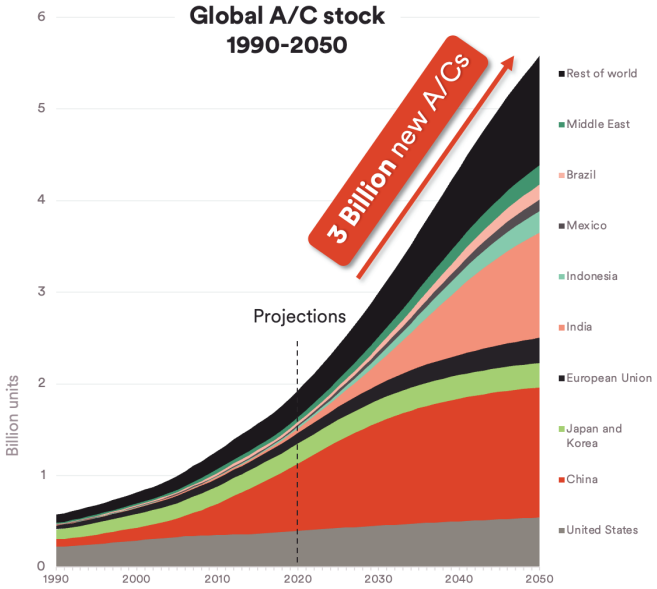
# Super-Efficient Air Conditioning

Clean Cooling COLLABORATIVE

The world needs a better air conditioner.

The planet is warming, and access to cooling has become a defining issue of our time. There is an urgent need for efficient cooling technology with a dramatically lower climate impact.




## The Challenge

As the planet heats up and urbanization increases, 3 billion more room air conditioners (ACs) are expected to be installed globally by 2050. Countries with hot and humid climates, like India and Indonesia, may see a fivefold increase in room ACs between now and 2050.

Room ACs are increasingly the technology of choice in emerging markets due to the low cost of entry, particularly in the residential sector. However, current room ACs are relatively energy inefficient, not designed to effectively remove humidity, and often use refrigerants with high global warming potential.

The use of room ACs also disproportionately impacts the grid's peak electricity demand — the costliest and most polluting demand to meet. The rise in room AC stock will drive up the global energy use for space cooling by nearly 3.5 times, stressing the power infrastructure and driving the need for significant additional generation capacity. The resulting emissions will cause further warming, particularly in dense urban environments, necessitating an even greater need for cooling — a vicious circle.

## The Opportunity

In late 2018, a broad-based coalition led by RMI, the Government of India's Department of Science and Technology, and Mission Innovation launched the Global Cooling Prize with the ambitious goal of developing an affordable residential air conditioner that has five times (referred to as "5X") lower climate impact — factored as a combination of greater energy efficiency and lower global warming potential refrigerants — than the typical units sold at the time in India. As the world's fastest-growing AC market, India was the natural choice as the testbed for the Prize.

A shift from conventional ACs to super-efficient ACs that meet the 5X criteria will prevent 68 gigatons of $CO_2e$ emissions by 2050 — the equivalent of just over a year's worth of GHG emissions from all anthropogenic sources today.

It would also prevent an additional 2,000 GW of power generation capacity, significantly reducing pressure on power grids as countries try to switch to renewable energy sources.

The Prize successfully demonstrated through two winning prototypes that the desired improvements are achievable with currently available technology; however, these models are not available to consumers today. Markets must first overcome several supply and demand barriers to make these products commercially available and for their sales to achieve significant market share.

## The Path Forward

Much work is needed to help bring super-efficient room ACs to the market. One of the foundational tasks is to fix the current test methods for measuring the performance and energy use of room air conditioners. Current methods do not adequately simulate real-world operating conditions, nor do they properly measure the unit's ability to efficiently remove moisture.

While this will take time, necessary groundwork is already underway. The Global Cooling Efficiency Accelerator — a CCC-led, broad-based collaborative with partners with deep technical and policy expertise from RMI, LBNL, AEEE, and NRDC — is working on updating the test methodology, catalyzing the manufacturing ecosystem, gathering essential data through testing and validation, preparing markets and consumers, and building momentum through media outreach and championing early adopters.

# Plan of Action

A coordinated effort is needed to catalyze the successful commercialization of super-efficient next-generation room ACs that includes the following elements:

1. Policymakers adopt updated test methods and minimum energy efficiency standards and labels to remove the worst-performing products from the market and to highlight the more efficient ones.
2. Manufacturers continue to perform the necessary product development to achieve the targeted efficiency gains and switch to more environmentally friendly refrigerants. Mechanisms are in place to unlock investments and drive the manufacturing of super-efficient room ACs.
3. Field testing of near-production units is performed to validate the unit's performance and to gather real-world energy use and cost savings data.
4. Leading governmental agencies and corporations step up and purchase the initial super-efficient offerings through coordinated bulk procurement programs.
5. Financial mechanisms such as rebates and low-interest loans are in place to jump-start the market and to help overcome the price premium of these super-efficient next-generation ACs. (Note: while these units will cost more to purchase, they are very cost-effective as they provide lower utility bills over the 10-year product lifetime).

Published by Clean Cooling Collaborative. November 2023. Learn more at cleancoolingcollaborative.org, or email us at ccc-comms@climateworks.org