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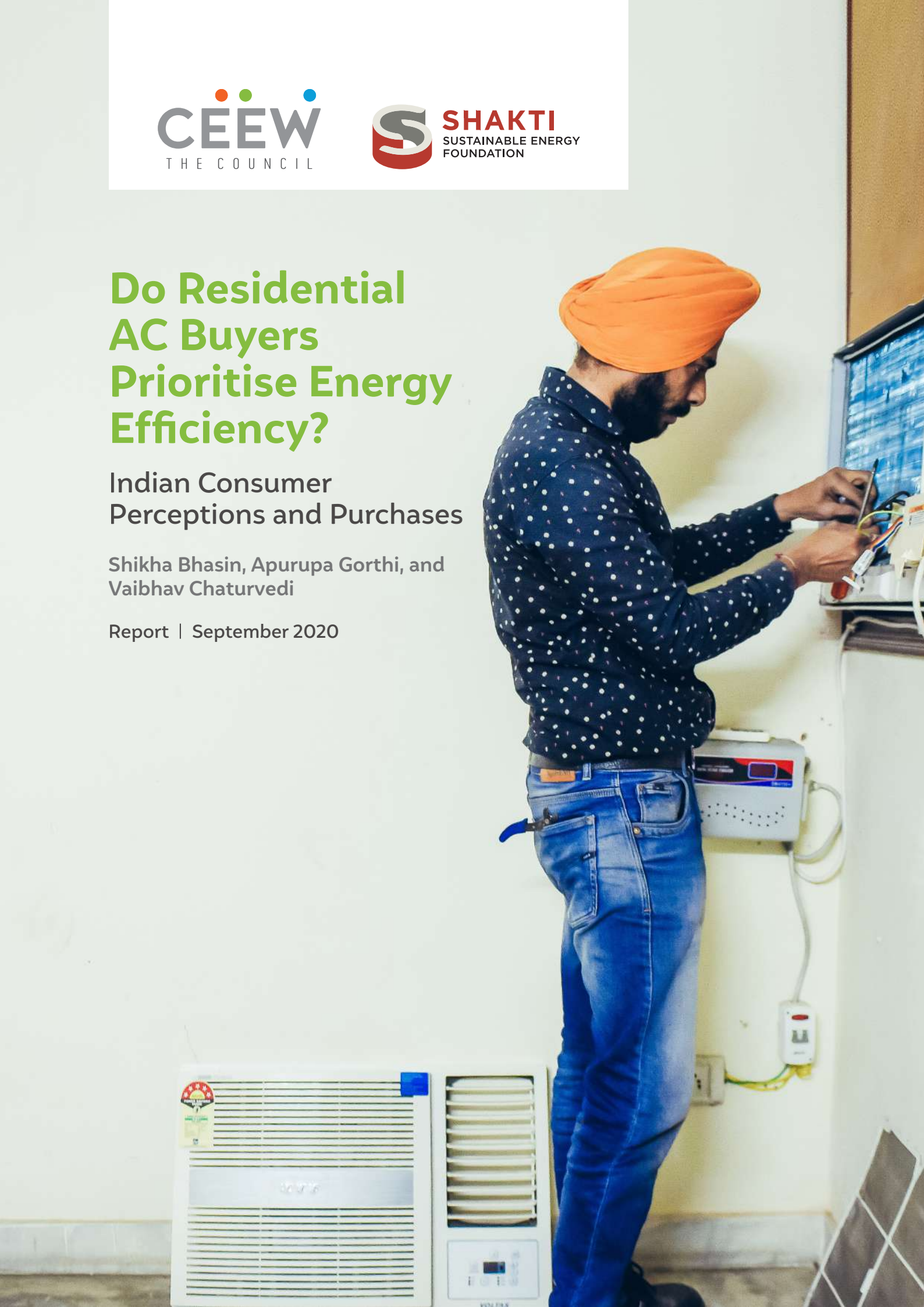
Indian Consumer Perceptions and Purchases

Shikha Bhasin, Apurupa Gorthi, and Vaibhav Chaturvedi

Report | September 2020



The global AC market is expected to grow by almost two-and-a-half times, in number of AC units. (IEA 2018) The increase in electricity and refrigerant use caused by this rising demand will result in the growth of consequential GHG emissions.

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The **Council on Energy, Environment and Water (CEEW)** is one of Asia's leading not-for-profit policy research institutions. **The Council uses data, integrated analysis, and strategic outreach to explain — and change — the use, reuse, and misuse of resources.** The Council addresses pressing global challenges through an integrated and internationally focused approach. It prides itself on the independence of its high-quality research, develops partnerships with public and private institutions, and engages with the wider public.

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The Council's major contributions include: The 584-page *National Water Resources Framework Study* for India's 12th Five Year Plan; the first independent evaluation of the *National Solar Mission*; India's first report on global governance, submitted to the National Security Adviser; irrigation reform for Bihar; the birth of the Clean Energy Access Network; work for the PMO on accelerated targets for renewables, power sector reforms, environmental clearances, *Swachh Bharat*; pathbreaking work for the Paris Agreement, the HFC deal, the aviation emissions agreement, and international climate technology cooperation; the concept and strategy for the International Solar Alliance (ISA); the Common Risk Mitigation Mechanism (CRMM); critical minerals for *Make in India*; modelling 222 scenarios for India's low-carbon pathways; India's largest multidimensional energy access survey (ACCESS); climate geoengineering governance; circular economy of water and waste; and the flagship event, Energy Horizons. It recently published *Jobs, Growth and Sustainability: A New Social Contract for India's Recovery*.

The Council's current initiatives include: A go-to-market programme for decentralised renewable energy-powered livelihood appliances; examining country-wide residential energy consumption patterns; raising consumer engagement on power issues; piloting business models for solar rooftop adoption; developing a renewable energy project performance dashboard; green hydrogen for industry decarbonisation; state-level modelling for energy and climate policy; reallocating water for faster economic growth; creating a democratic demand for clean air; raising consumer awareness on sustainable cooling; and supporting India's electric vehicle and battery ambitions. It also analyses the energy transition in emerging economies, including Indonesia, South Africa, Sri Lanka and Viet Nam.

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"India has led one of the most successful energy-labelling programmes globally. This study is an attempt to gauge its impact in non-tier I cities, and address gaps to better the energy efficiency trajectory of our cooling sector."

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"Energy efficiency is a prime focus of the Kigali Amendment to the Montreal Protocol. This study looks into the daily behaviours of AC users and lends valuable insights into the energy efficiency of Indian households."

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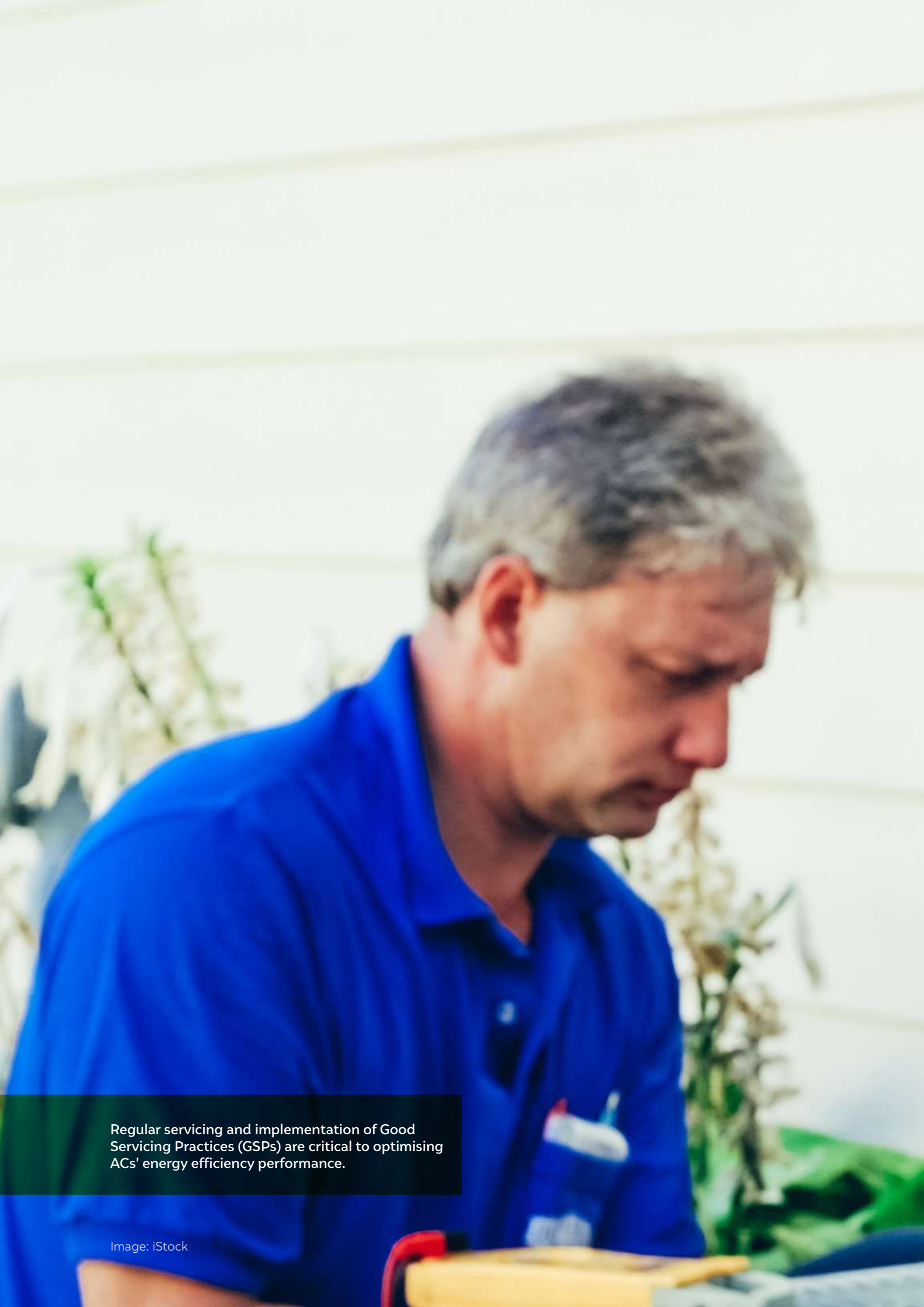
"Our research shows that star labelling has succeeded in winning consumer trust. However, the high cost of high-efficiency appliances continues to be a barrier that has to be surmounted to push high-efficiency ACs in the market."



