STUDY ON PUBLIC PROCUREMENT POLICIES FOR REFRIGERATION AND AIR-CONDITIONING EQUIPMENT USING NON-ODS BASED REFRIGERANTS

सत्यमेव जयते

प्रकृतिः रक्षति रक्षिता
Nature Protects if She is Protected

OZONE CELL
MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE
GOVERNMENT OF INDIA

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मंत्री
पर्यावरण, वन एवं जलवायु परिवर्तन
और
श्रम एवं रोज़गार
भारत सरकार

स्वच्छ भारत
एक कदम स्वच्छता की ओर

सत्यमेव जयते

MINISTER
ENVIRONMENT, FOREST AND CLIMATE CHANGE
AND
LABOUR AND EMPLOYMENT
GOVERNMENT OF INDIA

भूपेन्द्र यादव
BHUPENDER YADAV

MESSAGE

The Montreal Protocol on Substances that Deplete the Ozone Layer, having universal ratification, is recognized as the most successful international environmental treaty. The extraordinary international cooperation of parties to the Montreal Protocol has led to not only the phase –out of production and consumption of several Ozone Depleting Substances (ODSs), but also to significantly contribute towards protection of the global climate system.

India, being a party to the Montreal protocol and all its amendments has been successfully implementing ODS phase-out programme and adhering to the commitments of the country under the Protocol. India has set-up a sound regulatory and fiscal incentive system in the country. This has ensured successful implementation of the programmes and achievement of all its commitments to the Protocol. Recently, Cabinet of India has approved the ratification of Kigali Amendment to the Montreal Protocol for phase-down of high-global warming potential (GWP) hydrofluorocarbons as per the agreed schedule of the Montreal Protocol.

Recognizing cooling is the key for food preservation, health and well-being of people and is linked with several Sustainable Development Goals (SDGs), India developed a comprehensive India Cooling Action Plan (ICAP). India is one of the first countries in the world to understand the importance and growing needs of cooling in all the sectors and set the goals for next 20 years. The overarching goal of ICAP is to provide sustainable cooling and comfort for all while securing environmental and socio-economic for the society minimizing growth in refrigerant and electricity demand. ICAP has taken a holistic and balances approach by encompassing both passive and cooling strategies as well as optimization of cooling loads.

One of the recommendations of the ICAP is mandatory public procurement guidelines for highest star rated refrigeration and air conditioning equipment with low-GWP options wherever feasible.

A well-functioning and efficient public procurement system helps the sustainable development process by improving the strategic and efficient allocation and utilization of government expenditure i.e. public procurement. The report has been developed by Ozone cell and The Energy and Resources Institute (TERI) under the HPMP stage-II "*Study on Public Procurement Policies for Refrigeration and Air-Conditioning equipment using non-ODS based refrigerants*" will help to achieve the obligations under the Montreal protocol.

I congratulate all those who were part of preparation and consultation of this report.

With best wishes.

Date: 14.09.2021

(Bhupender Yadav)

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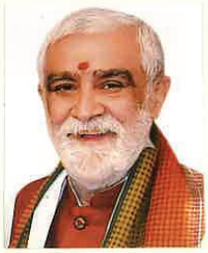
आहारशुद्धौ सत्त्वशुद्धिः

एक कदम स्वच्छता की ओर



MESSAGE

The Montreal Protocol on Substance that Deplete the Ozone Layer is in operation over more than three decades and has been achieving successfully its objective of protection of stratospheric ozone through implementation of consensus-based policy decisions based on scientific technological developments and active participation of all the stakeholders especially the industry. The successful phase –out of production and consumption of chlorofluoro and bromofluoro compounds which were responsible for depletion of ozone layer has put the ozone layer on the path of recovery. It is believed that with full implementation of all the provisions of the Protocol, the ozone layer should return to its pre-1980 level by 2050 to 2075.

India is a Party to the Montreal Protocol since 1992 and has played a proactive role in the implementation of ODSs phase-out activities in the country. Structured implementation framework supported by regulatory and fiscal measures have led to India successfully meeting all the phase-out targets of the Montreal Protocol including Hydrochlorofluorocarbon Phase-out Management plan (HPMP) Stage-I as per the accelerated phase-out schedule of the Montreal Protocol. The implementation of HPMP Stage-II is in progress.

The HCFC Phase out Management Plan (HPMP) Stage-II implementation has been forward-looking, systematic and efficient. It has been approached in an integrated and result oriented manner in order to achieve he compliance targets as per the accelerated phase-out schedule of the Montreal Protocol. Towards this endeavor, all the key stakeholders have been working closely as done in the past. Public procurement policies are an important lever for transforming the market and accelerate the adoption of non-ODS, low Global Warming Potential (GWP) and energy efficient alternative technologies. Under the HPMP stage-II enabling activities, with collaborative efforts from the Ozone Cell, Ministry of Environment, Forest and Climate Change, UN Environment and The Energy and Resources Institute (TERI), the report "*Study on Public Procurement Policies for Refrigeration and Air-Conditioning equipment using non-ODS based refrigerants*" has been developed.

It gives me great pleasure to dedicate this study report to the novel cause of reduction of ODS and energy use by promoting sustainable practices in the public procurement process. I congratulate all those who are part of preparation of this report.

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MESSAGE

There are several international environmental treaties, covering various issues. Among the most successful of these treaties are the ozone agreements. The Vienna Convention on the Protection of Ozone Layer (1985) and its Montreal Protocol on Substances that Deplete the Ozone Layer. These treaties address one of the most ominous global environmental problem ever faced by humankind, the destruction of fragile mantle of stratospheric ozone by synthetic chemicals that protects all life on earth from the sun's lethal ultraviolet rays.

The Parties to the Montreal Protocol are determined to protect the ozone layer by taking precautionary measures to control equitably total global emissions of substances that deplete it with the ultimate objective of their elimination on the basis of development in scientific knowledge, taking into account technical and economic considerations. Recognition of common but differentiated responsibilities as in the case of the Montreal Protocol, has served as an example of excellent international cooperation for addressing other environmental challenges.

India being the Party to the Montreal Protocol and ratified all the amendments to the Protocol, has met successfully all the obligations of Montreal Protocol by accessing technical and financial assistance from Montreal Protocol. The Indian industry has also been making all round efforts to phase-out production and consumption of Hydrochlorofluorocarbons (HCFCs) as per the accelerated phase-out schedule of HCFCs. The key attribute to India's success in implementation of ODS phase-out programme is involvement of key stakeholder both at planning as well as implementation stages.

