POLICY BRIEF

SUPER EFFICIENT AC DEPLOYMENT

Opportunities through business models in India

Madhur Bhargava and Manjeet Singh

CIFF CHILDREN'S INVESTMENT FUND FOUNDATION

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1. Introduction

Global warming is manifesting through retreating glaciers, declining Arctic sea ice, rising sea level, frequent forest fires, floods, etc. The rising temperatures and heat waves across the earth are rendering space cooling a necessity, especially in countries close to the equator that have tropical climate, like India. Moreover, urbanization in India is growing at a fast pace owing to greater employment opportunities, availability of better medical facilities and basic amenities, intermixing of cultures, and the centralization of resources. This has resulted in heat island effect to further exacerbate the impacts of global warming in major city areas. Over the years, India has also seen a steady rise in the per capita income, increasing by 54% from 2010 to 2020.[1] As a result, more people are installing and using more electric appliances leading to a surge in electricity consumption. According to Key World Energy Statistics 2019, India is the third largest consumer of electricity in the world, after China and USA, with the generation of 1497 terawatt-hour (TWh).[2] By 2030, India is projected to depend on energy imports for 53% of the country's total energy consumption.[3] Every year, major cities such as Delhi witness a record breaking high in peak power demand, on an average 500 MW rise per annum. In 2019, an all-time high was reached during summers in Delhi at 7409 MW.[4] The primary contributor is the use of Air Conditioners. The continuous rise in temperatures and increasing purchasing power, increase in construction activities are fuelling growth for air-conditioned space. In India, the current average penetration of room air conditioners is at about 7–9%,[5] and that is expected to grow by 11 times by 2037–2038.[6]

The conventional cooling technologies used for refrigeration and air conditioning are based on refrigerants often with high Ozone Depleting Potential (ODP) and/or high Global Warming Potential (GWP). When released into the atmosphere, these greenhouse gases significantly contribute to climate change. India is a signatory to the Montreal Protocol and has successfully phased out HCFCs, gases with high ODP and GWP. In the absence of the Montreal Protocol, global mean temperatures could have risen over 2°C by 2070[7] due to warming from ozone-depleting substances alone, also contributing to millions of cases of skin cancer, and trillions of US dollars' worth of investment in health benefits among other catastrophes. The Kigali Amendment to Montreal Protocol has called for a phase-down of HFCs, gases with zero ODP, but high GWP while emphasizing on the improvement of energy efficiency of active refrigeration cooling equipment.[8]

India released the India Cooling Action Plan in 2019 in response to the Kigali Amendment goals, as well as, growing cooling requirements across sectors and the associated challenges. Several measures to improve the efficiency of cooling equipment through regulatory and market mechanism based initiatives including star rating programme and bulk procurement models have also been taken by the government to maximise the climate benefits. In India, affordability greatly influences the buying decision of the consumers, thus, it becomes imperative to tackle the issue of price hump associated with upcoming energy-efficient technology. Energy Efficiency Services Limited (EESL), an ESCO under the Government of India leveraged economy of scale to deploy the Super-Efficient Air Conditioners (SEACs) in the Indian market. This policy brief analyses in detail EESL's Super-Efficient AC Programme, phase 2 and the gaps and opportunities to deploy the SEACs through various business models.

[1] https://www.macrotrends.net/countries/IND/india/gdp-per-capita
[2] https://iasgatewayy.com/india-becomes-3rd-largest-producer-of-electricity/
[3] https://www.orfonline.org/expert-speak/ramping-up-solar-energy-generation-and-equipment-manufacturing-can-make-indias-economy-sustainable-and-atmanirbhar-67191/
[4] https://www.deccanherald.com/business/delhis-peak-power-demand-clocks-seasons-highest-of-5268-mw-841807.html
[5] http://ozonecell.in/wp-content/uploads/2019/03/INDIA-COOLING-ACTION-PLAN-e-circulation-version080319.pdf
[6] https://www.tvj.co.in/indias-cooling-growth-trajectory/
[7] https://www.unenvironment.org/news-and-stories/press-release/kigali-amendment-hits-milestone-100th-ratification-boosting-climate
[8] http://ozonecell.in/wp-content/uploads/2019/03/INDIA-COOLING-ACTION-PLAN-e-circulation-version080319.pdf

