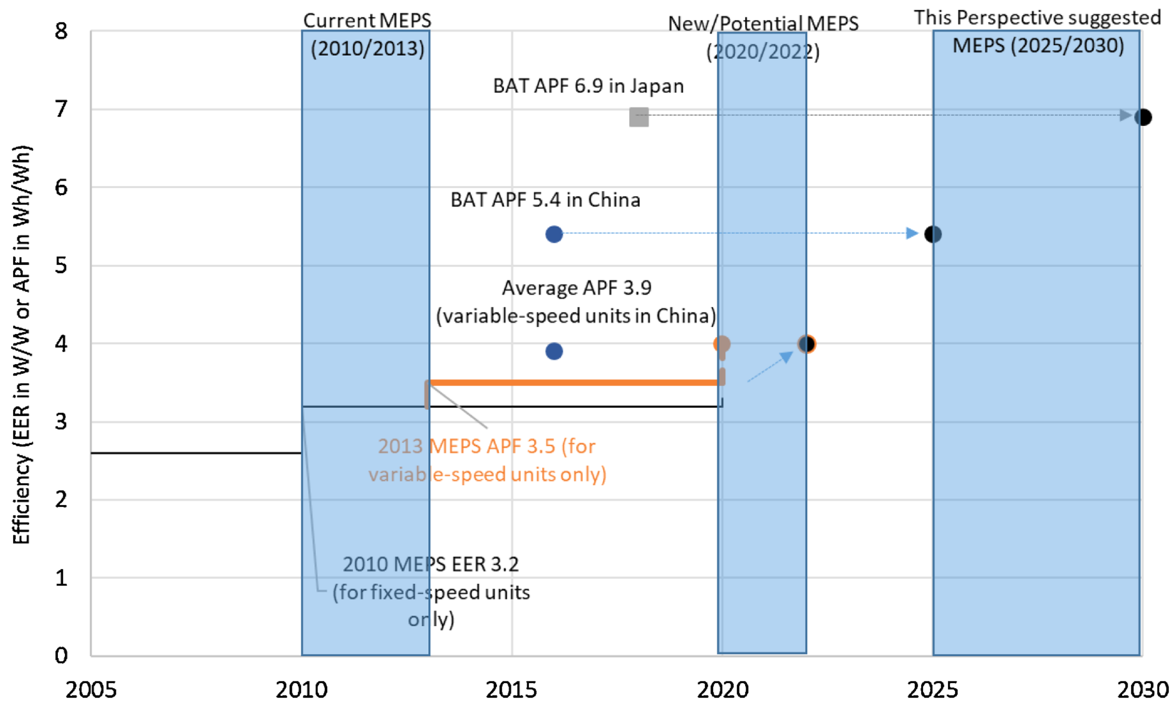

Fig. 5. Recommended pathway for Chinese RAC policy leadership.
Current MEPS (2010/2013): China has not changed the MEPS for fixed-speed RACs since 2010 and the MEPS for variable-speed RACs since 2013.
New/Potential MEPS (2020/2022): The new standard imposes five grades (Table 2), with Grade 5 as the MEPS for fixed-speed units and Grade 3 as the MEPS for variable-speed units; it will become effective in July 1, 2020. In 2022, it is expected that MEPS for both fixed- and variable-speed units will be at Grade 3 (China APF 4.0).
This Perspective suggested MEPS (2025/2030): Based on the current BATs in China (China APF 5.4) and Japan (China APF 6.9).
All MEPS in the figure are for units (reversible heat pumps) with CC of 4.5 kW or less.