The HCFC Phase-out Management Plan (HPMP) is being implemented in the country by Ozone Cell, Ministry of Environment, Forest and Climate Change (MoEF&CC) in close cooperation of United Nations Development Programme (UNDP) as, lead implementing agency, United Nations Environment Programme (UNEP) and GIZ as the cooperating agencies. UNEP is responsible for implementation of enabling activities under the non-investment component of India's HPMP stage-II in cooperation with Ozone Cell, Ministry of Environment, Forest and Climate Change. The Public Procurement is one of the elements that was one of the recommendations of India cooling Action Plan (ICAP) forms the part of enabling activities.

The scale of the Public Procurement can be used to transform the market and accelerate the adoption of non-ODS, low Global Warming Potential (GWP), and energy efficient alternative technologies.

I take this opportunity to compliment all the representatives from Ozone Cell and The Energy and Resources Institute (TERI) involved in the development of the report "*Study on Public Procurement Policies for Refrigeration and Air-Conditioning equipment using non-ODS based refrigerants*".

[R P Gupta]

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LIST OF ABBREVIATIONS

BEE	Bureau of Energy Efficiency
BIS	Bureau of Indian Standards
OECD	Organisation for Economic Co-operation and Development
CTC	Carbon tetrachloride
CFC	Chlorofluorocarbons
ISEER	Indian Seasonal Energy Efficiency Ratio
EER	Energy Efficiency Ratio
GeM	Government e-Marketplace
GHG	Greenhouse Gas
SDG	Sustainable Development Goals
GWP	Global Warming Potential
ODP	Ozone Depletion Potential
HCFCs	Hydrochlorofluorocarbons
HFCs	Hydrofluorocarbons
ISO	International Organization for Standardization
RAC	Room Air Conditioners
SME	Small and Medium Enterprises
SPP	Sustainable Public procurement
DCR	Direct Cool Refrigerator
FFR	Frost Free Refrigerator
MoEF&CC	Ministry of Environment, Forest and Climate Change
EESL	Energy Efficiency Services Limited
ESEAP	EESL's Super-Efficient AC Program

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This report is developed as part of Enabling activities of HPMP Stage-II project. Ozone Cell, Ministry of Environment, Forest and Climate Change (MoEF&CC) and United Nations Environment Programme (UNEP) are jointly implementing the enabling activities of HPMP Stage-II.

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1

BACKGROUND

The Montreal Protocol is a global agreement to protect the Earth's ozone layer by phasing out production and consumption of the substances that deplete the Ozone Layer. The landmark agreement was signed in 1987 and entered into force in 1989. The Montreal Protocol is widely considered the most successful environment protection agreement. It is the first international environmental treaty to achieve complete ratification by all 197 countries.

India became a party to the Montreal Protocol in 1992. Since then India has been implementing a phase-out of production and consumption of Ozone Depleting Substances (ODSs). The production and consumption of Chlorofluorocarbons (CFCs), Carbon tetrachloride (CTC) and Halons has been successfully phased out in India as of 1st January 2010. During the implementation of the CFC phase-out under the Montreal Protocol, HCFCs were also introduced as transitional substitutes for ODSs wherever other non-ODS technologies were not available. HCFCs are used in the foam manufacturing, refrigeration, air conditioning industry, fire-fighting, solvent sectors, etc.

In 19th Meeting of Parties held in September 2007 decided to accelerate the phase-out of HCFCs by 10 years for the parties. The Montreal protocol calls for the complete phase-out of production and consumption of HCFCs in 2030 for Article 5 parties by following reduction steps: By 2015 of 10%, By 2020 of 35%, By 2025 of 67.5% and allowing for servicing an annual average of 2.5% during the period 2030-2040 (Montreal Protocol Decisions, 2007).

To fulfill the commitments of the Montreal Protocol, India being an Article 5 country initiated activities related to the phase-out of the HCFC. In 2009, India started collecting data on the consumption of HCFCs from various sectors like foam, Refrigeration, and Air conditioner (RAC) and developed a roadmap to phase-out of HCFCs (GOI, 2017b). The HCFC Phase-Out Management Plan (HPMP) Stage-I was launched in 2012 and it was successfully implemented by achieving the targets of 10 % reduction in consumption and production of HCFCs by 2015 (baseline 2013). Further, MoEF&CC launched HPMP stage –II in February 2017 and completed phase-out of HCFC-141b in the Foam manufacturing sector in 2020. (*Ministry of Environment, Forest & Climate Change Government of India, 2020*) further conversion of ten manufacturing lines in six room AC manufacturing enterprises from HCFC-22 to HFC-32 and to train about 17,000 refrigeration and air conditioning (RAC) technicians on alternative technologies and good servicing practices in the country (GOI, 2017b).

Under the enabling activities of India's HPMP stage-II, one of the activities is to develop this documents towards integrating adoption of non-ODS and low-global refrigeration and air conditioning appliances in Public procurement policies.

2

IMPLEMENTATION OF THE MONTREAL PROTOCOL

India became the Party to the Montreal Protocol in 1992. The Government of India has entrusted the work relating to the ozone layer protection and implementation of the Montreal Protocol to the Ministry of Environment, Forest, and Climate Change (MoEF&CC). The Ministry has established an Empowered Steering Committee (ESC) Chaired by Secretary (EF&CC), which is overall responsible for the implementation of the Montreal Protocol provisions, review of various policies including implementation options, project approvals, and monitoring. The Ministry has set up an Ozone Cell, which has been given the responsibility for carrying out all tasks relating to ODS phase-out. It governs day-to-day operations, the promulgation of relevant policies, and monitoring implementation of all phase-out projects. Currently, the Ozone Cell is engaged in the phase-out of production and consumption of Hydrochlorofluorocarbons (HCFCs) with an accelerated phase-out schedule as per the Montreal Protocol.

HCFC phase-out is being implemented through HCFC-Phase-out Management Plans (HPMPs). HPMP Stage-II has been implemented by Ozone Cell, MoEF &CC in close cooperation with UNDP as lead implementing agency UNEP and GIZ as cooperating agency.

3

STUDY OBJECTIVE

The objective of this project is to conduct a study on the existing policies, technology landscape, and implementation mechanisms for public procurement in India, including bulk procurement. Public procurement is relevant to further adoption of non-ODS, low GWP, and energy-efficient alternative technologies along with the capacity building and awareness among the agencies involved in the procurement process.

4

APPROACH AND METHODOLOGY

This section explores the approach and methodology adopted for the study. The approach for the study involved a desk-based review of the policy documents, research articles, reports, action plans and information available in the public domain. Information is also gathered through conducting stakeholder consultation by one-to-one interactions through virtual means with experts from various sectors under cooling involving stakeholders from manufacturing industries, policy-makers, academia and individual expert to understand the gaps and challenges in the process. The consultations also focussed on the feedback and recommendation received from the experts to improve the procurement process and ways to promote the use of low GWP and energy-efficient technologies in the procurement process.