2. Existing Policy Context to Promote Energy-Efficient Appliances in India

In March 2019, the government of India released the India Cooling Action Plan, which details the country's vision in reducing refrigerant-based emissions, curbing the fast-rising electricity demand, and building capacity of the servicing personnel/ technicians in the cooling sector. The Plan outlines specific targets to be achieved by 2037–2038, in line with India's Sustainable Development Goals (SDGs), Nationally Determined Contributions (NDCs), and Kigali Amendment goals. Adoption and promotion of energy-efficient appliances that use low-GWP refrigerants will play an instrumental role in achieving the aforementioned goals. In India, Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, develops policies and strategies within the framework of Energy Conservation Act, 2001. The objective of the Act is to reduce the energy intensity of the Indian economy.[9]

In May 2006, BEE had launched the Standards and Labelling programme to label electrical appliances through star ratings, including room air conditioners with star ratings.[10] The programme was successful in creating consumer awareness towards energy consumption and has resulted in around 43% average increase in the EER of ACs between 2007 and 2019 as shown in figure 1.[11]

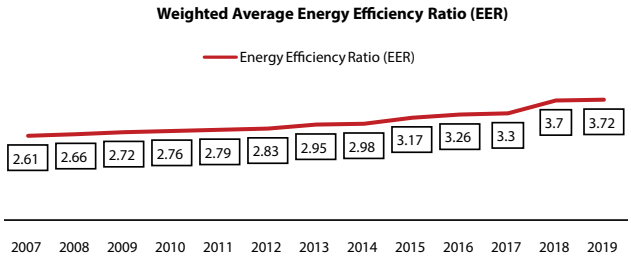

Figure 1: Improvement in average EER between 2007-2019[12]
Source: BEE and CLASP

[9] https://beeindia.gov.in/content/about-us
[10] https://beeindia.gov.in/sites/default/files/Baseline%20Study%20of%20Appliances%20%26amp%3B%20Equipment%27s%20for%20Standard%20ppt.pdf
[11] https://www.teriin.org/sites/default/files/2020-01/modified-accelerating-the-uptake.pdf
[12] https://www.teriin.org/sites/default/files/2020-01/modified-accelerating-the-uptake.pdf

The rating is regularly ratcheted up to encourage the production and consumption of higher energy efficiency air conditioning units. In India, the star rating is given based on the ISEER (Indian Seasonal Energy Efficiency Ratio), which accounts for the Indian climatic conditions. The higher the unit's ISEER rating, the more energy efficient it is. [13] The current ISEER rating for split ACs by BEE is given in table 1.

Table 1: SEER ratings valid from 1st January 2018 to 31st December 2021 for Split ACs (Fixed and Variable Speed)[14]

Star Level	Min ISEER Rating	Max ISEER Rating
1	3.3	3.49
2	3.5	3.99
3	4	4.49
4	4.5	4.99
5	5	

The periodic upgradation in the energy performance standards encourages the manufacturers to improve their technologies and it supports the penetration of energy-efficient equipment into the market over time. In an attempt to regulate the default temperature ACs are operated at, BEE mandated all ACs to have the default temperature set at 24°C by the manufacturers, with effect from 1 January 2020.[15]

In order to keep pace with India's national commitments to ICAP and international commitments to the Montreal Protocol and its Kigali Amendment that emphasizes the crucial role energy efficiency plays in climate change, it is imperative to expedite the market penetration and take up of energy efficient equipment. Price hump associated with the advanced technology can be one of the major challenges in this process, especially in India where per capita income is low and affordability is the primary criterion. To overcome this challenge,

[13] https://www.reliancedigital.in/solutionbox/iseer-star-ratings-how-they-help-save-on-electricity-bills/
[14] http://www.beestarlabel.com/Home/ViewMeetingDoc?file=08-04-2019%20042552505_11th%20TCM%20for%20AC%20dated%20%2019-03-2019.pdf&path=MeetingFiles
[15] https://pib.gov.in/PressReleasePage.aspx?PRID=1598508#:~:text=All%20Room%20Air%20Conditioners%20to,Celsius%20from%20Jan%201%2C%202020&text=The%20Central%20Government%20in%20consultation,on%2030th%20October%202019.