Regular servicing and implementation of Good Servicing Practices (GSPs) are critical to optimising ACs' energy efficiency performance.

Image: iStock

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Acronyms

AC	air conditioner
BEE	Bureau of Energy Efficiency
BLY	*Bachat Lamp Yojana*
CO_2	carbon dioxide
CSR	corporate social responsibility
Discom	distribution companies
DSM	demand side management
EC	energy conservation
ECBC	*Energy Conservation Building Code*
EEFP	Energy Efficiency Financing Platform
FEEED	*Framework for Energy Efficient Economic Development*
GDP	gross domestic product
GHG	greenhouse gas
GSP	good servicing practice
GWP	global warming potential
HFC	hydrofluorocarbons
ICAP	*India Cooling Action Plan*
IEA	International Energy Agency
ISEER	Indian seasonal energy efficiency ratio
LPG	liquefied petroleum gas
MTEE	*Market Transformation for Energy Efficiency*
Mt CO_2-eq	million tonnes of CO_2 equivalents
NAPCC	*National Adaptation Plan on Climate Change*
NMEEE	*National Mission for Enhanced Energy Efficiency*
PAT	Perform Achieve and Trade
PRFGFEE	*Partial Risk Guarantee Fund for Energy Efficiency*
PSI	Population Services International
S&L	*Standards* and Labelling programme
SDA	state-designated agency
SE4ALL	Sustainable Energy for All
SEEP	*Super-Efficient Equipment Programme*
SEER	seasonal energy efficiency ratio
TWh	terra watthours
UNFCCC	United Nations Framework Convention on Climate Change
VCFEE	Venture Capital Fund for Energy Efficiency

Power consumption by buildings, as a share of peak electricity load, for space cooling is estimated to grow from 10 per cent currently to 45 per cent by 2050 (IEA 2018).

Image: iStock

Executive summary

Residential air-conditioner (AC) penetration in India today is concentrated in metropolitan cities and accounts for a tremendous share of the current electricity used. This consumption by residential buildings is expected to rise substantially within the next decade, necessitating an energy optimisation strategy for India's cooling needs. Further, the Kigali Amendment to the Montreal Protocol (2016) requires a refrigerant transition to low-global warming potential (GWP) alternatives, while increasing and optimising ACs' energy efficiencies. Through this report, we aim to identify residential consumers' understanding of AC energy efficiency as well as the factors that influence their decision to purchase ACs. Regular servicing and the adoption of good servicing practices (GSPs) have been recognised as an important aspect of maintaining AC energy efficiency during its operational lifetime. As a first step in this direction, this study aims to document end-users' understanding of the impact of GSPs on servicing.

This report highlights residential consumers' understanding of AC energy efficiency, the factors influencing purchase decisions, and their understanding of the impact of good servicing practices on energy efficiency

Given the focus on residential AC consumers, a door-to-door survey was conducted across four tier II Indian cities. For this, cities with a population of 10 lakh or more as per census data (2011) were classified into north, south, east, and west zones. One city from each zone was randomly picked, which resulted in Dhanbad, Madurai, Meerut, and Vadodara being surveyed. Within each city, six municipal wards, and three housing localities from each ward, were randomly picked. Six households from each locality were surveyed as a part of this study. This resulted in a sample of 108 households from each city and a total sample size of 432 households.

Of all the AC-owning households interviewed, over 75 per cent were aware of the star labelling programme. Among the households who reported being aware of the star labelling programme, 95 per cent deemed it trustworthy and 93 per cent claimed to find it useful. Given these positive perceptions and values associated with the programme, it is not surprising that most households (over 70 per cent) also wanted to purchase a high-star labelled AC. However, only 14 per cent actually went on to purchase a 4- or 5-star labelled AC. When asked about the reasons for this discrepancy between desire and purchase decisions, over 75 per cent of households attributed the cost of the AC as a barrier.

Energy star rating is among the top attributes considered during AC purchase, according to the majority of households. This was demonstrated by two key data points related to AC purchase decisions – information and attributes of the AC. It is interesting to qualify that on asking when these attributes were considered in relation to the timing of the purchase, i.e.,

well in advance of buying the AC or at the time of purchase, 68 per cent of the households reported that they considered energy efficiency a key attribute at the time of purchase, whereas relatively more respondents indicated that budgetary and branding decisions had been finalised well before the purchase was made.

While the above data has indicated fairly succinctly the significance that is attributed to energy efficiency when considering the purchase and use of an AC, it is telling that very few households see any explicit relationship between energy efficiency and AC usage practices. Only a third of households believed there to be any relationship between servicing and the maintenance of energy efficiency, while two-thirds of the household base reported being unaware (approximately 30 per cent) or not believing in a link between the two (over 40 per cent).

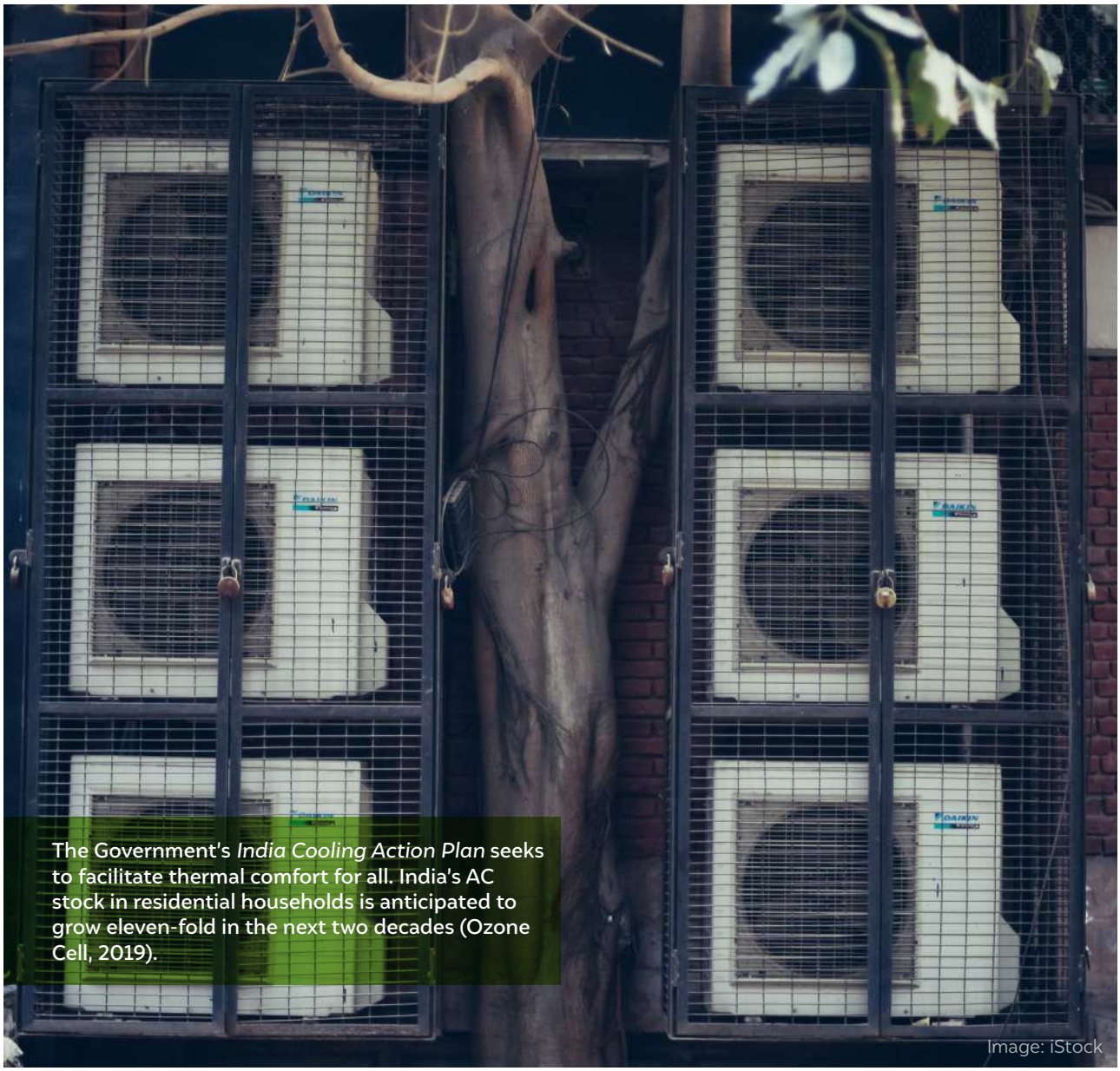
Given the potential for energy savings through high-efficiency purchases, as well as efficiency optimisation of AC units, this analysis identifies India specific challenges, and information lags to these ends in its AC consumer base. In order to tackle these, this report concludes by bringing out two sets of recommendations for: (i) enhancing financing solutions for higher efficiency AC purchases; and (ii) optimising efficiency through operations and maintenance (O&M) practices.

