

A Brief on Energy Efficiency of China's Export Residential Air Conditioners

I. Background

China plays a vital role in the global value chain. Due to its vast market demand and strong supporting and manufacturing capacity, China's production of residential air conditioners (RACs) makes up more than 80% of total global output for many consecutive years (Figure 1). China's RAC sales consisted of more than 50% of total global sales in the refrigeration year¹ 2020 (RY2020). It implies that Chinese RAC products' energy-saving properties can significantly impact global energy efficiency (EE). For this reason, research relevant to China's RAC has attracted more and more international attention.

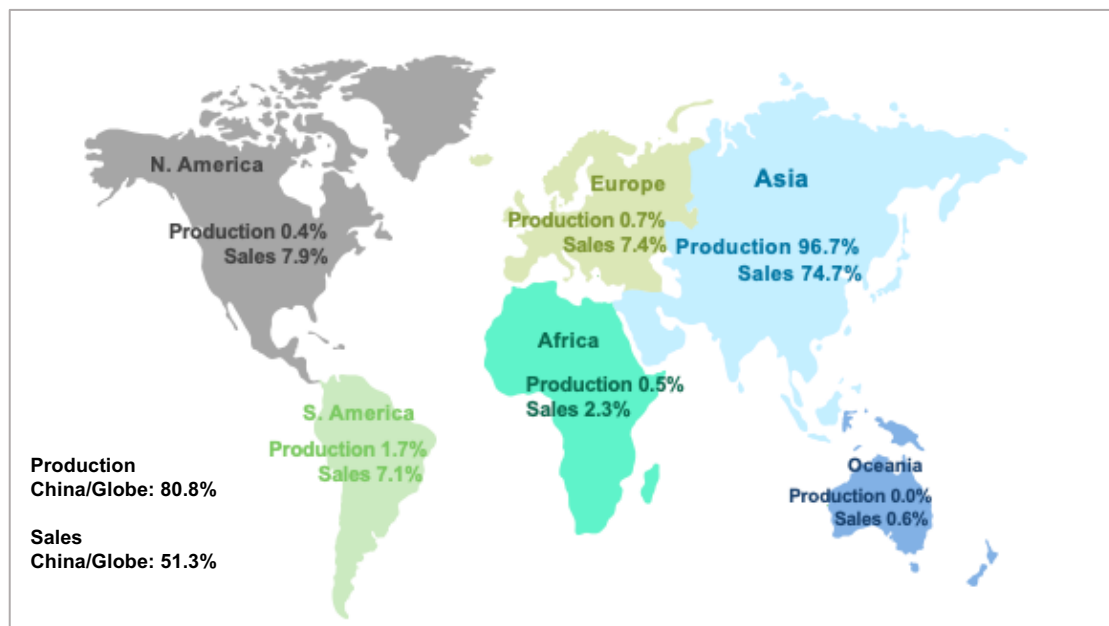


Figure 1. Global RAC Production and Sales in RY2020

At the end of 2019, the sudden outbreak of the COVID-19 pandemic swept the world. Because of the Chinese government's swift response, China's export witnessed growing resilience. China's RAC has withstood the attack from the global pandemic and achieved a small growth of 1.6% despite the shrinking household air-conditioning demand. Except for exports to the United States and Algeria, which have been affected by trade relations and policies, the scale of China's exports to target countries

¹ from August of the previous year to July of the current year

has been relatively stable or has increased (Figure 2).