Energy Efficiency Services Limited (EESL), a super ESCO under the aegis of the government of India, has several successful programmes to its credit that were instrumental in pushing energy-efficient and climate-friendly appliances into the market.

3. EESL's Super-Efficient AC Programme (ESEAP)

Bulk Procurement Mechanism

Bulk procurement can be employed to enhance the penetration of desired products into the market at an accelerated rate. The strategy leverages economy of scale for its successful implementation. Tenders are floated into the market and orders are given in bulk to the companies with the best bids and products. The bulk order along with the competitive sealed bidding brings down the prices of the products. In the context of ACs, highest efficiency, low GWP models should be made available to the consumers at affordable costs.

EESL demonstrated the impact of bulk procurement through the prominent programme UJALA – Unnat Jyoti by Affordable LEDs for All. Within a span of three years, UJALA brought down the prices of LED bulbs from ₹310 per piece in January 2014 to ₹39.90 per piece by August 2019 through its innovative business models and a wider outreach to consumers (Figure 2). The scheme helped achieve an estimated energy savings of 47.87 billion kWh per year with avoided peak demand of 9683 MW, an estimated GHG emissions reduction of 39 million tonnes of CO_2 per year, and an estimated annual monetary savings of ₹19,100 crore in the consumers' electricity bills.[16]

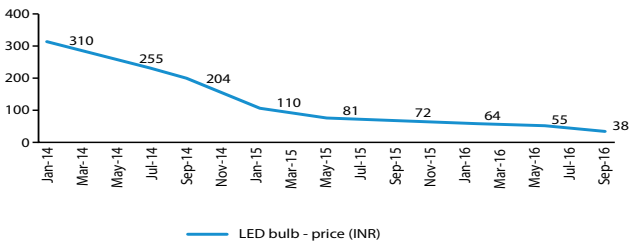

Figure 2: LED bulb price trend (bulk procurement model)

[16] https://eeslindia.org/ujala.html

ESEAP Phase 1

In 2017, EESL initiated ESEAP with the intent to increase the market penetration of SEACs by procuring them at reduced costs using competitive bidding and bulk procurement and thus, overcoming the price hump. The contract for the programme was awarded to Panasonic and Godrej for a total of 100,000 units of air conditioners.

The programme tender had mentioned the requirement of AC units of 1.5 TR with ISEER 5.2 (minimum). It had also specified details on design, manufacture, supply, Installation and after-sales services. Although 40% of the SEACs procured were with refrigerant of low-GWP, there was no mention of the required refrigerant within the tender itself.

Despite successful procurement of energy-efficient and climate-friendly air conditioners, there was a want for demand aggregation and stakeholder consultation. The business strategies executed under the UJALA programme for mass distribution of LEDs at significantly lower costs could not be applied for room ACs due to higher costs involved – higher upfront cost, maintenance and servicing cost, transportation cost, etc.[17] For a more detailed analysis of the ESEAP Phase 1, reader may refer TERI's Policy brief "Bulk procurement program: Critical analysis of EESL program" published in Jan, 2019.