While it is commendable to note the awareness spread that the star labelling programme has achieved across appliance buyers even in India's Tier II cities, when it comes to energy efficient ACs, the stark market reality betrays its accessibility given the high price points. Different financing platforms such as tax incentives, cumulative procurement programmes, as well as aggregating incentives across brands to encourage a more accessible price point for such units would be a direct area of intervention to scale up their sales, and contribute to a wider spread of higher efficiency appliances.

Furthermore, enhancing the narrative around energy efficiency as a purchase priority for consumers needs more attention. Data on electricity savings resulting from a higher efficiency AC, as well as its impacts on the local and global environment need to be brought out to the public in a simple targeted manner. Furthermore, the amount of possible savings as a result of a higher efficient AC purchase, and the impacts of regular servicing – on electricity savings and the life of the AC, for example – also need to be studied and targeted to the Indian consumer so that purchase decisions for higher efficiency products are not just well intentioned, but also well thought about.

68% of the households considered energy efficiency a key attribute at the time of purchase, but few saw any explicit relation between energy efficiency and servicing practices

1. Introduction



The Government's *India Cooling Action Plan* seeks to facilitate thermal comfort for all. India's AC stock in residential households is anticipated to grow eleven-fold in the next two decades (Ozone Cell, 2019).

Image: iStock

There is a rapidly evolving consensus that accelerated climate change mitigation actions at scale are needed to limit greenhouse gas (GHG) emissions (Climate Action Tracker 2017). Rising temperatures, as well as the increasing intensity and frequency of heatwaves experienced globally are exacerbating socio-economic vulnerabilities as well as losses – physical, environmental, and human. In this context, the increase in electricity use caused by the rising demand for space cooling has led to growth in consequential GHG emissions. These indirect emissions constitute a large share of the overall emissions arising from space cooling (Chaturvedi et al. 2015).

In 2016, space cooling alone required a total of 2,000 TWh of electricity, leading to GHG emissions of 1,130 million tonnes of carbon dioxide equivalents (Mt CO_2-eq) globally (Peters 2018). Based on the carbon intensity of electricity generation, the use of ACs and electric fans already accounts for about a fifth of the total electricity used in buildings around the world, which is 10 per cent of all global electricity consumption (IEA 2018). The global AC market will grow by almost two-and-a-half times (in number of AC units), to a market value of USD 400 billion, by 2050. This growth corresponds to the estimated increase from 1.2 billion room ACs installed today to more than 4.5 billion units by 2050 (Campbell, Kalanki, and Sachar 2018). The global energy consumption for cooling in 2018 was estimated to be 3,900 terawatt hours (TWh) and was largely sourced from fossil fuel-based sources (Peters 2018). It is expected to double at 7,500 TWh or reach 9,500 TWh by 2050 depending on the technologies' efficiencies, thus having an immediate impact on the GHG emissions resulting from the energy used to power these cooling appliances and systems (Peters 2018). As Campbell, Kalanki, and Sachar 2018 have analysed, "doubling the market average efficiency improvement rate from current levels results in an 8 per cent reduction, equivalent to 10 gigatons of CO_2e emissions". The need for efficient cooling technologies will play a significant role in keeping to global climate ambitions.

There are two key aspects to controlling emissions arising out of the increase in usage of cooling appliances: one, the efficiency of the appliance; and two, refrigerant consumption

However, the emissions arising from powering these cooling appliances is only one part of the story. The refrigerants that generate the cooling within these systems and appliances are also a critical area of concern from a climate perspective. In most developing countries, cooling systems still tend to be largely based on high-global warming potential (GWP) hydrofluorocarbons (HFCs) refrigerants. HFCs are far more potent than carbon dioxide as greenhouse gases. A transition away from these high-GWP fluorinated gases holds the key to 0.5°C of global warming (Velders et al. 2017). In October 2016, 197 countries committed to the Montreal Protocol's Kigali Amendment, agreeing to lower consumption and production of HFCs with high global warming potential (GWP), in an effort to limit global warming[1]. This Amendment is expected to reduce up to 80 per cent of the global production and consumption of HFCs by the year 2047; a pivotal contribution to combating global warming.

In addition to meeting emission reduction targets through phasing down HFCs, the Kigali Amendment also emphasises the importance of enhancing the energy efficiency of refrigerant-based appliances and systems to lower GHG emissions (UNIDO 2017). Thus, there are two key aspects to controlling emissions arising out of the increase in usage of cooling appliances: one relates to the efficiency of the appliance/system which causes indirect emissions; and the second relates to refrigerant consumption which contributes directly to increased GHG emissions.

1.1 India's efficient AC use: a climate game changer

Despite a less than 10 per cent penetration of ACs in Indian households, the country's cooling demand has a substantial energy footprint. Demand for space cooling in buildings in India is expected to increase 11 times from the current requirement over the next 20 years in India (Ozone Cell 2019). As a consequence, power consumption (as a share of peak electricity load) for space cooling (comprising of electric fans and air conditioning for residential and commercial buildings) is estimated to grow from 10 per cent currently to 45 per cent by 2050 (IEA 2018). The peak load in cities is already being impacted by AC use. For example, AC use

1. As of 18 September 2020, 103 Parties to the Montreal Protocol had ratified the Kigali Amendment (UN Treaty Collection). For a list of the countries, see: https://kigali-amendment.openclimatedata.net/

alone in Delhi accounts for almost 40 per cent of its peak load demand in summer months (Phadke, Abhyankar, and Shah 2014).

Rising income levels and higher average summer temperatures are contributing to the ubiquity of ACs in Indian residences, with prevalence increasing from 4 per cent to close to 10 per cent in the last decade (CEEW et al. 2013; Sharma and Shah 2017; Ozone Cell 2019). Residential AC penetration in India is concentrated in metropolitan cities with the growing middle class gaining access to continuous electricity (Sharma and Shah 2018). Even with the current number of ACs among Indian residences, providing cooling for all during a regular summer will require about 1.2 times the current electricity generated in India (Somvanshi 2019). This consumption by residential buildings is expected to supersede that of industrial demand due to an increase in AC penetration as well as in the number of dwellings as early as 2030 (NITI Aayog 2015). Currently, the share of the building sector in the total electricity consumption in India stands at 7 per cent. India's building stock is growing at a rate of 8–10 per cent annually and is likely to reach 10,400 million square meters of built area by 2030 (Ozone Cell 2019). Optimising energy use for space cooling will, therefore, hold key to minimising the climate impacts arising from this need.

1.2 Energy efficiency and residential AC users: addressing research gaps

In recent years, the Bureau of Energy Efficiency (BEE) has created a *Standards and Labelling* (S&L)[2] programme to encourage the use of energy-efficient appliances in households, especially ACs. An important component of the S&L programme was educating retailers on the significance of star labelling and energy efficiency in addition to generating consumer awareness. It is imperative to evaluate the knowledge and understanding of residential AC users regarding energy efficiency and how it influences their purchase decisions. Despite the existence of some evaluation studies on the impact of S&L on residential AC users' purchase behaviours, they have limitations either in terms of the geography (Banerjee and Banerjee 2015) or because they are dated (CLASP 2015).

An aspect of AC energy efficiency that is little explored is its relationship with good servicing practices (GSPs). While purchasing energy-efficient ACs is an essential step, it is not sufficient. Given the 7–10 year operational life of residential ACs, deteriorating performance in energy efficiency can prove expensive both from a climate perspective as well as an economic one – it will no longer provide the anticipated energy (bill) savings.[3] A badly maintained AC can perform worse than its assigned energy star rating, thus rendering its energy performance worse than an AC with a lower star rating. For instance, a well-maintained unit with a seasonal energy efficiency ratio (SEER) of 3.8 may be more efficient than a badly maintained unit with a SEER of 5 (GIZ 2019).

There are currently no studies on AC end-user awareness about regular servicing with GSPs and its implications for energy efficiency. In order to increase the adoption of GSPs among end users, there is a need to create awareness about its relationship with energy efficiency. As a first step in this direction, this study aims to document end users' understanding of the impacts of GSPs while servicing.

Purchasing energy-efficient ACs is not an end in itself. A badly maintained AC can lower energy performance far lower than its star-rating

2. Further details on the S&L programme are provided in Section 3.

3. Further details on the S&L programme are provided in Section 3.

Based on these gaps in data and literature, the key research questions this study seeks to answer are as follows:

1. What are the key factors that influence end users' purchase decisions in relation to AC star ratings?
2. What is residential end users' current awareness and perception towards AC star ratings?
3. How do end users perceive the relationship between AC servicing and its energy efficiency?