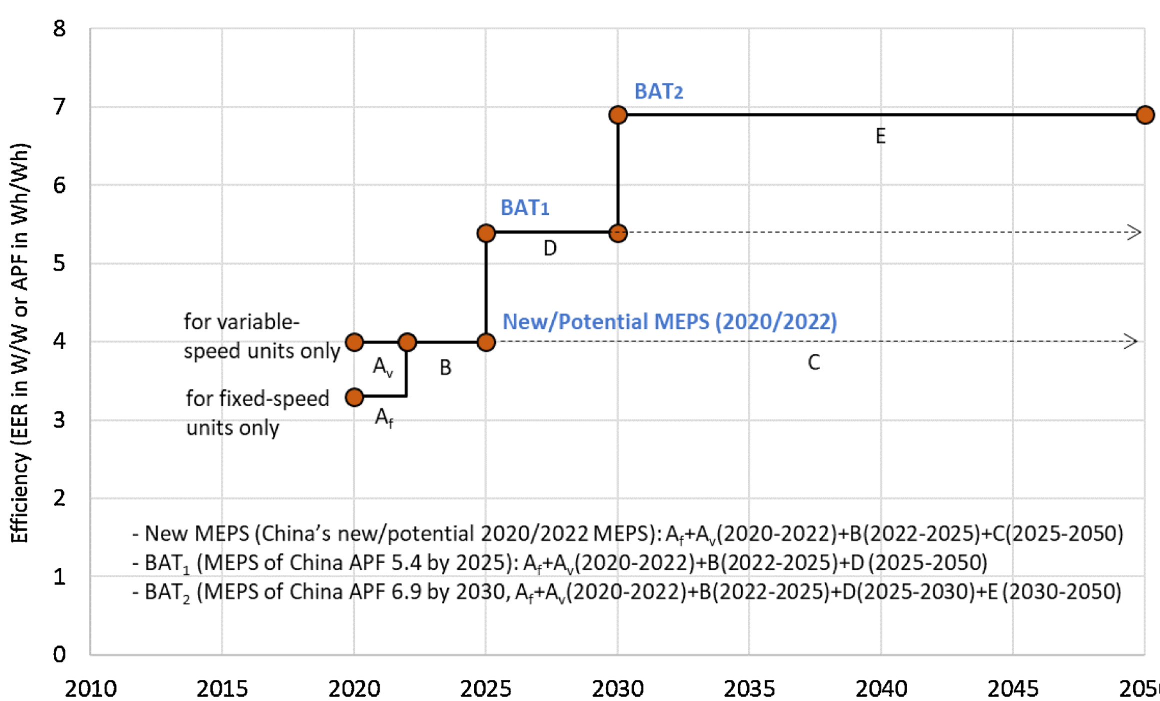

Fig. 6. Three improved policy scenarios analyzed in this Perspective

Table 4
Assumptions for the policy scenario analysis
Source: [3, 11]

Scenario		China Share of fixed-speed units	Share of variable-speed units	Other Share of fixed-speed units	Share of variable-speed units
2020	**Baseline**	39%	61%	83%	17%
	New MEPS	32%	68%	26%	74%
2025	**Baseline**	35%	65%	81%	19%
	New MEPS	0%	100%	24%	76%
2025	**Baseline**	30%	70%	78%	22%
	New MEPS	0%	100%	23%	77%
	BAT_1				
2030	**Baseline**	24%	76%	72%	28%
	New MEPS	0%	100%	22%	78%
	BAT_1				
	BAT_2				
2050	**Baseline**	0%	100%	27%	73%
	New MEPS			0%	100%
	BAT_1				
	BAT_2				

Notes and other assumptions:
● Other countries include Brazil, Chile, Colombia, Egypt, India, Indonesia, Mexico, Pakistan, Saudi Arabia, Thailand, United Arab Emirates, and Vietnam. China and these countries account for 65%–70% of global RAC market demand.
● Emissions factor ($kgCO_2$/kWh): time series data (0.730 in 2010 decreasing to 0.253 in 2050) based on [9], 0.778 (other countries, AC sales weighted) based on [3].
● Average electricity price in U.S. dollars (USD) per kWh: 0.078 (China), 0.082 (other countries, AC sales weighted).
● Share percentages represent share in new sales.
● China is assumed to export RACs that meet the Chinese standard.
● Annual hours of use: China 1,569 hours/year (based on GB 21455:2013), other countries 1,817 hours/year (based on ISO 16358:2013)