ESEAP Phase 2

Around mid-2019, EESL started phase 2 of their project in which they set to deploy 50,000 units of SEACs[18]. To deploy the Super-Efficient Air Conditioners in retail sector, EESL developed a dedicated website www.eeslmart.in. When fully deployed, the 50,000 units are expected to save 27 million units of power consumption and about ₹1.6 crore annually, mitigating around 22,140 tonnes of CO_2 per year. After the successful completion of the pilot programme, EESL plans to scale it up.[19]

[17] https://www.teriin.org/policy-brief/bulk-procurement-room-air-conditioning-critical-analysis-eesl-programme

[18] https://energy.economictimes.indiatimes.com/news/power/indias-first-super-efficient-ac-launched-at-rs-41300/70127165

[19] https://m.economictimes.com/industry/energy/eesl-hopes-to-sell-250000-super-efficient-ac/articleshow/70965535.cms

Key business strategies in ESEAP 2

Various strategies have been devised to bring down the cost per unit of the SEACs.

- Procuring the equipment through competitive sealed bidding method to reduce the cost
- Purchase of the SEACs in bulk to reduce the cost/piece
- Partnership with banks to provide further discounts
- Availability of 0% EMI option
- Application of ESCO model for institutions, i.e., sharing a portion of the bills with the institutions
- Engagement of city DISCOMs to promote the ACs to their customers
- Demand aggregation

Super-Efficient Air Conditioner Specifications

ISEER	5.4
Refrigerant Gas	R-32
Compressor Type	High EER twin rotary – BLDC
Condenser Coil	Copper
Max operating Ambient Temp Range	52°C
Warranty on Indoor Unit and their components (for retail customers only)	5 years
Warranty on compressor (for retail customers only)	10 years

Additionally, www.eeslmart.in also offers retail consumers the option to get their old AC dismantled at ₹400 per unit. The consumers can also select the option of 'Buy back of AC' at ₹2500 per unit, which is transacted with the supplier at the time of installation.[20]

Potential Business Strategies

In phase 2, EESL has successfully procured the SEACs. To ensure the sales of the super-efficient AC units, further business strategies can be applied as described below:

[20] https://eeslmart.in/Product/Detail?Pid=5

Demand Aggregation Strategies

Demand aggregation for the SEACs can be achieved through multiple methods. Hiring a third party agency with expertise in marketing will give a significant boost to the sales of the air conditioners by providing the program a wider reach to the target demographic through various media. Public procurement demand can be leveraged by linking the scheme with the existing Government e-Marketplace mechanism.

Segregation Based on Environmental Impact

The environmental benefits of using the SEACs have been mentioned on the website – www.eeslmart.in. The differences in the effects on the environment over time of the SEAC with low GWP refrigerant in comparison to those of a lower energy-efficient AC with higher GWP refrigerant can be depicted using vivid graphics and illustrations. Using vivid illustrations depicting the negative impact of ACs on the environment over time along with numbers and statistics to support the images can move the customers to consider contributing towards a healthier future environment.

Stand Out in Comparison

Websites that provide customers the chance to check out multiple options simultaneously and compare them are gaining popularity. For instance, www.gadgetsnow.com provides the option to compare customer-selected AC models. E-commerce platforms such as amazon.in also show comparisons between multiple models' specifications. A direct side-by-side comparison between EESL's SEACs and other ACs within the parameters of cost, specifications, and benefits guaranteed to the consumers will highlight the impressive deal offered by EESL.

Economy of Scope

The economy of scope can be employed to provide additional services to maximize the benefits of the programme for the customers. One way of doing this is to partner with a servicing company. The servicing company can benefit from a new large market and provide services at a reduced cost while the AC supplier (EESL) can offer additional after-installation local servicing benefits to the customers, making the deal even more attractive.

4. International Best Practices

The bulk procurement model is a great way to purchase high quality products at competitive rates by buying them in large quantities from competing suppliers. In the case of ESEAP phase 2, although the price per unit of the SEACs was significantly reduced, for a consumer looking for a new AC in the market, the upfront cost is still quite high compared to other lower star-rated ACs. The EESL model, although highly efficient and environment-friendly is offered at ₹41,300 (₹39,990 after sale) whereas many inferior AC models are available for as low as ₹20,000–25,000, that could also serve the basic purpose of providing respite from the soaring temperatures during peak summers. This poses the challenge of selling these units to the average consumers. To overcome this obstacle, other countries run different business models, as mentioned in the following paragraphs.