This report seeks to answer the above questions by first creating a methodological framework of assessing literature, policies and designing the study based on gaps therein (Chapter 2). Chapter 3 highlights the current literature on the subject. Chapter 4 highlights the key results of the study and discusses these with an eye to consumer awareness programmes that have been run by the Government of India on energy efficient ACs. Finally, chapter 5 discusses these findings and proposes recommendations to enhance the uptake of energy efficient ACs as a purchase decision, as well as from an operations and maintenance point of view.

2. Methodology

This study is based on household surveys conducted across four Tier-II Indian cities: Meerut; Madurai; Vadodara; and Dhanbad.

Image: Alina Sen/CEEW

To trace perceptions, purchase behaviours, and practices around AC energy efficiency among residential users in general, and the effectiveness of the star labelling programme as the policy flag bearer for energy efficient ACs in India, this study aims to determine the purchase process for residential ACs and consumer awareness about energy star labelling. Additionally, this study also attempts to ascertain consumer understanding of the relationship between AC servicing and energy efficiency, as a driver of the latter. The following methodological steps were undertaken to arrive at scientifically-rigorous data

points to nuance the current understanding of Indian households' priorities, purchase, and practices vis-à-vis energy efficient ACs.

2.1 Literature and policy review

An extensive literature analysis was undertaken to understand the research baseline – and the gaps therein – of Indian consumers' perception of AC energy efficiency. This literature review focussed not just on households' perceptions related to purchasing higher efficiency AC units within the remit of India's star-labelling energy efficiency programme, but also consumer understanding related to servicing.

2.2 Study design

Given the focus on households, a door-to-door survey was conducted across four Indian cities. For this, cities with populations of 10 lakhs or more as per Census 2011 were classified into north, south, east, and west zones. These four zones were used to capture a variety of climatic conditions as well as any differences in AC purchasing and use patterns. One city from each zone was randomly picked, which resulted in Dhanbad, Madurai, Meerut, and Vadodara being surveyed (see Table 1). Within each city, six municipal wards, and three housing localities from each ward were randomly picked. Six households from each locality were approached for this survey. This resulted in a sample of 108 households from each city and a total sample size of 432 households.[4]

For this study, six households in three localities each, in each of the randomly picked six municipal wards, were randomly selected in one Tier II city each from the north, south, east, and west zones of India

The eligibility criteria for this survey were as follows:

- Household must have an AC
- Respondent must be at least 21 years of age
- Respondent should have made decisions related to AC purchase and servicing
- Respondent must continue to live in the current dwelling until January 2020[5]
- One AC in the household must at least be two years old at the time of the survey, and not under a servicing warranty for the running year.

Questionnaire design

The survey questionnaire[6] consisted of five sections and an additional section for respondent details. The five key sections of this questionnaire aimed to gather information on the following:

1. AC attributes and sources of information used for the purchase decision
2. Energy efficiency and star labelling
3. Awareness about GSPs
4. End-user perceptions of servicing technicians
5. AC ownership data

4. Sampling was based on the procedures followed for a randomised controlled trial (RCT) experiment. This survey was the pre-assessment of an RCT conducted across the four cities. Details on the sampling procedure can be found in Bhasin, Chaturvedi, Gorthi, and Laha (2020).
5. This was required so that households could participate in the end-line survey and the intervention between June and December 2020.
6. This analysis used the baseline questionnaire of a larger RCT conducted by the authors. Details of this RCT study may be accessed at Bhasin, Chaturvedi, Gorthi, and Laha (2020).

For the purposes of this report, ten data points from the baseline were used. The baseline data used in this analysis encompassed information on the following:

1. Information sources and the features of ACs that influenced purchase decisions
2. Awareness and understanding of the energy star label of the AC
3. The desirability of 4- or 5-star labelled ACs and barriers for purchasing them
4. Respondents' perceptions on the link between AC servicing and energy efficiency

2.3 Data collection and analysis

For the data collection, we conducted training sessions for field coordinators and enumerators. The training addressed aspects such as the motivation behind the survey and gave an overview of the technical concepts used in the questionnaire. During the training, each question from the questionnaire was explained and role-playing exercises were used to train enumerators.

The baseline survey was conducted between May 24, 2018 and June 12, 2018. Each interview was estimated to take about 45 minutes to complete. The questionnaire was originally designed in English and was then translated into three widely spoken regional languages in the cities to be surveyed, namely, Hindi, Gujarati, and Tamil (see Table 1). The questionnaire was coded into a computer-assisted personal interview (CAPI) tool[7] to administer the survey. The survey responses were recorded by enumerators on Android tablets.

City	Zone	Language
Meerut	North	Hindi
Dhanbad	East	Hindi
Vadodara	West	Gujarati
Madurai	South	Tamil

Table 1
List of cities, their zones, and the languages used to administer the survey

Source: Authors' compilation

Data quality was monitored daily using logical checks designed for specific questions. Feedback was provided to enumerators on the field at the end of every day for the first week, after which errors in data collection were minimal. Wherever data quality was not satisfactory, enumerators were requested to re-collect data either from the same household or replace the data with a new household depending on the severity of the issue.

Verbal and written consent was collected at the start of every interview. Households were informed of the purpose and time required to complete the interview as a part of the consent form.[8]

7. For this study, we employed SurveyCTO to administer the survey. SurveyCTO is a CAPI tool developed in India to assist with quantitative and qualitative surveys. More information on this tool can be found here: https://www.surveycto.com/

8. For this study, we employed SurveyCTO to administer the survey. SurveyCTO is a CAPI tool developed in India to assist with quantitative and qualitative surveys. More information on this tool can be found here: https://www.surveycto.com/

Power consumption by residential buildings is expected to supersede that of industrial demand due to an increase in AC penetration as well as in the number of dwellings as early as 2030 (NITI Aayog 2015).

Image: Alina Sen/CEEW

3. Literature review: Indian consumers and energy efficiency

Energy conservation and efficiency is well recognised by the Indian government and is promoted through the various schemes and programmes under the *Energy Conservation Act*, 2001 (EC Act 2001). A key sector of focus in this Act is the residential sector, which is expected to grow rapidly due to urbanisation in the next decade. In fact, recognising this has not only led to BEE's S&L programme being mandated for ACs but also to the Energy Conservation Building Code (ECBC)[9] being developed and rolled out for commercial and residential buildings.

ICAP estimates a potential 30% reduction in energy demand for cooling if energy efficiency practices are adopted

The growth in demand for cooling is inevitable and is aligned with India's development priorities. The India Cooling Action Plan (ICAP) establishes cooling as a national priority and raises a call to action to proactively meet this cooling growth in a sustainable manner. Taking cue from national leadership, action at every level is important to ensure that we achieve cooling for all while optimising energy use and minimising related emissions.

3.1 Motivators for adopting energy efficiency for households

A 2018 study by Sustainable Energy for All (SE4All) stated that the increasingly affluent middle class in developing countries like India is expected to purchase the most affordable and, consequently, the most inefficient ACs in the next decade (Miller et al. 2018). Delhi is among the Indian cities with the highest AC penetration (29.4 per cent) – about 25–30 per cent of its annual energy consumption can be attributed to cooling needs (Sharma and Shah 2018; Somvanshi 2019). Further, during peak summers, energy for cooling can constitute 40–60 per cent of the peak electricity load for Delhi (Shah et al. 2015). While with the current high AC penetration in the city and the subsequent high electricity demand seem like a Delhi issue, the IEA estimates that India's cooling needs may constitute 45 per cent of the peak electricity load by 2050, making this a nationwide problem (IEA 2018). ICAP estimates that there is potential for a 30 per cent reduction in energy demand for cooling by adopting energy efficiency practices (Ozone Cell 2019). Therefore, energy efficiency enhancement is an important requirement in the context of meeting India's growing need for cooling access.

Energy efficiency in ACs involves a substantial initial investment. Based on the online sale prices of ACs, Somvanshi (2019) observed that a 5-star rated AC can be at least INR 8,000 more expensive that a 3-star AC. Various factors determine consumers' decisions to purchase efficient ACs. Studies have tested the dependency between socio-economic and demographic

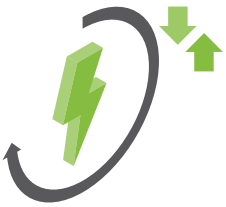
9. ECBC is a set of guidelines for residential and commercial buildings aimed at incorporating energy efficiency into their design and construction. See UNDP, GEF, and BEE (2017) for more information

characteristics and energy efficiency among individuals or households. For example, studies reported that older households are more likely to adopt energy conservation practices and purchase energy-efficient goods (Trotta 2018; Zainudin et al. 2016). However, other characteristics such as gender, education, and income either did not exert any influence or were inconclusive (Trotta 2018). Further, these aspects can vary significantly between regions and demographic groups. For example, while Trotta (2018) found that women in Britain were more likely to purchase efficient appliances, Zainudin et al. (n.d.) did not find the same to be true in Malaysia.