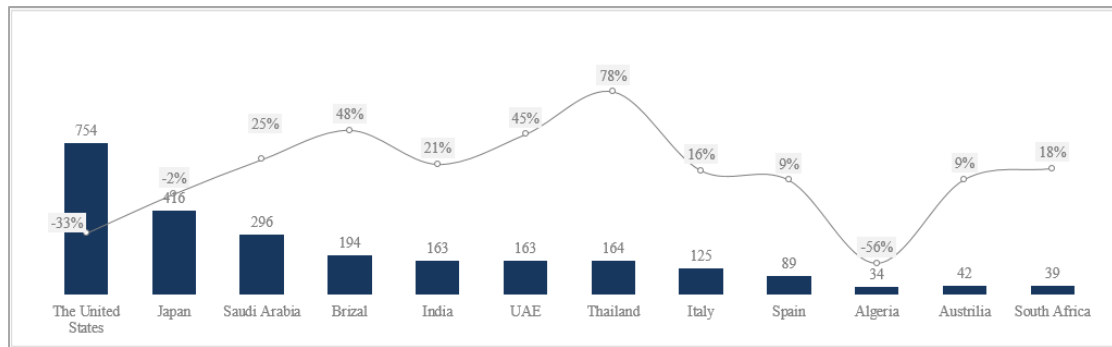


Figure 2. China's RAC Export Scale and Growth in Target Countries, RY2020 (10K, %)

Contrary to the rapid growth of China's export scale, research on the energy performance of export RAC products is still vacant. With the support of the Energy Foundation, ChinaIOL studied the global RAC demand, distribution, and China's RAC export, to explore the relationships of EE composition between China's export and the importing countries' local market demand. The study targeted two to three countries from each continent with the largest numbers of imports from China to study China's RAC export trends, magnitude, product types, and EE levels. On this basis, the study sorted target countries' energy standards and compared them with China's current Minimum Energy Performance Standard (MEPS) for RAC. Then it analyzed China's export RACs' EE distribution and compared it with the EE composition of the local market in these countries. This project also plans to conduct continuous monitoring and evaluation of China's export RAC's energy efficiency in the future.

II. Main Methods and Findings

2.1 Analysis Methods

Due to the differences in assessment methods for RAC's energy efficiency, working conditions, and testing requirements among target countries, different countries' EE standards can not be compared directly. To accurately measure and compare current market EE levels among various countries, each country's EE standard was benchmarked against China's current MEPS² so that they are on the same scale for comparison. ChinaIOL utilized networks and sources that it has established over the years, analyzed existing data and data obtained from market research, conducted direct interviews with enterprises and experts, and compiled a dossier of countries' data for the comparison. Figure 3 is the comparison of split unit AC's EE standards,

² China's new MEPS (the current standard) for room air conditioners (both ACs and heat pumps) took effect on July 1st, 2020. The new MEPS brought fixed-frequency ACs and more efficient variable-frequency ACs into one scale and adopted new assessment standards that are more strict than previous ones.

and Figure 4 is the comparison of window AC's EE standards.³

China Old MEPS	China Current MEPS	Asia					Oceania	Europe		America		Africa		
		Japan	India	Thailand	Saudi Arabia	UAE	Australia	Spain	Italy	USA	Brazil	South Africa	Algeria	
Above Inverter Grade 1	Above new grade 1	/	/	/	/	/	/	/	/	/	/	/	/	
	New Grade 1(APF)	APF5.8(≤3200w)	/	/	/	A EER > 16.5	/	AEER/ACOP > 3.66	/	/	/	/	/	
Inverter Grade1 (SEER/APF)	New Grade 2(APF)	/	Star 5	NO.5★★,NO.5★★★	B(EER:14.5-16.5), C(EER:13.0-14.5)	/	AEER/ACOP≈3.66	A+++	A+++	SEER22	/	/	/	
Inverter Grade2 (SEER/APF)	New Grade 3(APF)	/	Star 4	/	D(EER:11.8-13)	Star 5	/	A++	A++	SEER18	/	/	/	
Inverter Grade3 (SEER/APF)	/	/	Star 3	NO.5,NO.5★	/	Star 3,Star 4	/	A+	A+	SEER16	A	/	/	
F/S Grade 1 (SEER/APF)	New Grade 4(SEER)	/	/	/	/	/	/	/	/	/	/	/	/	
	New Grade 5(SEER)	/	/	NO.5★,NO.5★★	/	/	/	/	/	/	/	/	A++	
F/S Grade 2 (SEER/APF)	Below New Grade 5	/	Pre-EE Fix Speed Star 5	/	/	/	/	/	/	/	/	/	/	
		/	/	NO.5	D	/	/	/	/	/	/	/	A+	
F/S Grade 3 (SEER/APF)	/	/	/	/	E	/	/	/	/	/	B	A	A	
Below F/S Grade 3	/	/	Star 1, Star 2	/	F,G	Star 1, Star 2	/	/	/	/	/	C,D	B	B