Methodology

1. Based on the secondary research landscaping of the existing policy trends, methodology, and implementation of public procurement of non-ODS, low GWP, and energy-efficient products in India was studied.

2. To address the issue of the HCFC refrigerant use in the public procurement process selection of the products was done based on the availability of data.

3. The impact of selected refrigerant-based products on energy consumption and GHG emissions was analysed.

4. Envisioned the analysis for the products to show the opportunities in monetary and electricity saving after the adoption in the public procurement process

5. Based on the secondary research and stakeholder consultation identified the gaps and technological intervention in the current procurement process

6. Based on the findings, recommendation have been provided on various fronts to include non-ODS and low GWP technology based equipment in the public procurement process.

5

PUBLIC PROCUREMENT

5.1 Introduction

Public procurement refers to the purchase by governments and state-owned enterprises of goods and services.

Public procurement wields enormous purchasing power, accounting for an average of 12 % to 20 % of gross domestic product (GDP) at a global level(World Bank, 2020). Leveraging this purchasing power by buying more sustainable goods and services can help drive markets in the direction of sustainability, reduce the negative environmental impacts of an organization, and even produce positive benefits for the environment and society. Sustainable public procurement (SPP) is now regarded as an important instrument in helping to achieve Sustainable Development Goals. The UNEP defines Sustainable public procurement as "a process whereby public organizations meet their needs for goods, services, works and utilities in a way that achieves value for money on a whole life-cycle basis in terms of generating benefits not only to the organization, but also to society and the economy, whilst significantly reducing negative impacts on the environment (UNEP, 2017).

Public Procurement in India estimated to be 15-20% of it GDP. In the year 2020, the GeM Portal saw sales of over 44000 air conditioners worth `1.7 billion.

Public Procurement in India estimated to be 15-20% of it GDP. In the year 2020, the GeM Portal saw sales of over 44000 air conditioners worth ₹1.7 billion, and it continues to grow. Public procurement of this magnitude has the potential to direct and influence consumers and market behaviour towards the adoption of non-ODS, low GWP and energy efficient technologies. In March 2018, the Ministry of Finance constituted a Task Force on Sustainable Public Procurement. Additionally, the draft National Resource Efficiency Policy (2019) includes the agenda of Sustainable Public Procurement, that suggests establishing green procurement guidelines providing information on resource efficiency criteria to be used in the procurement processes for the prioritized products/service categories. Recently, to enable and encourage all central and state government agencies to buy efficient and environment friendly green RACs a new product category of Green Room Air Conditioners was launched on the Government e-Marketplace (GeM) (Press release of Ministry of Commerce and Industry, 2021).

5.2 Public Procurement Framework in India

The public procurement system in India is governed by General Financial Rules (GFRs), which allow the government entities to conduct procurement activities independently. . Many entities such as Defence, Railway, Telecom, Public Works Department (PWD), and The Directorate General of Supplies and Disposals (DGS&D) separately issues procurement manuals to administer the procurement activity (Hazarika & Jena, 2017).

The GFR contains all the rules regarding the procurement applicable to all ministries or departments, regarding the procurement of the goods, works, and services. The GFR also comprises comprehensive administrative rules and directives on financial management and procedures for government procurement. For procurement, in 2017 government launched an electronic portal Government e-Marketplace (GeM) to make the process more transparent, efficient, and more accountable which will be discussed later in detail. The Government of India issued Public Procurement (Preference to Make in India) Order 2017 which grants purchase preference to local suppliers based on certain conditions to promote manufacturing and production of goods and services in India(Public Procurement (Preference to Make in India) Order, 2017). The framework of public procurement (Hazarika & Jena, 2017)in India has mainly four features that are shown in Table-5.1

Table 5.1 Public Procurement Framework in India

Constitutional Provisions	Legislative Provisions	Administrative Guidelines	Overseers
◆ Authorizes the Central and State Governments to contract for goods and services.	◆ Contract Act,1872 ◆ Sale of Goods Act, 1930 ◆ Government of India (allocation of Business rules), 1961 ◆ CAG's Duties, Power and Condition of Service Act,1971 ◆ Bureau of Indian Standards Act,1986 ◆ Prevention of Corruption Act,1988 ◆ Arbitration and Conciliation Act, 1996 ◆ The Ozone-Depleting Substances (Regulation and control) Rules, 2000 ◆ Information Technology Act, 2000 ◆ Energy Conservation Act, 2001 ◆ Competitions Act, 2002 ◆ Central Vigilance Commission Act, 2003 ◆ Right to Information Act, 2005 • State Level Procurement guidelines	◆ General Financial Rules (GFR),1947 and last modified in 2017 ◆ Manual for Procurement of Goods, 2017 (MPG) ◆ Delegation of Financial Powers Rules, 1978 (DFPR) ◆ Directorate General of Supplies and Disposals(DGS&D) ◆ Manuals and Policies governing procurement by individual ministries/ departments such as Defence and Railways.	◆ Central Vigilance Commission (CVC) ◆ Competition Commission of India (CCI) ◆ Central Bureau of Investigation (CBI) ◆ Controller and Auditor General(CAG) ◆ Public Procurement Division (PPD)

The Constitution of India authorizes and allows the central and state governments to contract for goods and services, executive power, and autonomy in public spending. The legislative provisions for various procurement rules and regulations are guided by acts cited in Table 5.1. Apart from these, some states developed their own procurement rules to carry out the public procurement process ex. Tamil Nadu, Karnataka, Rajasthan, Andhra Pradesh, and Assam.

The administrative guidelines for procurement are mainly governed by the General Financial Rules (GFR). All government procurements must follow the principles outlined in the GFR (General Financial Rules, 2017), which includes specific rules on the procurement of goods and services and contract management. The Manual for Procurement of Goods (MPG), 2017 contains guidelines for the purchase of goods. The government's financial powers to various ministries and departments are governed by the Delegation of Financial Powers Rules (DFPR), 1978. The Directorate General of Supplies and Disposals (DGS&D) provides guidelines on behalf of ministries/department as requested (Seth et al., 2016).

To check the issue in the procurement process in India there are five major overseers listed in Table 5.1, the public procurement division under the Department of Expenditure mandate the reforms in the public procurement process in the country and also attempts to spread the information about the best practices, provide guidance and issue in the procurement manual. The Central Vigilance Commission (CVC) and Comptroller and Auditor General (CAG) work to increase transparency and objectivity in the Public Procurement Process. Competition Commission of India (CCI) checks anti-competitive elements in the process. Central Bureau of Investigation (CBI) engaged in investigation and prosecution of the criminal activities in the procurement process such as probity issues.