Besides the initial investment (purchase price), the lifetime costs (maintenance cost, electricity bills, etc.) of the appliance also influence purchase decisions (Chunekar and Sreenivas 2019). To this end, an empirical study on consumers' willingness to pay for energy-efficient ACs found that a majority of the respondents indicated that they either did not want to pay extra, or that they were willing to pay up to 5 per cent more for energy-efficient ACs; less than 20 per cent indicated the willingness to pay more than 6 per cent (Zainudin et al. 2016). Knowledge about associated cost savings and environmental friendliness of these products encouraged the willingness to pay more (Zainudin et al. 2016). Even in terms of decision-making, Banerjee and Banerjee (2015) found that consumers that choose to purchase a 5-star AC typically do so for their second AC or due to the additional 'design' features that a 5-star AC has to offer. They stated that it was the aesthetics of a 5-star model that made it attractive in the cases where it was bought.

Electricity pricing can also play a significant role in consumers' purchase decisions. Somvanshi (2019) stated that the low domestic tariff for electricity disincentivises buying energy-efficient ACs. The high price of an energy-efficient AC and low electricity tariffs requires a period of seven years or more to break-even, whereas the average lifetime of an AC is about six years and in the most optimistic scenarios, up to 10 years (Somvanshi 2019; Sony and Mekoth 2018).[10] This finding is also supported by a qualitative study based in Mumbai, wherein consumers stated that the low cost of electricity was the key contributor to the lack of motivation to adopt energy conservation behaviours (Sony and Mekoth 2018).

Further, Chunekar and Sreenivas (2019) proposed that quality of electricity supply had a role to play in purchase decisions. They stated that based on anecdotal evidence, people in Indian regions that had poorer quality of electricity purchased cheaper and thereby less efficient appliances. However, even in major metropolises in India, 3-star ACs are more prevalent that 5-star ACs (Sachar, Goenka, and Kumar 2018). It is therefore necessary to understand what motivates households to purchase energy-efficient ACs. Household decision-making is a particularly complex system to understand due to the unique conditions that exist in every case. Households' understanding of energy efficiency should therefore be considered in the context of AC purchasing behaviour.



Households' energy-efficient behaviours may be characterised as low effort Vs high effort, low cost Vs high cost, and repetitive Vs one-off

Energy-efficient behaviours by end users or households have long been studied to understand and design suitable government/marketplace policies. Key considerations are whether these behaviours are low effort versus high effort, low cost versus high cost, and repetitive versus one off. An exhaustive literature review compiled by Moore and Boldero (2017) finds that among pro-environmental behaviours, specific types of practices can be followed to rouse these behaviours among households. For instance, a repetitive low-effort and low-cost

10. Government of India estimates AC lifecycle to be 10 years (Ozone Cell 2019)

behaviour like turning off lights in an unoccupied room could be encouraged by appealing to the self-interest of the household. As an example, BEE's *Button Dabao, Bijli Bachao* (press the button, save electricity) campaign used the element of self-interest by informing consumers about electricity savings. On the other hand, a behaviour that involves high investment would necessitate forms of monetary compensation such as subsidies (Moore and Boldero 2017). Education and awareness building around the benefits of said-practices need to be introduced for high-effort and high-cost behaviour changes.

Action at multiple levels will be required for India to achieve cooling for all while optimising energy use and minimising related emissions

While lessons can be derived from Moore and Boldero (2017) to create an awareness strategy, they are by no means representative of an Indian scenario. However, the general principles discussed in these studies can be tested and adapted to the Indian context. Further, this also points to an urgent need to study pro-environmental behaviours in Indian households.

3.2 Success of the S&L programme: a consumer's lens

An evaluation of the S&L programme based on a national survey can be found in CLASP (2015). The survey focused on the perceptions and awareness of consumers, retailers, and others with regards the star labelling programme. In total, 5,000 consumers and 642 retailers were interviewed as part of the nationally representative sample.

The study found that between 2010 and 2014, consumer awareness of star labelled products improved from 33 per cent to 63 per cent, respectively (Market Xcel 2015). It also showed that while the programme targeted the rural population as well, its reach was largely restricted to the urban population (Market Xcel 2015).

A key motivator for energy conservation practices with regards AC use was an awareness of the energy-guzzling nature of ACs and the possibility of reducing electricity bills through energy efficiency (Market Xcel 2015). The study noted that a key practice that consumers adopted was the auto switch-off timer during the night and the use of coolers to minimise their dependence on ACs (Market Xcel 2015).

Over 68% of households surveyed believe that ACs have a large or substantial impact on their electricity consumption.

Image: Alina Sen/CEEW

4. Findings: how does urban India perceive energy efficiency?

Energy efficiency and star labels formed a recurring theme in the survey, thus capturing urban households' perceptions and practices. Through this analysis, we present if and how concepts of energy efficiency surface during the purchase and operational life of an AC. The responses of the households we surveyed reflect the impact of the systematic consumer awareness programme that the star-labelling programme has been running. To a series of questions that covered awareness, trust, willingness to buy, other purchase choices, usage, key challenges, sources of information related to energy efficiency, and other AC attributes as described above, we received the following responses.

Of the 75% of households aware of the Standards and Labelling Programme, 95% deemed it trustworthy, and 93% found it useful

4.1 Star labelling programme: trustworthy and aspirational

Of all the AC-owning households we interviewed as part of a random sampling conducted across four Tier II cities in India, over 75 per cent were aware of the star labelling programme. This awareness was significantly higher in some regions — 80 and 90 per cent of the surveyed households in Dhanbad and Madurai, respectively. However, less than 50 per cent of the households we surveyed in Vadodara reported being aware of the star labelling programme. It is worth noting that when we asked the households about the programme, we also showed them the star labelling sticker to aide visual recognition.

Among the households that were aware of the star labelling programme, 95 per cent deemed it either highly trustworthy (48 per cent) or trustworthy (47 per cent), and 93 per cent claimed to find it either very useful (43 per cent) or useful (50 per cent).

Given the positive perceptions and values attributed to the programme, it is not surprising that a majority of these households (over 70 per cent) wanted to purchase a high-star labelled AC. The energy star label was ranked fourth among the information sources that households reportedly took into account when considering the purchase of their AC. This was preceded by advertising (TV and print) and personal recommendations – also key sources of information influencing the AC purchase decisions among households. Moreover, of all the key attributes that influence AC purchase in households, the energy performance of the unit ranked third. Almost 93 per cent of households ranked brand as a key attribute, followed by tonnage (62 per cent of households). Over 55 per cent of households ranked the energy star rating as a key attribute when buying ACs. The other two attributes in the top five considerations were the design/aesthetic of the AC (approximately 53 per cent of households) and cost – just over 48 per cent of households ranked this as a key consideration.

It is interesting to qualify that when asked at which point buyers considered these attributes – well before buying the AC or at the time of purchase – 68 per cent of households reported that they considered energy efficiency a key attribute at the time of purchase, whereas relatively more respondents indicated that they decided their budgetary and branding preferences well before making their purchase.

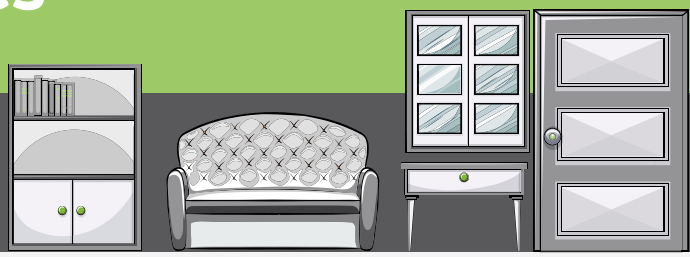
However, of all these households, only 14 per cent actually went on to purchase a 4- or 5-star labelled AC. When asked for the reasons in this discrepancy between desire and purchase decisions, over 75 per cent of households cited cost as a barrier.

HOUSEHOLD PERCEPTIONS

ENERGY EFFICIENT ACs

AC's contribution to the ELECTRICITY BILL?

6%	16%	37%	31%	9%
Very small	Small	Substantial	Large	Don't know



★★★★★

Are you aware of the STAR LABELLING PROGRAMME (SLP)?

YES - 76% NO - 24%

Is SLP TRUSTWORTHY?

48%	47%	4%	1%

Is SLP USEFUL?

40%	53%	2%	5%

Very useful/trustworthy · Useful/trustworthy · Not useful/trustworthy · Don't know

Wish to BUY?

YES - 71% NO - 29%

Did you PURCHASE?

YES - 14% NO - 86%

Why NOT?

38%	40%	5%	15%	3%
Very high cost	Marginally high cost	Trust deficit	Low use	Other reasons

AC purchased by households

x	★	★★	★★★	★★★★	★★★★★
10%	0%	11%	65%	4%	10%

COST REMAINS THE KEY BARRIER IN PURCHASING HIGH-EFFICIENCY ACs

Over **75%** of households, among those that wanted to purchase a high star AC, were unable to do so due to product pricing

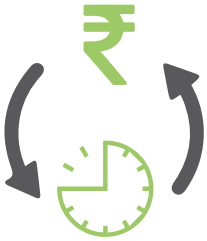
Over **60%** of households consider AC's contribution on electricity spend to be significant

Only **14%** of households went on to purchase a 4/5 star AC

x: indicates no star rating
High star ACs include 4 and 5 star ACs

Source: Authors' compilation

4.2 Understanding the perception of energy efficient ACs



The trade-off between upfront spending, or through the appliances' lifetime, is still clearly stacked against energy-efficient purchases

In response to the impact of ACs on electricity consumption, over 68 per cent of households affirmed 'large' or 'substantial', as opposed to being unsure or perceiving AC's impact as being small. However, the well established trade off between upfront spending, or through the course of the appliances' lifetime, is still clearly stacked against energy efficient purchases. Based on our survey data, the energy star rating is among the top attributes that buyers consider when purchasing an AC. This was highlighted across two key data points related to AC purchase decisions: (i) sources of information that households considered when purchasing an AC; and (ii) star rating as an attribute of the AC. However, as highlighted earlier, only a minor number of these households went on to purchase an energy efficiency labelled air conditioner. Moreover, a very limited subset of the households surveyed had installed separate metres to establish electricity consumption for their ACs alone. While this data point in itself if not significant, it is noteworthy that over 90 per cent of these households were among the small subset of households which had bought high-star ACs (4 or 5 star units).