Figure 3. Comparison of Current RAC (Split) EE Standards in Target Countries

China Old MEPS	China Current MEPS	Asia					Oceania	Europe		America		Africa	
		Japan	India	Thailand	Saudi Arabia	UAE	Australia	Spain	Italy	USA	Brazil	South Africa	Algeria
Above Grade 1	/	/	/	/	/	/	/	/	/	CEER12.1	/	A++A+	/
Grade 1 (SEER) 3.3		/	Star 5	/	/	/	/	/	/	/	/	/	/
Grade 2 (SEER) 3.1		/	Star 4	/	/	/	CEER/ACOIP > 3.1	/	/	CEER11	/	A	/
Grade 3 (SEER) 2.9		/	Star 3	/	/	/	/	/	/	/	A	B	/
Below Grade 3		/	Star 1, Star2	/	F	Star 1, Star 2	/	/	/	/	/	/	A,B

Figure 4. Comparison of Current RAC (Window) EE Standards in Target Countries

Then the study merges the standards information to the market data to see the correlations between EE compositions of China's export products and the EE composition determined by the local demand in receiving countries. Doing this allows us to compare current RAC's EE levels in different geographic markets, and it also allows us to have a peek at China's contribution to the RAC industry's global energy efficiency.

2.2 Main Findings

Figure 5 and Figure 6 below present the result of the comparison. Left bars indicate the market share of different EE level products imported from China, and right bars are the market share of different EE level products in the local market. This comparative arrangement helps explain China's export products' influence and the counter-influence to the local market on energy efficiency. Each color in a bar represents a relevant EE level. To simply state, blue represents a higher efficiency (corresponds to China's MEPS grade 3 and above), and orange indicates a lower efficiency (corresponds to China's MEPS grade 4 and below). Within the same color

³ The new MEPS does not have relevant requirements for integrated AC products. Window ACs are integrated products, and thus they adhere to the old MEPS. Because of their structure, window ACs' energy efficiencies are generally lower than that of split ACs.

range, the darker the color, the more efficient the product.