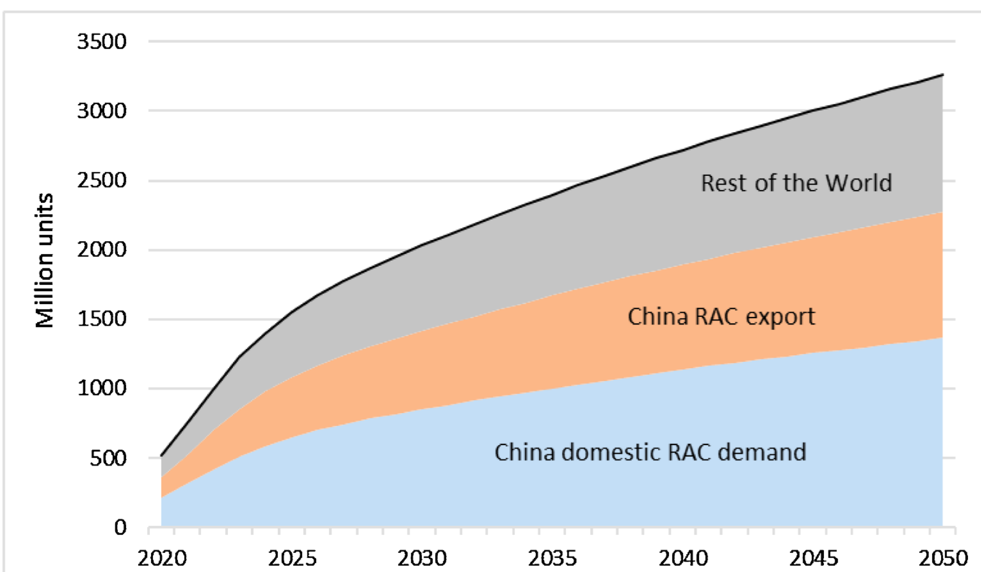

Fig. 7. Projected RAC stocks in China and the global market.
Stocks represent cumulative new sales from 2020 onward. Figure is adjusted from [11], based on the assumption that 70% of the global RAC demand is manufactured in China (45% sold in China and 25% sold in other countries) between 2020 and 2050.

efficient as the most efficient RACs produced today in China or on the global market. This policy is modeled after Japan's successful Top Runner energy-efficiency program, which required best-available-technology (BAT) efficiencies to become the norm 5–7 years after the program's start in 1998.[4] That program stimulated a 60% RAC efficiency increase between 1997 and 2004, following decades of much more modest efficiency improvements (Fig. 4) [20]. During the 1997–2010 period, RAC prices dropped by 65% in consumer price index (CPI) terms [20].

China is well suited to implementing a policy similar to Japan's Top Runner program. The share of variable-speed RACs sold in China surpassed 50% in 2016, resulting in a product-weighted average efficiency of APF 3.9. In addition, the most efficient RACs made by Chinese companies are already two to three times more efficient than typical RACs sold in other markets, including models with low-GWP refrigerants [16]. According to data collected for registered models in 2017, the highest-efficiency RACs are typically available in small sizes,

[4] For companies that manufacture or import equipment covered by the Top Runner Program, each equipment's average energy-efficiency value weighted by shipment must achieve a target standard value by the target fiscal year.