Sustainable task force 2018

From 2008, various research institutes brought out reports on sustainable/green public procurement practices in the Indian context and assessed awareness, interest, and concerns, and investigated the reforms that would impact the public procurement process. The first step towards developing guidelines was taken by MoEF&CC and nominated a committee to draft Public procurement bill in 2012 to encourage the government to procure greener products and services. The planning commission in 2014 documented the need for the SPP to move towards the low carbon economy. In 2017, NITI Aayog published a strategy Paper on Resource Efficiency in India which includes an action plan for promoting resource efficiency in India. In that Strategy paper Sustainable Public Procurement has been identified as one of the action points. (UNEP, 2019)

To unlock the economic and environmental gain through the public procurement process, the government of India issued a notification on 19th March 2018 to constitute a task force on sustainable public procurement to develop sustainable procurement policy in specific product groups/services /works that government procures (GOI, 2018b). Identified some areas for attention such as strengthening the certification and eco-labelling system, developing tool kits for the use of Life cycle costing (LCC) in various sectors, training and capacity building of procurement officers, etc.

The task force on SPP is constituted by the Ministry of Finance with the following terms of reference:

01	02	03	04
Review international best practices in the area of SPP	Inventories the current status of SPP across Government organizations	Prepare a draft Sustainable Procurement Action Plan	Recommend an initial set of product/service categories (along with their specifications) where SPP can be implemented

The sustainable task force identified some areas for attention such as strengthening the certification and eco-labelling system, developing tool kits for the use of Life cycle costing (LCC) in various sectors, training and capacity building of procurement officers, etc.

As per the current update, the issues related to SPP were discussed with stakeholders involved in the process and six meetings of the task force have been held. Preparation of the action plan is in progress because balancing the interest of all stakeholders in the action plan is a complex process (MoF, 2020).

5.3 Conventional Tender Procurement Process

In India, the conventional procurement process for any product or service is linear. The tender is floated by procuring entity after defining the requirement and specification. The bids received by the entities from different sellers and then these bids qualify for the financial evaluation to meet the technical specification set by the procuring entity. The bid evaluation is mainly done based on least-cost, not on the other energy or environmental criteria. Generally, the environmental impact of the product through its life cycle is not considered in the evaluation process.

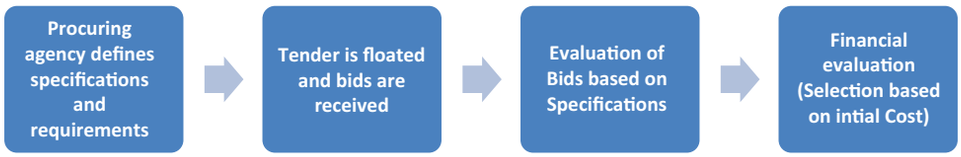


Figure 5.1 Conventional Procurement Process *(UNEP, 2019)*

5.4 Sustainable Public Procurement Framework

The UNEP report on sustainable public procurement in India suggested that the process of sustainable procurement should be cyclic. The procurement entity should allocate the budget after the identification of the needs that will not compromise the product specification (UNEP, 2019). Environmental aspects should be included during all the stages of the procurement as shown in Figure 5.2.

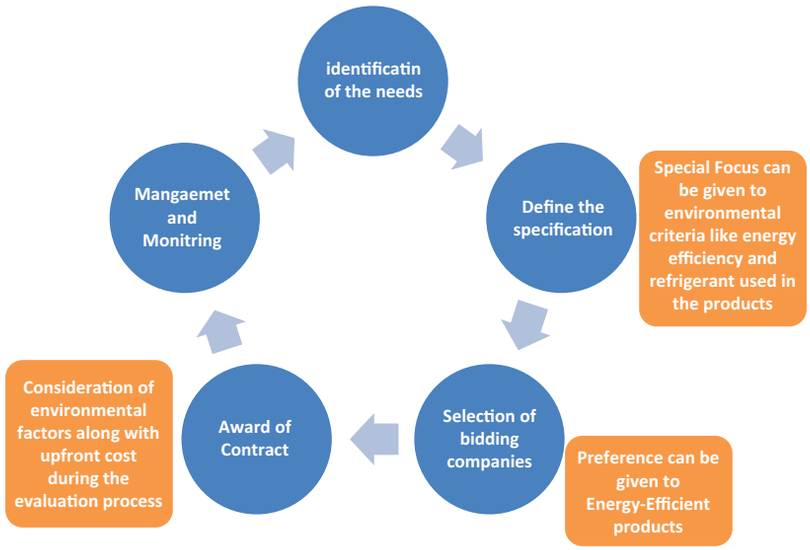


Figure 5.2 Sustainable Procurement Process *(UNEP, 2019)*

5.5 Public Procurement Mechanisms

The history of procurement in India is related to the DGS&D. which has its origins in the India Stores Department established in 1860 in London by the British for Centralized purchase of goods for India. To arrange purchases for the government departments in India one dedicated department was established in 1922. In 1951, the previous department set up was reorganized and DGS&D was formed. Defense and Railways were allowed to procure items meant for their exclusive use in 1974 (*Hindustan Times, 2018*).

As a replacement of the DGS&D in April 2017, The Ministry of Commerce and Industry shifted towards e-procurement and launched the Government e-Marketplace (GeM) to make the procurement process more transparent and efficient.