Rwanda's 'Coolease' Financial Mechanism[21]

'Coolease' was launched in Rwanda by the Rwanda Green Fund (FONERWA) and the Rwanda Business Development Fund (BDF), in partnership with UN Environment's United for Efficiency (U4E) initiative and the Basel Agency for Sustainable Energy (BASE) to promote the adoption of energy-efficient and climate-friendly cooling solutions in Rwanda. This scheme mainly focuses on accelerating the adoption of energy-efficient cooling technologies and the use of greener refrigerants in line with the Kigali Amendment to the Montreal Protocol.

In Rwanda, Business Development Fund (BDF) set up a dedicated leasing subsidiary, which serves as a Special Purpose Vehicle to finance the cooling system, and doubles up as a bridge between the technology supplier and the customers. Suppliers with appropriate technology to offer reach out to BDF to become a part of the scheme. Their agreement covers requirements for supply, quality, installation, maintenance, and willingness to relocate the equipment. Customers seeking these technologies separately reach out to BDF to incorporate energy-efficient cooling technology into their lives. BDF provides fund to meet the upfront cost of the cooling system to the customer. For this, the customer pays monthly rents and a maintenance fee. The objective of a wider use of energy-efficient and greener cooling equipment is realized when customers start benefiting from savings in their monthly bills.

Engaging financial institutions in the bulk procurement mechanism of ESEAP will help bring down the prices of the procured units significantly.

Cooling as a Service (CaaS)[22]

To tackle the high upfront and running costs, which turn customers away from buying the latest SEACs, Cooling as a Service (CaaS) strategy was developed. Run by Basel Agency for Sustainable Energy (BASE) on behalf of Kigali Cooling Efficiency Programme (K-CEP), the initiative allows consumers to access and pay for the basic need of cooling rather than the physical product or infrastructure that delivers the cooling. The technology provider installs and maintains the cooling equipment, thereby recovering the costs through periodic payments made by the customer. These payments are fixed-cost-per-unit for the cooling service delivered (for example, dollars per tonnes of refrigeration, or units of cooled air), and are based on actual usage. The technology provider also pays for the electricity consumed by the equipment, which is an incentive to install the most energy-efficient equipment and ensure high-quality maintenance.

In India, renting air conditioners for home and office use is a common practice, especially in urban areas. Expanding ESEAP to target this sector of rented electrical appliances, and providing the SEACs on rent at low cost will open up a new market for these ACs, thereby proving beneficial for the customers, DISCOMs, and the environment.

China's 'Promoting Energy-Efficient Products for the Benefit of the People'

The 'Promoting Energy-Efficient Products for the Benefit of the People' programme was introduced in China in 2009 as an example of how manufacturers

[21] http://fonerwa.org/blog/rwanda-cooling-initiative-coolease-financial-mechanism

[22] https://energy-base.org/projects/cooling-as-a-service-initiative/#:~:text=MODEL,purchase%20price%20of%20cooling%20equipment.&text=The%20technology%20provider%20installs%20and,payments%20made%20by%20the%20customer.

can be incentivized to produce and sell the most energy-efficient (and 'green') ACs.

The programme, with its first phase lasting two years, aimed to increase the penetration of energy-efficient products including ACs, cars, lighting, and three-phase asynchronous motors, along with addressing the financial crisis of 2008. The promotion programme was developed by the Ministry of Finance and the National Development and Reform Commission. By lowering the upfront price, the programme encouraged consumers to buy energy-efficient products. The manufacturers were given refund on the sale of these energy-efficient products on a monthly basis. The price of the energy-efficient ACs was subsidized prior to their sale.

The production and sales of lower energy-efficient ACs (average 3-star rating) are often pushed by the manufacturers in India as the mid-range ACs are the most sought, and thereby prove to be the most profitable for the manufacturers to produce and sell. Investing into a programme similar to China's by incentivizing the manufacturers to promote higher efficiency products will push the ACs into the Indian market.