These findings are well in line with the priorities that previous government programmes have also run. BEE's extensive ad campaign for print, electronic, and social media included flyers and articles explaining energy efficiency and star labelling that were widely published in national and regional dailies. The star label has been mandated for room ACs, among other appliances, due to their high energy consumption. A radio programme *Bachat ke Sitare Dost Hamare*[11] was aired in 20 languages on various radio stations such as All India Radio's FM Gold, FM Rainbow, and Vividh Bharati. The programme aimed to provide information on the benefits of the star label while also encouraging consumers to purchase star labelled appliances. Messages from public figures through interviews and advertisements [BEE 2018] are also used to encourage the adoption of energy conservation behaviours among the public (e.g., [BEE 2019a]). The data collected in this survey also indicates that advertisements related to star labelling specifically also accrued the third highest visibility among consumers as a channel of information, just after print and television adverts.

11. Losely translates as *"energy saving stars are our friends"*

HOUSEHOLD PERCEPTIONS

AC PURCHASE BEHAVIOURS

TOP 5 INFORMATION SOURCES USED TO MAKE A PURCHASE DECISION

1. NEWSPAPER/ MAGAZINE
2. TV COMMERCIAL
3. STAR RATING STICKER
4. FRIEND, NEIGHBOUR, RELATIVE OR CO-WORKER
5. SALESPERSON

More details in Annexure 1

TOP 5 AC ATTRIBUTES CONSIDERED FOR PURCHASE

01. BRAND
02. TONNAGE
03. ENERGY STAR RATING
04. AESTHETICS AND DESIGN
05. PRICING/COST

More details in Annexure II

KEY ATTRIBUTES CONSIDERED DURING PURCHASE TIMELINE	STAR LABELLING	TONNAGE	PRICE	BRAND	AESTHETICS AND DESIGN
WELL IN ADVANCE Respondents' choice (%)	32%	43%	49%	47%	31%
TIME OF PURCHASE Respondents' choice (%)	68%	57%	51%	53%	69%

BRANDING, PRICING, TONNAGE, STAR LABELLING AND DESIGN AESTHETICS are among the key attributes considered for an AC purchase.

A large number of households take decisions on these attributes even AT THE TIME OF PURCHASE

SALES PERSONS ARE AMONG THE TOP FIVE SOURCES OF INFORMATION that households rely on to make their AC purchase decisions.

Source: Authors' compilation

We may also consider the simplicity in the messaging that the star rating labels invoke and the regularity of awareness campaigns as key reasons for the ease with which households understand and trust the programme as well as its positive outreach. The label that is visible across products is easy to understand, and compare across product lines and brands.

Energy efficiency is also a positive USP for various brands, and many manufacturing companies and retail outlets also focus on it as a selling point. This could also be because of the ease that the labelling programme offers in comparing and switching between different types of ACs. Regardless of make, refrigerant, branding, tonnage, pricing, inverter, wiring, and other key features that make an AC, the star labelling programme offers an easily comparable vantage point.

The Star Label offers an easy comparison between ACs notwithstanding different refrigerants, branding, tonnage, pricing, and other key features

In addition to sales staff highlighting the star rating of the products on offer, households reported that the star labelling sticker acted as a key source of information for them at the point of sale. This can be attributed to the recognition that the star labelling programme has garnered for itself. From all the above data points, it is certainly noteworthy that the accessibility of information has been optimised as part of the star labelling programme.

As a factor that influences the purchase of an AC at the time of buying unlike other attributes, such as tonnage, budget, and brand where consumers are more decisive from earlier on in their purchase decisions, energy efficiency being a key consideration may be linked to extensive training and awareness programmes that have been dedicated to retail sales staff as part of the star labelling programme.

As noted in separate data points highlighted in this section, sales staff was also considered among the top five sources of information that influenced households' decisions around AC purchase. This is in line with systematic attempts made at organising awareness among retail staff by BEE— in addition to consumers, BEE also provides training to retailers nationwide to create awareness on the benefits of the star labelling programme among traders, sellers, and distributors. Two phases of this programme successfully trained over 4,000 retailers and aims to expand across 82 cities in India (BEE n.d.). The main objective of these training sessions is to equip salespersons with the tools to provide information on the benefits of star labelling to consumers while making sales (BEE 2019d; 2019c).

4.3 Energy efficiency and servicing practices: limited awareness

While the data in the previous section indicates fairly succinctly the significance attributed to energy efficiency when considering the purchase and use of an AC, it is telling that very few households see any explicit relationship between energy efficiency and AC usage practices. Only a third of households believed that there was any relationship between servicing the AC and the maintenance of energy efficiency; two-thirds of the household base reported that they either did not know of or did not believe in a link between the two (approximately 30 per cent and over 40 per cent respectively).

Only a third of households believed that there was any relationship between servicing the AC and the maintenance of energy efficiency

Moreover, of those who responded as recognising a linkage between energy efficiency of their appliance and servicing practices, only 26 per cent identified any specific aspect/ practices of the servicing as a having a direct impact on the electricity 'load' of an AC, electricity consumption, or efficiency of the AC unit. These practices included cleaning of the AC, earthing and voltage related practices and filter cleaning specifically. However, among all the households that were surveyed, only less than 10 per cent had a contractual Annual Maintenance Contract or had bought an Extended Warranty Service both of which provide regular servicing.

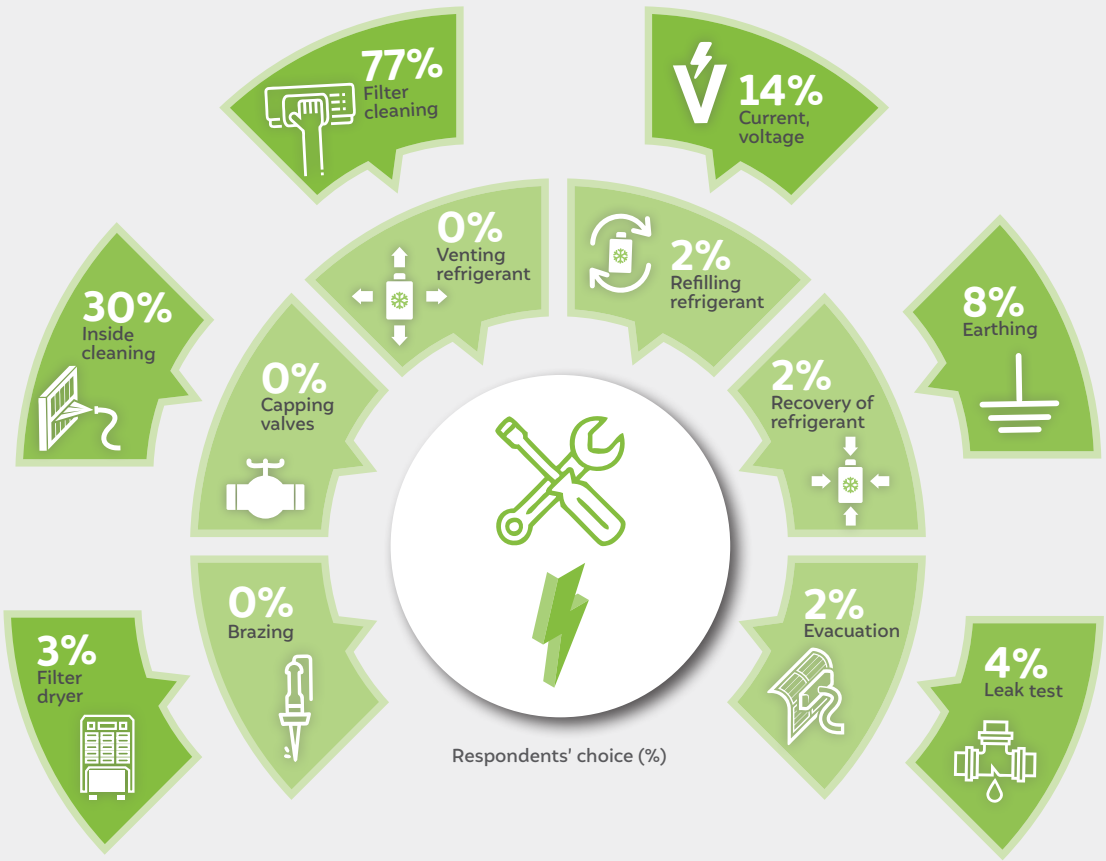
Thus, in an attempt to frame a larger picture around awareness related to energy efficient ACs, if the starting point is familiarity with the star labelling programme, then trust and usefulness of it, followed by consideration of the star labels when planning a purchase, the 'desire' or 'aspiration' to purchase, the actual purchase, and then finally, the internalisation of electricity savings brought on as a result of the energy efficient purchase, its measurement, and maintainace, it is clear that Indian households still have a long road ahead in internalising energy efficiency behaviours related to ACs.