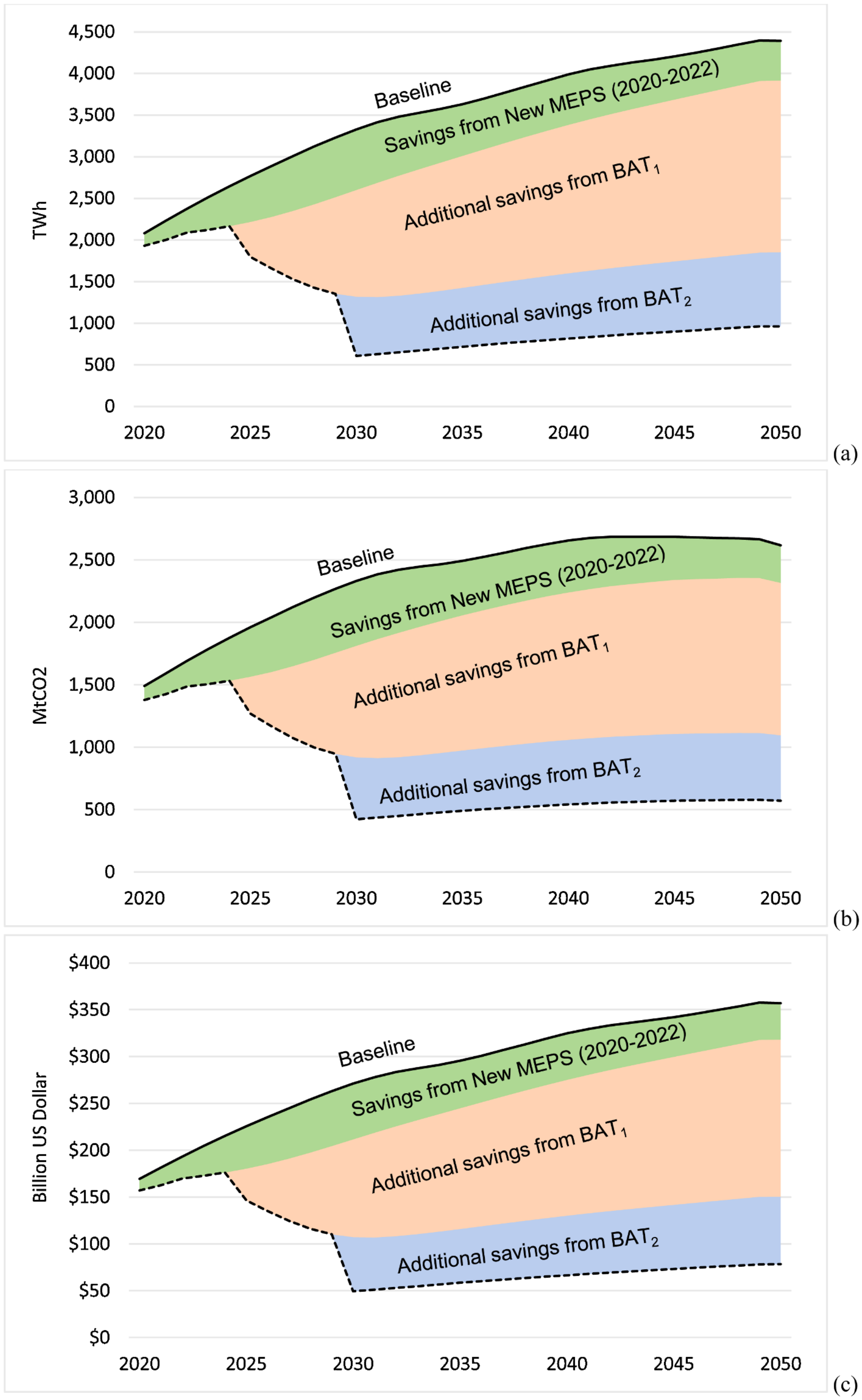

Fig. 8a. Projected global savings potential by scenario with regard to (a) energy consumption, (b) CO_2 emissions, and (c) electricity bills, 2020–2050. Figure is adjusted from [11].

particularly 0.75-RT[5] (2.5–2.6 kW CC) products [18].[6] The BAT—that is, the most efficient model, sized at 0.75 RT—in the Chinese market is rated at China APF 5.4, which is 20% higher than China's Grade 1 threshold of China APF 4.5 for the 2013 variable-speed room AC standard [18]. In other major economies such as Europe, Japan, and the U.S., the most efficient RACs are typically produced by Japanese manufacturers [18]. In addition, the Chinese APF metric is more comparable to the Japanese APF metric than are other regions' seasonal efficiency metrics [21]. Thus, in this Perspective, we use the BAT level identified in Japan for comparison. The BAT in the Japanese market (for a 1.1-RT product) is at China APF 6.9 (translated from Japan APF 7.9) [22].