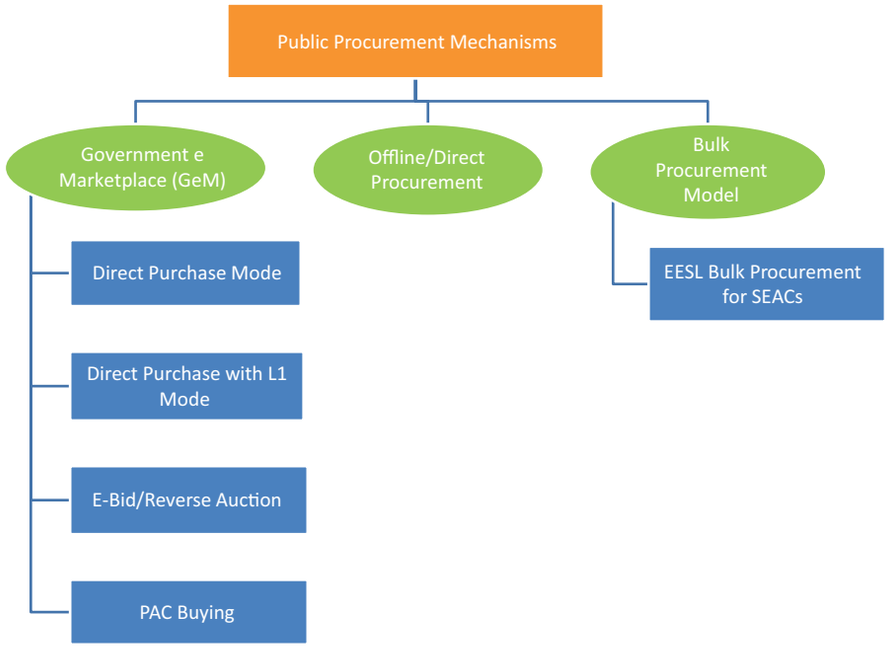


Figure 5.3 Public Procurement Mechanisms

5.5.1 Government e-Marketplace (GeM)

GeM is online an end-to-end procurement platform developed for the purchase of commonly used goods and services by government buyers or users like ministries, departments, municipalities, and other local bodies at the Centre and State level. This platform was introduced to increase transparency, efficiency, and speed in the procurement process. GeM uses modern technology and enablers and brings together all government buyers on a unified online platform for the procurement of commonly used goods and services. GeM reduces manual process inefficiencies in procurement and provides a paperless and cashless e-marketplace with a streamlined, consistent process for all users (*GeM Handbook, GOI, 2018*).

The government issued the Public Procurement Order (Public Procurement (Preference to Make in India) Order, 2017) which grants purchase preference to local suppliers to promote manufacturing and production of goods and services in India.

Through GeM, GOI has taken a significant step to promote 'Make in India' and 'Atmanirbhar Bharat' schemes. The government issued the Public Procurement Order (*Public Procurement (Preference to Make in India) Order, 2017*) which grants purchase preference to local suppliers to promote manufacturing and production of goods and services in India.

Recently, Government also mandated for sellers to enter the Country of Origin while registering all new products and also the country of origin should be listed for products already on the GeM platform. GeM has also enabled a provision for indication of the percentage of local content in products. With this new feature, now, the Country of Origin as well as the local content percentage is visible in the marketplace for all items (*Ministry of Commerce and Industry, 2020*).

As per the GFR Rule 149, the Purchase through GeM by Government users has been authorized and made mandatory for the procurement of goods and services available on the platform (*General Financial Rules, 2017*). The GeM has primarily three buying modes for the government users and the use of the appropriate modes is decided by the total value of the procurement indicted by the platform. All decisions related to the use of the modes available on GeM shall be made solely and exclusively by the buyer with required approvals from the competent authorities.

The modes of procurement are (*GeM Handbook, GOI, 2018*):

(i) Direct Purchase Mode

Direct Purchase mode shall be allowed for low-value transactions (up to ₹ 50, 000) and shall allow the buyer to directly procure from any available seller on GeM that meets specified quality, specification, and delivery period.

(ii) Direct Purchase with L1 mode

The Direct Purchase with L1 mode shall be allowed for mid-value transactions (above ₹ 50, 000 and ₹ 30, 00,000) and shall allow the buyer to directly procure from the L1 seller after comparing all available sellers (at least three different manufacturers/ OEMs and three different sellers)

(iii) E- bid/ Reverse Auction

Above ₹ 30, 00,000 purchases the E-bid/Reverse Auction mode shall allow buyers to conduct an electronic bid for the goods and services on the platform. The platform provides the option to customize the bid as per the requirement of the buyers.

(iv) Proprietary Article Certificate (PAC) Buying

Proprietary Article Certificate (PAC) filter provided on the GeM platform, which allows the selection of a specific model/ make from a particular seller that, is available on the platform.

The information on procurements made across various Ministries / Departments and all the organizations under them is available on the Central Public Procurement Portal (CPPP). All user departments and agencies are required to link up their portals with this centralized procurement portal (*Central Public Procurement Portal, 2020*).

To make GeM the Unified Procurement System government bringing together other portals such as the Central Public procurement portal (CPPP), the Indian Railway electronic procurement system (IREPS), and the defence public procurement (*The Economic Times, 2020*).

5.5.2 Offline Mode/Direct tendering

The GeM platform is a dynamic online marketplace with new categories of goods/ services continuously being added. In situations where the product/service is not supported on the Platform or there is insufficient competition basis specifications input by the buyer including service shall be deemed not available for procurement on the GeM platform and the buyer shall be allowed to procure via the offline mode. In such situations, the buyer shall be allowed to download a report for audit and shall allow the buyer to show verifiable proof for procuring outside the GeM platform (*GeM Handbook, 2018*).

5.5.3 Bulk Procurement Model

The bulk procurement model enhances the penetration of the desired product into the market at an affordable cost to the consumer at an accelerated rate. For the successful implementation of these procurement model economies of scale is being used. Tenders are floated in the market and competitive sealed biding brings down the prices of the products.

(i) EESL Bulk Procurement Models

EESL successfully implemented the bulk procurement program UJALA- Unnat Jyoti Affordable LEDs for All. UJALA program brought down the prices of LED bulbs from ₹ 310 per piece in January 2014 to ₹ 39.90 per piece by August 2019 (*Singh & Gurumurthy, 2018*). Based on the success of UJALA in 2017, EESL launched the program with the intent to increase the market penetration of SEACs (Super-Efficient Air Conditioners) by using competitive bidding and bulk procurement to overcome the high cost associated with efficient ACs. The Phase-I tender floated with mentioning the requirement of AC units of 1.5 TR with non-ODS technology and ISEER 5.2 (minimum). Also specified details on design, manufacture, supply, installation, after-sales services but there is no mention of low –GWP refrigerant as mentioned in Table 5.2. The contract for the program was awarded to two manufacturers for a total of 100,000 units of air conditioner and 40% of the SEACs procured through this were with low-GWP refrigerant. The strategies under

The bulk procurement model enhances the penetration of the desired product into the market at an affordable cost to the consumer at an accelerated rate.

UJALA for the distribution of LEDs at lower costs could not be applied for RACs due to higher upfront cost, maintenance and servicing cost, transportation cost, etc. For further information, the reader can refer to the policy brief issued by TERI named "Bulk Procurement in Room Air Conditioning: a Critical Analysis of the EESL programme" (*Singh & Gurumurthy, 2018*). An important parameters of the super-efficient AC in phase –I and Phase –II (*EESL, 2019*) are shown in Table 5.2 referring bid document issued by EESL and the policy brief issued by the TERI.