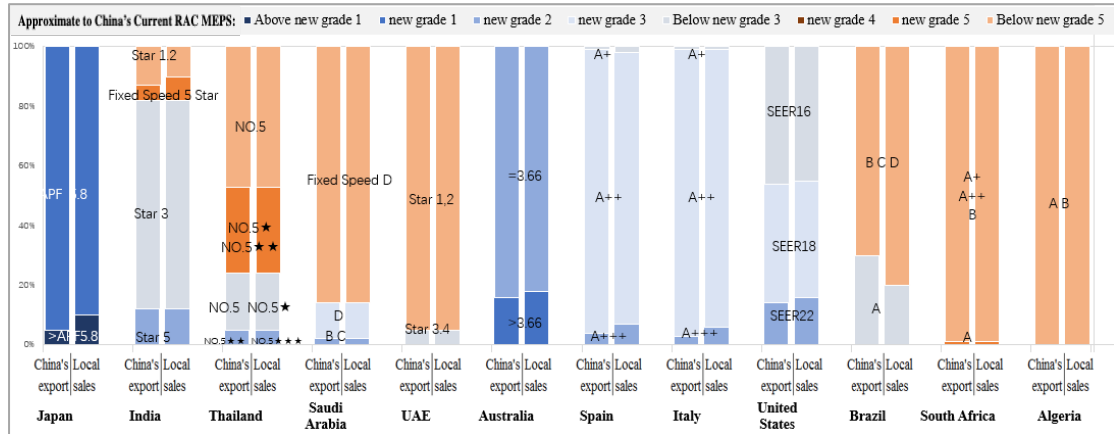


Figure 5. Energy Efficiency Distribution of RAC (Split) in Target Countries

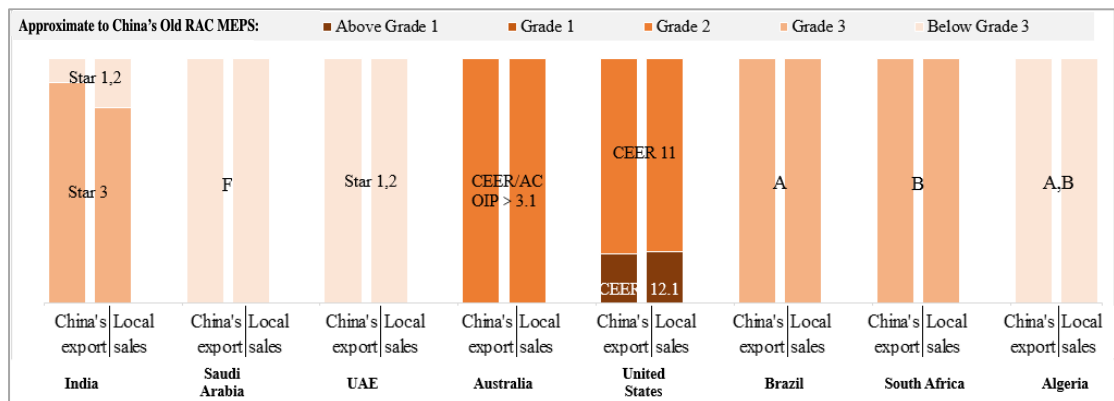


Figure 6. Energy Efficiency Distribution of RAC (Window) in Target Countries

Figure 5 and Figure 6 compare the split unit AC and window AC market in target countries, presenting each country's local demand and that portion supported by China's export. The bar chart also shows its market EE distribution. Take Thailand's split unit AC as an example, its NO.5★★ and NO.5★★★ are the highest grades in the country (represented by blue colors in the chart). However, these products do not have the greatest market share. No.5 is the lowest grade in Thailand's split unit AC market, and it accounts for nearly half of the market share. As seen in the graph, the EE composition of China's export to Thailand and Thailand's local sales are almost identical.

Compared to other countries, Thailand's overall efficiency level is lower than that of Japan, Australia, and countries with high EE requirements, as less and lighter orange colors are observed in these countries from the chart. Thailand's efficiency level is higher than that of African countries facing a hotter climate as Thailand has a greater proportion of blue and dark orange in the chart compared to these countries. Split unit ACs' EE distribution in Thailand is similar to that of India, though India's efficiency level is slightly higher.

III. Conclusion

3.1 Chinese Enterprises' Discretion Is Affected by OEMs

Although the beyond expected sales were encouraging, the study found that China's RAC export is dominated by original equipment manufacturers (OEM). That is, China produces parts and equipment, but they are marketed by overseas brands. According to the study on major RAC manufacturers, OEM is China's main export mode, and it accounts for about 72.3% of all exports. In contrast, original brand manufacture (OBM), which is to export as Chinese brands, is only responsible for 27.7% of all exports (Figure 7). Although the proportion of OBMs is steadily increasing every year, the ratio is still low.