HOUSEHOLD PERCEPTIONS
ENERGY EFFICIENCY & AC SERVICING

A MAJORITY OF HOUSEHOLDS ARE NOT AWARE OF CLEAR LINKAGES BETWEEN SERVICING PRACTICES AND ENERGY EFFICIENCY, a critical consideration to ensure energy efficient working of ACs.

Does servicing impact the AC's ENERGY EFFICIENCY (EE)? YES - 29% NO - 40% ? - 31%

How consumers perceive the impact these good servicing practices have on energy efficiency



Source: Authors' compilation

The Star Label is a key source of information and influence in a households' AC purchase at the point of sale.

Image: Emotivelens

5. Recommendations for furthering awareness on energy-efficient ACs

The discussion in this subsection reflects on the findings that have been gathered from a random sampling survey conducted in Indian households as highlighted above. Despite the successes and effectiveness that can be noted in the survey findings to reflect BEE's targeted efforts at trainings and awareness creation, market reality still remains in favour of lesser efficient products for other reasons. In furtherance to a discussion on the effectiveness of the awareness programme run by BEE above, the discussion below pertains to two specific areas for interventions to address: (i) costs; and (ii) O&M practices.

Energy efficiency purchases are directly linked to costing; innovative financing solutions need to be developed, evaluated, and scaled-up

In addition to financing solutions to address the main barrier as noted by consumers, if information and data gaps such as electricity savings, cost-benefit of AC's efficiency as compared to its running time, may also equip the retail staff to nudge, and the consumer themselves to consider, a higher efficiency product more favourably. Furthermore, the lack of awareness on servicing, operations and maintenance practices' influence on energy efficiency needs to be systematically targeted. These have been discussed below.

5.1 Financing purchase of high-efficiency ACs

As highlighted in the previous section, financing solutions or affordable high-star labelled ACs remain out of reach for a majority of the population. This can be extrapolated to be true for the Indian AC market at large, given that market data aligns with the findings of this study (for example, Sachar et al 2018).

Since energy efficiency purchases are directly linked to costing, and a major source of influence is at the time of purchase, schemes that allow for easier financing solutions such as a rebate in goods and services tax, tie-ups with retailers and manufacturing companies to incentivise higher-star purchases, as well as large scale procurement programmes especially for micro, small and medium enterprises, start-ups and other clusters need to be investigated from a business model perspective. While the super-efficient AC programme initiated by EESL is a start in such offerings, it needs to be assessed and enhanced based on the ongoing experiences and finally scaled up to meet the increasing cooling demand in India. We discuss some of these initiatives and financing solutions in detail below:

1. Tax incentives for 5 star ACs

ACs fall within the 'luxury' category of India's Goods and Servicing Tax (GST) and are subject to the highest rate of taxation. A lowering of GST on highest efficiency products from 28 per

cent to under 5 per cent would be able to successfully allow for competition between lower efficiency products available at pricing marks in the range of around INR 30,000 on average, as compared to highest star units costing upwards of INR 45,000. A significant markdown in the GST would allow for a more favourable competition towards higher efficiency products, and also encourage industry to create financing schemes and encourage further product development for this segment of ACs specifically.

Currently, BEE requires that AC efficiencies be increased every three years. Given that the demand is low for highest star ACs due to financing concerns, the vicious cycle of scaling up to lower costs continues; and has been met with pushback from industry to invest in greater R&D to lower component and other costs to bring the average product price down. An incentive on the final price could support demand creation, and help scale-up production and market uptake of better efficiency products across the country.

2. Bulk procurement

Energy Efficiency Services Limited (EESL), an ESCO established by BEE, launched a first-of-its-kind super-efficient AC programme in 2019. This was designed to facilitate consumer access to the most efficient AC products, not on the Indian market yet, made available at prices that were 30 per cent lower as compared to existing market offerings of efficient ACs. These Super-Efficient ACs have been produced by Voltas for this programme specifically, and will provide 1.5-TR cooling capacity at high ambient temperature while reducing the cost of cooling by 50 per cent (EESL 2020).

The success of this programme is as yet unknown, but the idea of investing in higher efficiency products to allow their purchase at competitive pricing is worth scaling up to encourage consumers to opt for best-efficiency technologies. Under its first ongoing phase, EESL aims to distribute 50,000 super energy efficient and environment-friendly ACs. This initiative has been enabled through significant investments of up to INR 190 crores with contributions from Global Environment Facility (GEF), Asian Development Bank (ADB) and the UN Environment Programme (UNEP) (Economic Times 2020).

3. Public procurement

Public procurement is a key economic activity of governments that can offer a host of advantages, depending on their modalities (Sridhar and Bhasin 2018). According to World Bank data, India procures 20 per cent of its gross domestic product (GDP) publicly (Djankov 2016). Government spending of such magnitude can immensely support the scale-up of industrial investments, and direction of consumer preferences and market behaviours. There is wide consensus on public procurement being accepted as a way to encourage the use of environment- friendly technologies so as to increase awareness and familiarity with said technology. Past CEEW research has highlighted how it may it encourage the sale of less known or more expensive environment-friendly options, and also support greater innovation by providing incentives, and signals, to industry at large (Sridhar and Bhasin 2018).

Given the low demand for high star ACs, companies remain stuck in a vicious cycle unable to scale-up to lower costs

4. International financing programmes

Akin to the support granted to EESL as part of the bulk procurement programme, international development agencies and banks can also play a critical role in galvanising the scale up of financing made available for high-efficiency products. Clean and efficient cooling is increasingly being recognized as a critical technology that can be leveraged and encouraged to curtail greenhouse emissions, both from energy utilization and refrigerant emissions' perspective. The Montreal Protocol has a dedicated fund (Multilateral Fund) to support countries in their transition to cleaner refrigerants, as do various multilateral and philanthropic bodies. The Kigali Cooling Efficiency Programme (K-CEP) and the Climate and Clean Air Initiative are only two examples of programmes that have specific financing windows for switching to low-GWP refrigerants (Bhasin, Sridhar and Chaturvedi 2017). Moreover, these international support mechanisms may be brought into conversation facilitated by industry and government to work with the financing sector within India, so as to create projects to provide financing solutions for higher efficiency products.

Consumer awareness programmes do not highlight the impact of regular servicing on energy efficiency. This is a critical area for improvement, both for the energy utilisation of the appliance and the country

5.2 Optimising efficiency through Operations and Maintenance (O&M)

While survey findings highlighted above clearly indicate that households consider energy efficiency important, they show a serious lack of clarity on the dependence of efficiency on regular servicing. This is suggestive of restrictive or asymmetrical information flows, which have been discussed in greater detail in a complementary research publication as part of this Shakti-CEEW project[12].

Consumer awareness programmes run by BEE and companies do not highlight the significance of regular servicing in optimising the energy utilisation of the AC. This is a huge area for improvement, both for the energy utilisation of the unit and cumulatively, for the country. Moreover, it is critical to also help deliver the benefits of an energy-efficient purchase to the household itself.

In order to recommend how best to address this gap in consumer awareness, we followed this survey with an end-line survey, to understand and analyse how best to target consumer awareness related to Good Servicing Practices (GSPs)[13]. However, in addition to a mass consumer awareness programme targeting operations and maintenance, on the informational supply side as well as to nudge consumers to undertake better and regular servicing to optimise efficiency of their ACs, the following interventions may be considered:

1. Manufacturing companies, retailers and OEMS must develop and promote informational outreach collaterals on best case practices related to installations and servicing of the AC. These should also be included in the product manual.
2. Retail outlets and manufacturing companies can create business models for effective servicing, offering incentives for annual servicing, maintenance contracts and extended service warranties. Of the households surveyed, less than 10 per cent had subscribed to such servicing contracts, suggestive of a market potential that may be tapped into.
3. The *India Cooling Action Plan* has envisioned a well-trained, certified servicing sector.

12. This study may be accessed at Bhasin, Chaturvedi, Gorthi, and Laha (2020).
13. This study may be accessed at Bhasin, Chaturvedi, Gorthi, and Laha (2020).

This ongoing supply side readiness is under progress, and seeks to create a workforce of technicians that undertake good servicing practices so as to optimize cooling and efficiency of the AC appliance. The modalities of GSPs, trainings and certifications have been studied in depth as part of this project as well[14]. As the servicing sector gradually formalises, businesses connecting households with trained and certified technicians will simultaneously emerge.