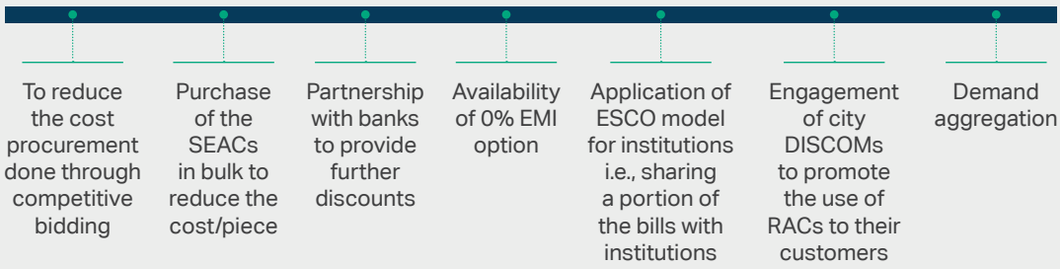
Table 5.2 Key Parameters of SEAPs

ESEAP Phase – I (2017)	ESEAP Phase-II (2019)
ISEER 5.2 or greater	**ISEER- 5.4 or greater**
Window or split 1.5 TR	Inverter Split AC 1.5 TR
No mention of Low-GWP Refrigerant requirement	**Refrigerant Gas- Low GWP (<700)**
Additional component warranty - 5 years warranty on condenser/evaporator coil and 10 years warranty on compressor	Warranty on Indoor Unit and their components 5 years and warranty on compressor 10 years for retail customer only

In mid-2019 EESL started phase 2 of the program with more efficient and environmentally friendly specifications of RACs mentioned in the above Table 5.2. They decided to deploy 50,000 units of SEACs in the retail sector (EESL, 2019). EESL developed a dedicated website for deployment www. eeslmart.com.

Key business strategies in ESEAP phase - 2

To bring down the cost per unit of the SEACs various strategies being followed:



Additionally, retail consumers get the option of dismantling their old RACs at ₹400 per unit and also the option of "Buy Back of AC" at 2500 per unit[1] The initial upfront cost of the SEACs is still higher even after the reduction by the EESL program in comparison with other RACs available in the market, that is limiting consumer to choose SEAC., This situation creates the challenge of selling these units to average consumers.

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

6

REFRIGERANT BASED PRODUCTS

According to the Bureau of Indian Standards (BIS), there are Indian Standards available in terms of safety, quality, and performance for the safe use of refrigerant and refrigerant-based products. For this study, we have selected four refrigerant-based products which include - Room air conditioners, Refrigerator, Deep Freezers, and Drinking Water Coolers. Selections of these products are based on the data made available to us through GeM and the scale of procurement for these products in the public procurement. To promote the use of low GWP and energy-efficient technologies, their impact on energy consumption and GHG emission has been considered for these products. In the following section, we have explained their operations and applications, their scale at central and state-level procurement, current technical specification in the process, and opportunities and benefits after the adoption of the technologies:

6.1 Available Products

All the refrigeration system discussed in this report uses Vapour- Compression Refrigeration (VCR) cycle to accomplish cooling. It is mostly used in the air conditioner, heat pumps, refrigerators, and HVAC systems. It is a preferred system by the manufacturing industry because of its efficiency and reliability. It uses refrigerant in a closed system and it circulates through four stages, which includes - compression, expansion, and phase change. Through this cycle, heat is either absorbed or expelled by the system, resulting in a change in the temperature of the surrounding (*Venkatarathnam & Murthy, 2017*).

The most common refrigerant in air conditioners has been R-22 but it has a high value of GWP which is harmful for the environment. Since the India is transitioning from HCFCs to non-ODSs as per the Montreal Protocol with its HCFC phase-out management plan, manufacturers have started moving towards low GWP options.

6.2 Procurement Scale of Selected Products

This section maps the scale of the selected products procured through the GeM from the year 2018 to 2021 including room ACs, refrigerators, deep-freezers, and water coolers. This section also highlights the major central ministries and state governments involved in the procurement of the selected product. Table 6.1 shows the presently used refrigerants in Refrigeration and Air-Conditioning equipment with their Global Warming Potential

Table 6.1 Presently used refrigerants in Refrigeration and Air-Conditioning equipment with their Global Warming Potential

Product	Presently used refrigerants	Global Warming Potential
Room Air conditioner	R-22	1810
	R-32	675
	R-410A	2088
	R-290	3
Refrigerator	R-134a	1430
	R-600a	3
Deep Freezer	R-134a	1430
	R-404A	3922
	R-290	3
Drinking water cooler	R-22	1810
	R-134a	1430
	R-290	3

Room Air Conditioners (RAC)

To increase work productivity and provide thermal comfort in scorching summer, the RACs are used to create ambient temperature in any closed spaces like offices, homes, malls, banks, and hospitals. Generally, two types of the RACs split and window with their different capacity procured by the government for their office use. Table 6.1 shows the procurement share of the split and window ACs, the share of split ACs is high in all years because split ACs are high mounted and designed for cooling larger spaces whereas window ACs are better for the smaller rooms. Number wise the procurement of the RACs is dropped in the year 2020 because of the Covid-19 lockdown situation.

Table 6.2 Procurement Based on the Type of RACs

Types	FY18-19	FY19-20	FY20-21
Split Ac	83% (37,021)	84% (40,086)	85% (27,922)
Window Ac	17% (7839)	16% (7669)	15% (4801)

GOI (as per rule 149 in GFR) mandated the use of the GeM portal for procurement which involves all the central level ministries, central public sector enterprises CPSE and state-owned departments, etc. For the better implementation of the policies here shown the share of the central and state-level procurement and different ministries and states involved in the procurement of the RACs.

Figure 6.2 represents the ministries involved in the procurement of the room air conditioner through GeM in three years. Ministry of Railways and the Ministry of Defence are the largest buyer organization of the RACs from the GeM portal. GeM is also trying to integrate with the Indian Railway electronic procurement system (IREPS) to make GeM a unified portal for procurement. Besides Railway and Defence, the Ministries of Human Resources, Home Affairs, Coal, Petroleum, and Power are major buyers from the platform.