[5] Refrigeration tons (RT) indicate the nominal CC of the equipment, where 1 RT = 12,000 Btu/h = 3.52 kW.

[6] The most efficient sizes vary in some countries. For example, the most efficient model in India is a 1-RT model, and the most efficient model in South Korea is a 2-RT model [16].

(a) (b) (c)

Fig. 8b. Cumulative projected savings potential by scenario with regard to (a) energy consumption, (b) CO_2 emissions, and (c) bill savings in China vs. other countries, 2020–2050

In alignment with Japan's Top Runner approach,[7] our recommended policy for China is based on setting MEPS in 5–10 years based on current (2016–2018) BATs. Specifically, we recommend that China set MEPS for fixed- and variable-speed RACs at China APF 5.4 (the Chinese market's current BAT) in 2025 and China APF 6.9 (the Japanese market's current BAT) in 2030. Fig. 5 compares our recommendation with China's current (2010/2013) MEPS and its new/potential MEPS (2020/2022).

This policy leadership would provide a longer-term policy signal to Chinese RAC manufacturers, enabling them to meet the efficiency targets cost-effectively by providing adequate time for investment

[7] The proposed Chinese policy in this Perspective is inspired by Japan's Top Runner approach but not fully analogous with respect to the impact of domestic programs on the efficiency of exports.

planning. The refrigerant transition under the Montreal Protocol already provides long-term policy certainty in consultation with the RAC industry. Combining the transition toward low-GWP refrigerants with a clear trajectory for energy efficiency improvement would allow the industry to exploit synergies in redesigning equipment and retooling manufacturing lines to achieve both goals simultaneously [19].

4. Projected impacts of the recommended policy

We compare global impacts during the 2020–2050 period among four policy scenarios. The Baseline scenario uses the 2010/2013 Chinese MEPS. The New MEPS scenario uses China's new/potential (2020/2022) MEPS, shown as $A_f + A_v + B + C$ (2025–2050) in Fig. 6. The BAT_1 scenario represents our recommendation for achieving MEPS of China APF 5.4 by 2025, shown as $A_f + A_v + B + D$ (2025–2050) in Fig. 6. Finally, the BAT_2 scenario represents our recommendation for achieving MEPS of China APF 6.9 by 2030, shown as $A_f + A_v + B + D + E$ (2030–2050) in Fig. 6.[8] Table 4 details the scenarios and our assumptions. Fig. 7 shows the RAC demand projection for the global market along with Chinese RAC exports and domestic sales—these demand projections are the same for all the scenarios analyzed.

Fig. 8a shows the projected benefits of the three higher-MEPS scenarios compared with the Baseline scenario—between 2020 and 2050—in the form of reduced RAC energy consumption, GHG emissions, and consumer bill savings. Fig. 8b shows the cumulative impacts in China versus other countries. The BAT_1 and BAT_2 scenarios could result in electricity consumption savings of about 58 petawatt-hours (PWh) (BAT_1) to 74 PWh (BAT_2), global GHG reductions of more than 38 billion metric tons (GT) CO_2 (BAT_1) to 49 GT CO_2 (BAT_2) and global bill savings of about 4.7 trillion USD (BAT_1) to 6 trillion USD (BAT_2). Savings in other countries, attributed to China's RAC efficiency standard improvement, account for about 70%–80% of the total global savings. This result clearly shows the importance of China's domestic policies to global RAC energy consumption. Because China produces about 70% of RACs in the global market and exports to areas with rapidly growing AC demand such as Southeast Asia, higher Chinese MEPS may produce widespread economic, energy, and emissions benefits.

5. Meeting challenges to policy enactment

Policies that mandate attainment of best-available efficiencies typically encounter three main concerns. The first is technology availability, but this is not a barrier to China's adoption of such a policy owing to the high efficiency of RACs already made by major Chinese manufacturers. In addition, several studies have shown pathways to these efficiency levels that can be accessed by most manufacturers [18,23,24]. A recent report finds that the barriers to improving energy efficiency while transitioning to low-GWP refrigerants for most RACs are primarily non-technical, and recommends policy improvements that stimulate the supply and demand needed to achieve economies of scale and identify cost-effective ways to realize the market transition [25].