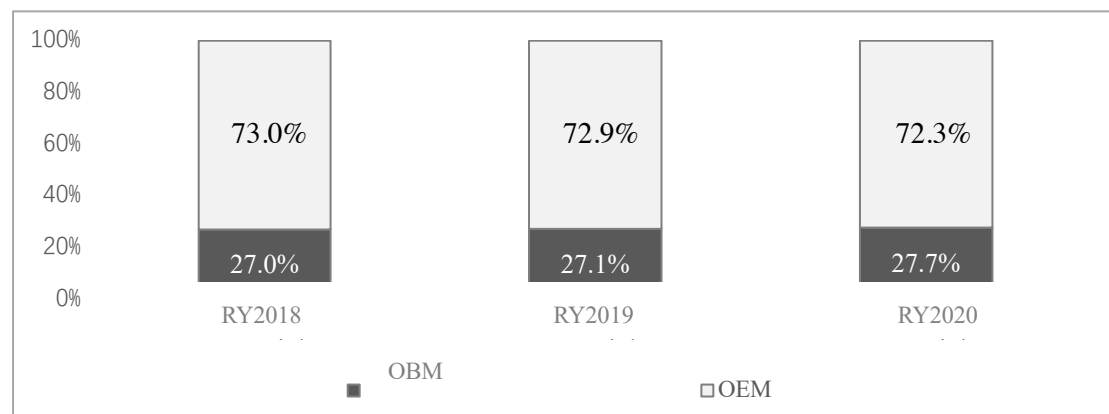


Figure 7. China's RAC Export by OEM in RY2018-RY2020

When RACs are exported by OEM, Chinese enterprises do not play an essential role in determining the finished products, including its EE performance and other specific parameters. It was discovered from the study that EE distribution of China's export and that of local sales tend to be consistent because Chinese export suppliers provide products according to purchasers' requirements and destinations' MEPS. The research found that, by benchmarking against China's current MEPS, 24.3% of China's export products to the 12 target countries were above the new Grande 2, and 28.9% were below the new Grade 5.

Because of the reacting nature to the local market's request, it is challenging for Chinese suppliers to proactively improve global energy efficiency. China has been recognized as a major AC manufacturing country, but it is not a powerful manufacturing country. There are still more efforts needed for Chinese suppliers to play a significant role in improving global energy efficiency.

3.2 Energy Efficiency Is Related to Climate and Economic Conditions

This research systematically sorted RAC EE standards in various countries around the world. More than 66 countries in the world have air conditioner EE standards in place (Figure 8). Countries that do not have a EE standard usually adopt or refer to neighboring countries' standards. In RY2020, China's RAC export to these 66 countries with MEPS exceeded 80% of China's total exports. Adding its own domestic market, China is supplying about 150 million RACs that comply with local energy

efficiency requirements.

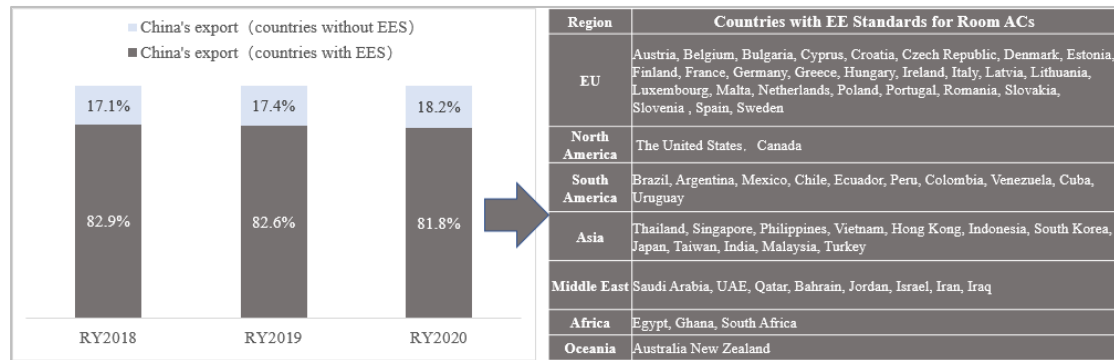


Figure 8. Share of China's RAC Export to Countries with EE Standards

The research shows that the AC efficiency levels in developed countries are generally higher, and EE monitoring is more stringent. European countries, the United States, Australia, and Japan have relatively high EE standards for split unit AC. The United States and Australia have higher EE standards for window AC. The efficiency levels in some Africa, Central East, and South American countries are low. Maintaining efficiency in a hot climate is challenging, but it is more because of these countries' economic status that led to the prevalence of low EE products, which resulted in low energy efficiency.

3.3 China Is Actively Promoting Energy Efficiency Globally

China is contributing to global EE improvement at its capacity and is continuously looking for ways to act its duty in the international arena. China's current MEPS grade 1 is world-leading, where only Japan and Australia have comparable standards to China's MEPS grade 1 at the moment.

On top of continuously improving its own energy efficiency, China is actively exploring ways to promote EE improvements and emission reduction worldwide. One way to do so is to help countries without EE standards or whose current standards are low to upgrade MEPS, thereby establishing a higher entry point to these markets for a higher share of energy-efficient products. Chinese enterprises should strengthen technology research and development to improve product quality and brand recognition, increase their credibility, and raise their voice internationally. At the same time, Chinese manufactures should make an effort to transition to OBMs in export, enhance the influence of OBMs in overseas markets, and promote the growth of China's high-efficiency export products.