4. In addition to servicing practices, information on usage also needs to be organized for awareness drives to hone energy efficiency benefits by consumers. One such example is the temperature set point of 24 degrees Celsius that BEE notified to be the default in 2018. This is considered to be suitable for human thermal comfort, and also contributes to electricity savings. In fact, it has been estimated that for every degree of warmer temperature in AC use, there is a 6 per cent drop in electricity consumption.[15] This awareness drive has so far been limited only to social media and a few news publications, and has not been aggressively rolled out as previous consumer programmes dedicated to the star labelling programme. Findings from this survey, published in a paper tackling related information, suggest that only 40% of households reported any effect of temperature setting on energy consumption[16]. However, some respondents among this subset of households also reported that keeping low temperatures is a good maintenance practice that they follow.[17] This possible misconception around AC set points needs to be further analysed, and since a higher set point is a behavioural nudge that does not require any additional investments, BEE should consider designing a large-scale campaign to adopt this energy efficient practice among households.

Data gaps on electricity savings from high star ACs, its impacts on the local and global environment need to be brought out to the public in simple, targeted ways

In conclusion, while it is commendable to note the awareness spread that the star labelling programme has achieved across even Tier II cities in India with regards to high-efficiency ACs, the stark market reality betrays its accessibility given the price points. Different financing platforms such as tax incentives, cumulative procurement programmes, as well as aggregating incentives across brands to encourage a more accessible price point for such units would be a direct area of intervention to scale up their sales, and contribute to a wider spread of higher efficiency appliances.

Furthermore, enhancing the narrative around energy efficiency as a purchase priority for consumers needs more attention. Data on electricity savings resulting from a higher efficiency AC, as well as its impacts on the local and global environment need to be brought out to the public in a simple targeted manner. Furthermore, the amount of possible savings as a result of a higher efficient AC purchase, and the impacts of regular servicing – on electricity savings and the life of the AC, for example – also need to be studied and targeted to the Indian consumer so that purchase decisions for higher efficiency products are not just well intentioned, but also well informed.

14. These may be accessed at Bhasin, Gorthi and Chaturvedi (2020) and Gorthi, Bhasin, Chaturvedi (2020).
15. These may be accessed at Bhasin, Gorthi and Chaturvedi (2020) and Gorthi, Bhasin, Chaturvedi (2020).
16. These may be accessed at Bhasin, Gorthi and Chaturvedi (2020) and Gorthi, Bhasin, Chaturvedi (2020).
17. This study may be accessed at Gorthi, Bhasin, and Chaturvedi (2020b).

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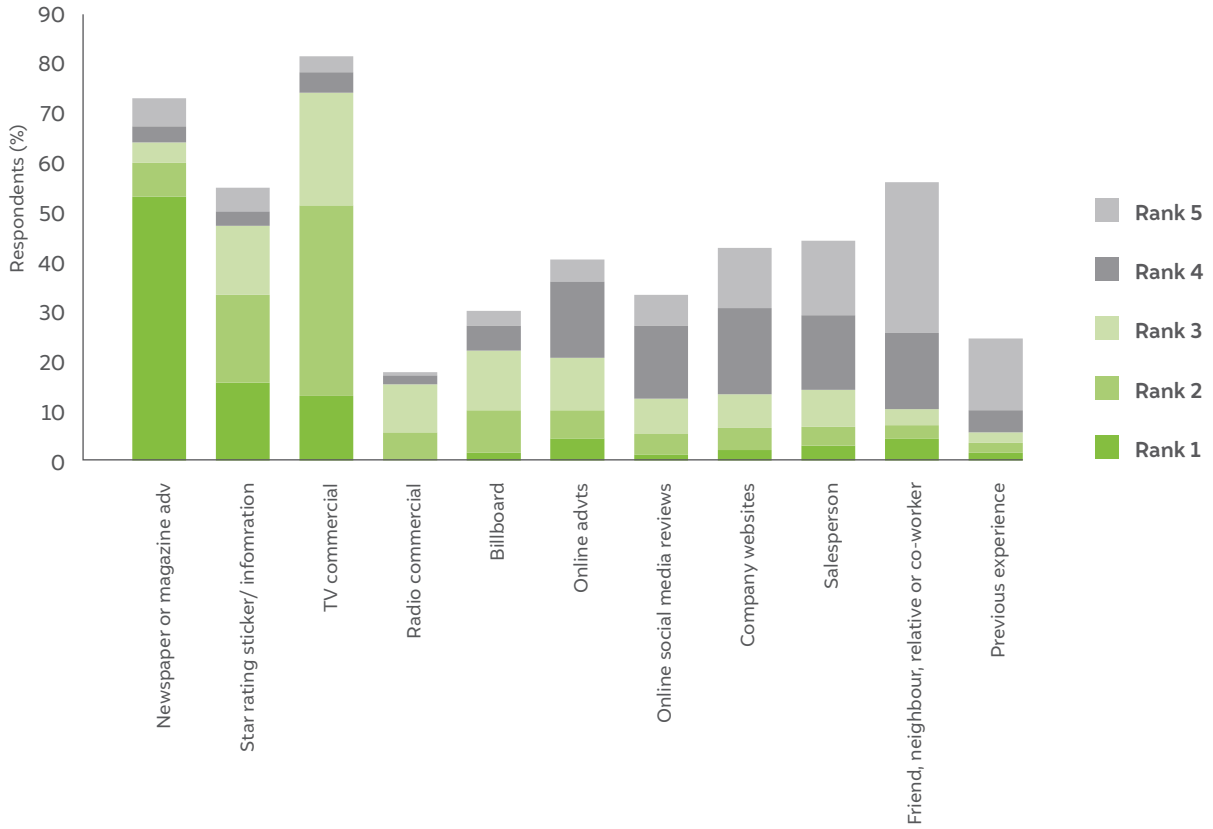
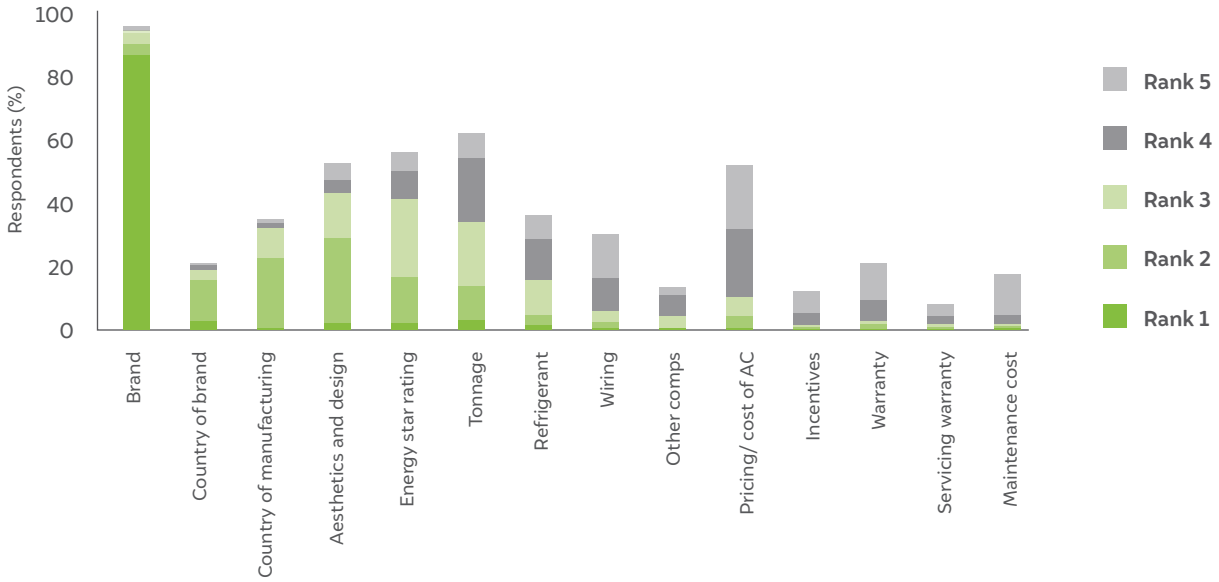
Annexure I: Information sources that influence an AC purchase decision



Information sources	Rank 1 (%)	Rank 2 (%)	Rank 3 (%)	Rank 4 (%)	Rank 5 (%)
Newspaper or magazine advt	54	7	4	3	6
Star rating sticker/ infomration	16	18	14	3	5
TV commercial	13	38	23	4	3
Radio commercial	0	6	10	2	1
Billboard	1	9	12	5	3
Online advts	4	6	11	15	4
Online social media reviews	1	4	7	15	6
Company websites	2	4	7	17	12
Salesperson	3	4	7	15	15
Friend, neighbour, relative or co-worker	4	3	3	15	30
Previous experience	1	2	2	4	14

Source: Authors' analysis

Annexure II: AC attributes consumers rank as important in their purchase decision



AC attributes	Rank 1 (%)	Rank 2 (%)	Rank 3 (%)	Rank 4 (%)	Rank 5 (%)
Brand	84	4	3	1	1
Country of brand	3	13	3	1	1
Country of manufacturing	1	21	23	4	3
Aesthetics and design	2	26	14	4	6
Energy star rating	2	14	24	9	6
Tonnage	3	11	19	20	8
Refrigerant	1	3	11	13	8
Wiring	1	2	3	10	13
Other comps	0	0	4	6	2
Pricing/ cost of AC	1	3	6	21	20
Incentives	0	1	0	3	7
Warranty	0	2	1	6	11
Servicing warranty	0	0	1	2	4
Maintenance cost	0	1	1	3	13

Source: Authors' analysis

Providing financing solutions and data saving on electricity may encourage the consumer to consider purchasing a higher efficiency product.

Image: iStock

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