The second concern is about higher prices and reduced consumer demand. However, several studies have shown that prices have continued to decline despite major efficiency improvements [20, 26–31]. This is possible because stringent mandates provide economies of scale to efficient products, which reduces their prices. For example, as seen in Fig. 4, RAC efficiencies more than doubled under Japan's Top Runner program while prices continued to drop (in real terms) at about the same rate as before the program began. Policy makers can consider programs such as public or private procurement of products that are qualified, standardized and sold in large quantities where a large enough number of customers can combine their buying power to obtain a significant discount. For example, in India, the Energy Efficiency Services Limited (EESL) launched a public bulk procurement for super-efficient RACs [32,33].

The third concern is about loss of market share in importing countries and regions. In importing countries and regions with strong efficiency standards, such as the European Union, increasing China's standards would better position China for continued export, even as the European Union looks to revise its standards within the next few years. Furthermore, market share in importing countries is unlikely to be lost because, as efficient RAC prices drop, most consumers likely will prefer efficient products owing to the bill savings and short payback times. In addition, key importing countries may follow China's lead on efficiency targets to reap similar domestic benefits. For example, as an international effort to address this concern, the United for Efficiency (U4E) initiative's Model Regulation Guidelines[9] suggest efficiency levels aligned with China's new MEPS and labels that are expected to take effect in 2022 and should have significant impacts on the cost and availability of energy-efficient RACs globally given the size of the domestic and export markets [34]. The Guidelines encourage consistent approaches across countries that can help create economies of scale for products, leading to reduced consumer electricity bills, air pollution, and GHG emissions while enabling greater electrical grid stability [34].

In addition to these three main concerns, there might be a challenge to sustainably assuring the quality of manufactured products over a long-enough period. Evaluation, measurement and verification help measure the effects of a program and determine whether it met its goals. Developing a long-term evaluation strategy, with appropriately planned and sequenced evaluation studies would enable the program to maximize its efficiency and effectiveness leading to program success.

6. Conclusion

China is in a unique position to lead the global transition to high-efficiency RACs through a policy aligning the efficiencies of all Chinese RACs with the most efficient models available in the Chinese and other markets today. Such a policy—similar to Japan's Top Runner program—is viable in China because of the policy's substantial economic and environmental benefits, its provision of long-term certainty for Chinese manufacturers, and the demonstrated ability of those manufacturers to produce low-GWP RACs with the required efficiencies. Taking advantage of the parallel transition away from high-GWP refrigerants under the Kigali Amendment to the Montreal Protocol provides additional savings opportunities. If adopted, our recommendations would dramatically increase benefits to consumers in China and worldwide while dramatically decreasing the significant and growing environmental impacts of RAC use. It would be an important step toward keeping a warming world cooler.

[8] Karali et al. [11] model the costs and benefits of the draft RAC MEPS in China (Table 2), projecting that the new MEPS will contribute to reducing CO_2 emissions about 13% between 2019 and 2050 and providing bill savings of 2,620 billion RMB to China's consumers. The study also finds that the highest-efficiency scenario, reaching MEPS APF 5.4 in 2025, provides the largest long-term national benefits. However, no previous study has discussed the potential impact of Chinese RAC efficiency standards and improvements on the global market.

[9] The U4E initiative, led by the United Nations Environment Programme, has released the Model Regulation Guidelines for RACs. This voluntary guidance is for governments in developing and emerging economies that are considering a regulatory or legislative framework requiring new RACs to be energy efficient and to use refrigerants with a lower GWP than typical legacy refrigerants. The contents were developed assuming interested countries would put them into effect in approximately 2023, but the timing and text are adjustable based on the context of individual countries.

Declaration of Competing Interests

There is no conflict of interests to report.

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