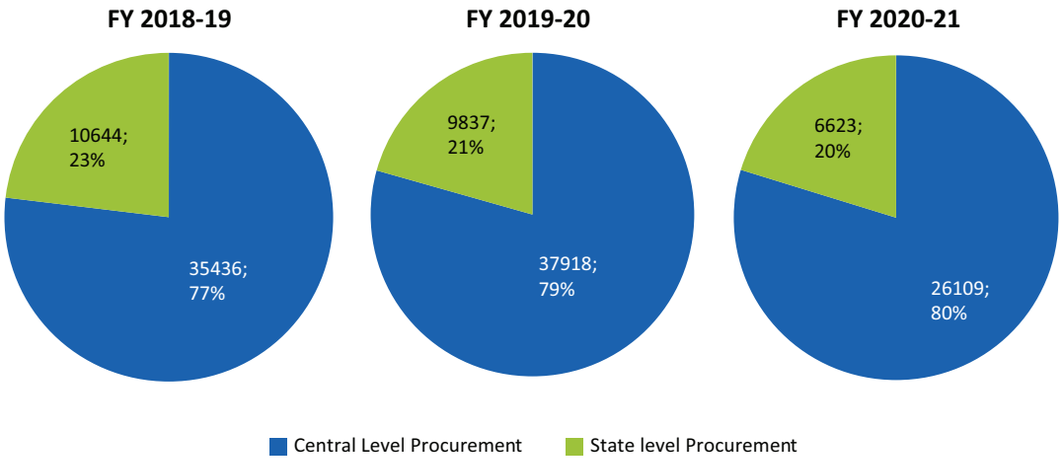
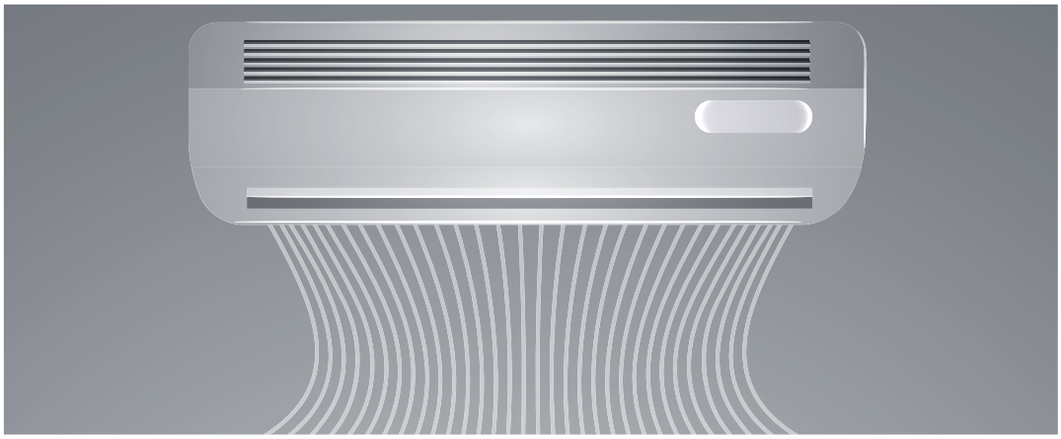


Figure 6.1 Procurement of RACs at Central and State level



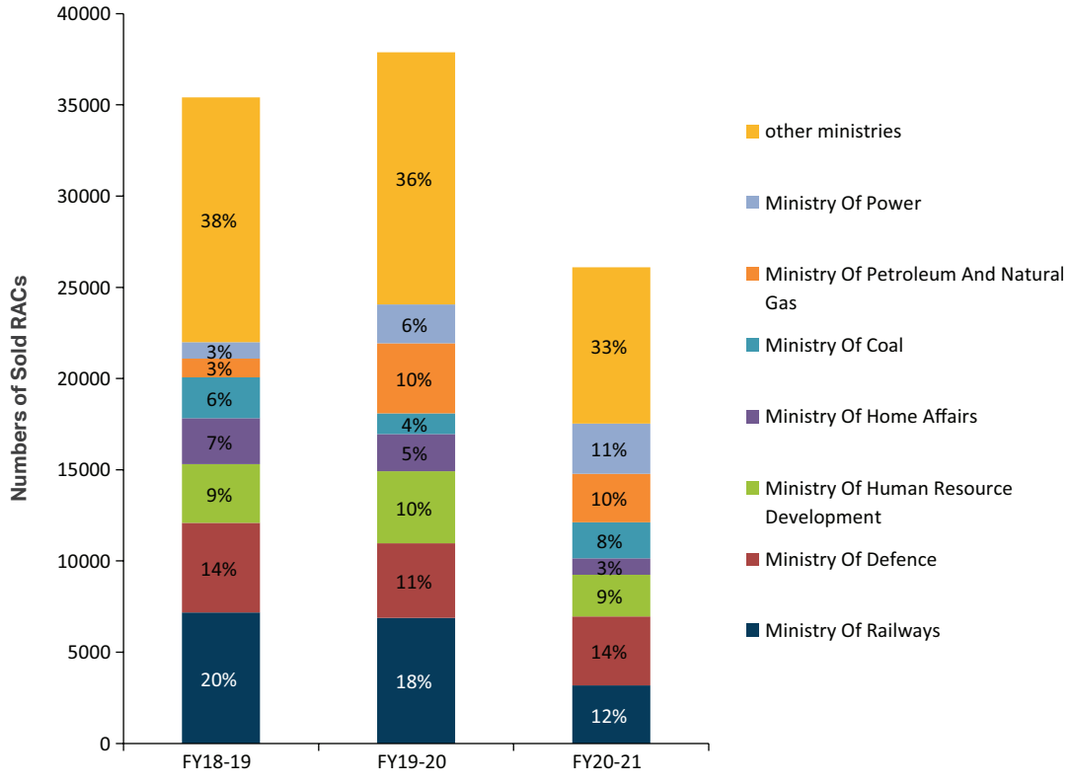


Figure 6.2 Central-Level Procurement trend of RACs

Among states, Uttar Pradesh is the largest buyer of the RACs in three years. As per data available, the Medical Health and Family Welfare Department, Uttar Pradesh shares the largest portion under the state procurement. Madhya Pradesh, Chhattisgarh, Gujarat, and Delhi are the other states that share a major portion in the procurement of RACs.