Buyers' Club

Buyers' clubs[23] were formed in Morocco and Brazil to meet the rising demand for air conditioners by procuring super-efficient ACs at lowered costs by leveraging economy of scale. In these countries, several banks came together to form the buyers' clubs, lending their expertise in the economics of the business model and providing adequate capital for the programme.

In India, with the ever-expanding businesses that require office spaces and cooling apparatus, a tie-up with them leveraging bulk procurement and demand aggregation simultaneously will not only push the market penetration of the SEACs, but will also be replacing other inferior models of ACs that would have been used otherwise.

5. Way Forward

The impact of rising temperatures in a tropical country like India will be catastrophic under BAU. The number and frequency of heat waves, forest fires, droughts have already seen a rise. The majority of population will not be able to afford the means to survive the extreme weather conditions. Moreover, energy security is one of the major challenges faced by the country as the AC demand steadily grows. Kigali Amendment to the Montreal Protocol intends to steer actions by the parties towards enhancing the market penetration of energy-efficient equipment while simultaneously stressing on phasing out refrigerants that contribute to global emissions that are primarily leading to climate change. ESEAP by EESL proposes to provide the solution using its expertise in public procurement to boost market penetration for SEACs with low GWP refrigerants.

ESEAP has many attractive offers and schemes for its SEACs – reduced price, EMI option, increased warranties, lowered installation costs, free post-installation services, and more. There is a need to reach a wider population and publicize the availability of such energy-efficient products using marketing strategies. Although priced at a highly competitive cost, the SEAC is still a lot more expensive than the lower-efficiency models, which might prove to be a deterrent for potential customers. The aforementioned international business models can lend components applicable to the Indian market. Both Coolease and CaaS serve to lower or eliminate the high upfront cost of the cooling equipment.

Based on the learnings from ESEAP phases 1 and 2, EESL has taken certain measures that they plan to incorporate in phase 3. They have onboarded associations, industry houses, corporates to deploy the ACs at a large scale. EESL is focusing on the banking sector and have conducted a pilot at ATMs of one of the leading banks in India. The preliminary result shows that there is a saving of 50 % and once scaled up will lead to huge savings.

Delhi Electricity Regulatory Commission (DERC) provides subsidies to utility side stakeholders for the reduction of peak electricity demand in the city. If these stakeholders are made to promote the SEACs, and if they further invest into providing discount in the upfront cost of the ACs to their customers, they can earn back on their investment through reduced electricity demand plus get subsidies by DERC. This can benefit both the utility side stakeholders and the consumers. Reduction in the GST if applied on such

[23] https://esmap.org/sites/default/files/events-files/Int%20Conf%20Sust%20Cooling/Buyers%20Club_Optimized.pdf

energy-efficient, climate-friendly appliances, can further reduce the cost, encouraging more people to buy these.

The ever-expanding building segment is expected to see a huge increase in demand for energy while adding on to India's carbon profile. Under business-as-usual scenario, it is predicted that India would account for 25% of the global emissions annually by 2050 due to the rising demand for comfort cooling.[24] Mass scale adoption of super-efficient ACs in India through business models would be instrumental in achieving the ICAP targets.

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We are an independent, multi-dimensional organization, with capabilities in research, policy, consultancy and implementation. We are innovators and agents of change in the energy, environment, climate change and sustainability space, having pioneered conversations and action in these areas for over four decades.

We believe that resource efficiency and waste management are the keys to smart, sustainable and inclusive development. Our work across sectors is focused on

1. Promoting efficient use of resources

2. Increasing access and uptake of sustainable inputs and practices

3. Reducing the impact on environment and climate

Headquartered in New Delhi, we have regional centres and campuses in Gurugram, Bengaluru, Guwahati, Mumbai, Panaji, and Nainital. Our 1000-plus team of scientists, sociologists, economists and engineers delivers insightful, high quality action-oriented research and transformative solutions supported by state- of-the-art infrastructure.

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