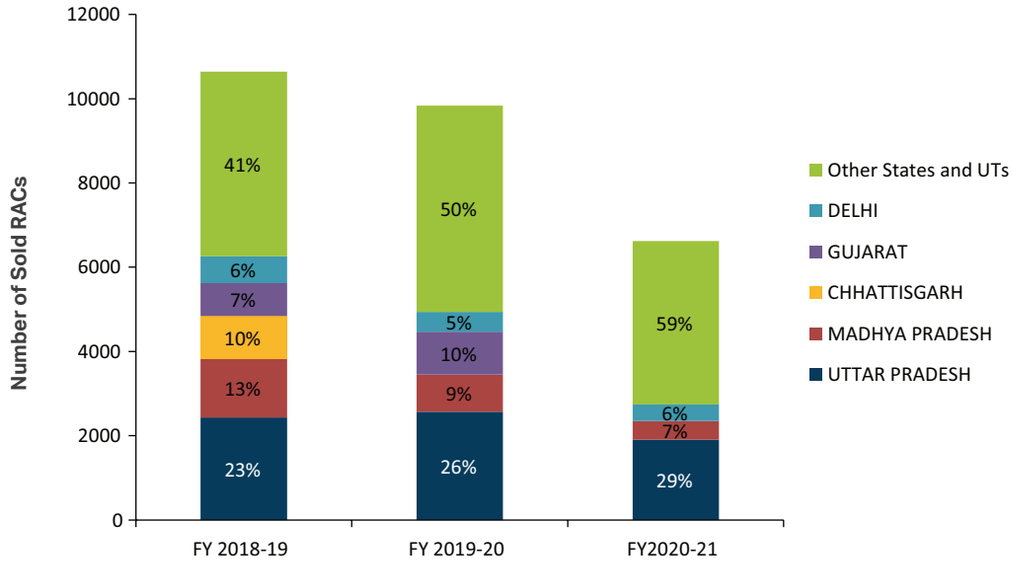


Figure 6.3 State-Wise Procurement trend of RACs

Refrigerators

Refrigerator is mainly used in household and commercial setups like government offices, buildings, hospitals, and schools for food preservation and storage of medicines and vaccines. The refrigerator has two types of cooling: direct cooling and frost-free cooling. In direct cooling, the circulation of cool air takes place naturally without any external aid so temperature distribution uneven inside the fridge under these circumstances collection of ice around the freezer box can be seen and it can be defrosted manually by button. In frost-free the distribution of cooling air inside the fridge is made even by using electric fans as a result there is no formation of ice so there is no need for defrosting. Table 6.3 shows the procurement share of the different cooling technology based refrigerator through GeM portal direct cool technology refrigerator have major portion throughout the years because of its economical method of cooling and also it consumes less electricity compared to the frost-free technology refrigerator.

Table 6.3 Procurement based on Cooling Technology of Refrigerator

Technology	FY18-19	FY19-20	FY20-21
Direct Cool	61% (7003)	62% (7530)	51% (6283)
Frost Free	39% (4429)	38% (4528)	49% (6095)

The procurement of the refrigerator involved the central ministries and state-owned departments and the share between them shown in Figure 6.4:

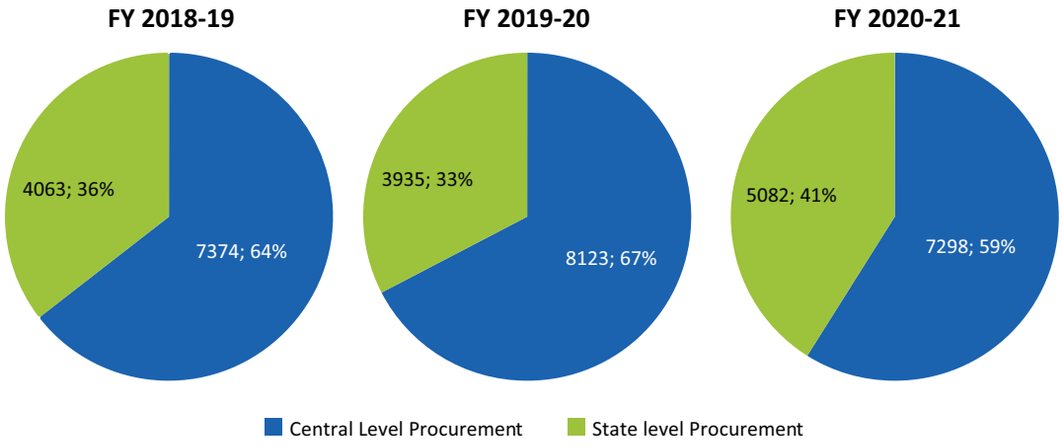


Figure 6.4 Procurement of Refrigerator at Central and State level

The GeM portal provides a wide range of products from office stationery to vehicles. The refrigerator of different capacities and star rating procured as per their use in the government organizations. At the central level, the Ministry of Defence is the largest procurer of the refrigerator. Under MoD different departments like Military Affairs, Defence Research & Development and Defence Production, etc. are uses the refrigerator to keep food fresh in their mess/canteen. Apart from MoD, the Ministry of Home Affairs, Railways, Health, and Family Welfare, and Human Resource Development also share the major portion.

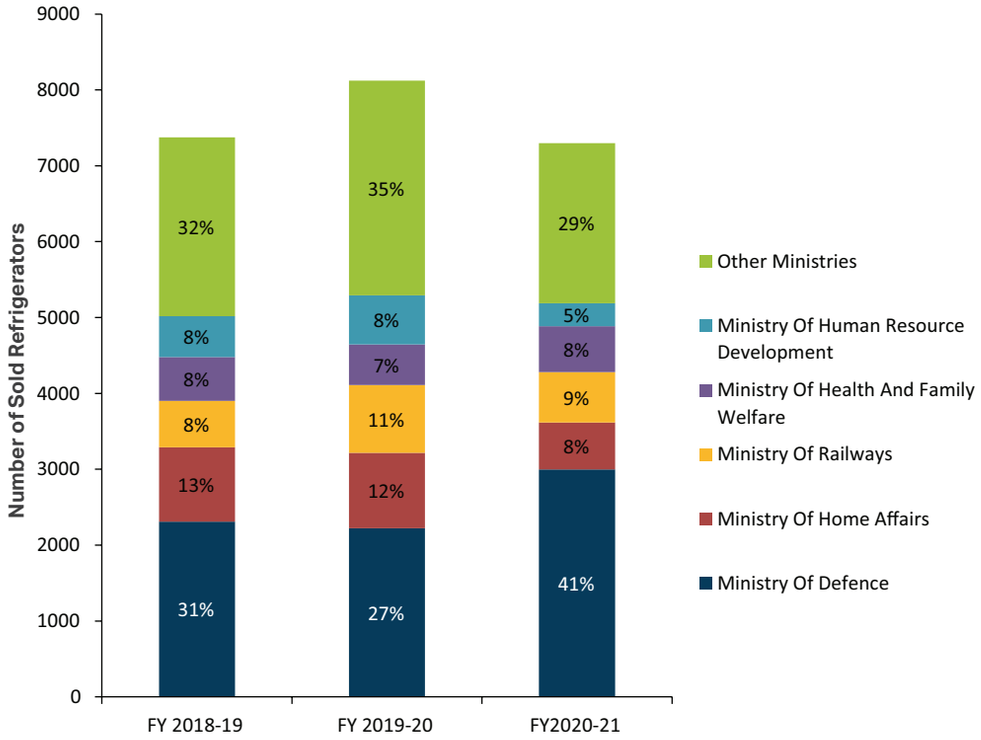


Figure 6.5 Central-Level Procurement trend of Refrigerators

In state-level procurement, Chhattisgarh and Uttar Pradesh is the largest procurer of the refrigerators through GeM. Animal Husbandry Department, Chhattisgarh, and Medical Health and Family Welfare Department, UP are the two main state-level departments that are involved in refrigerator procurement.

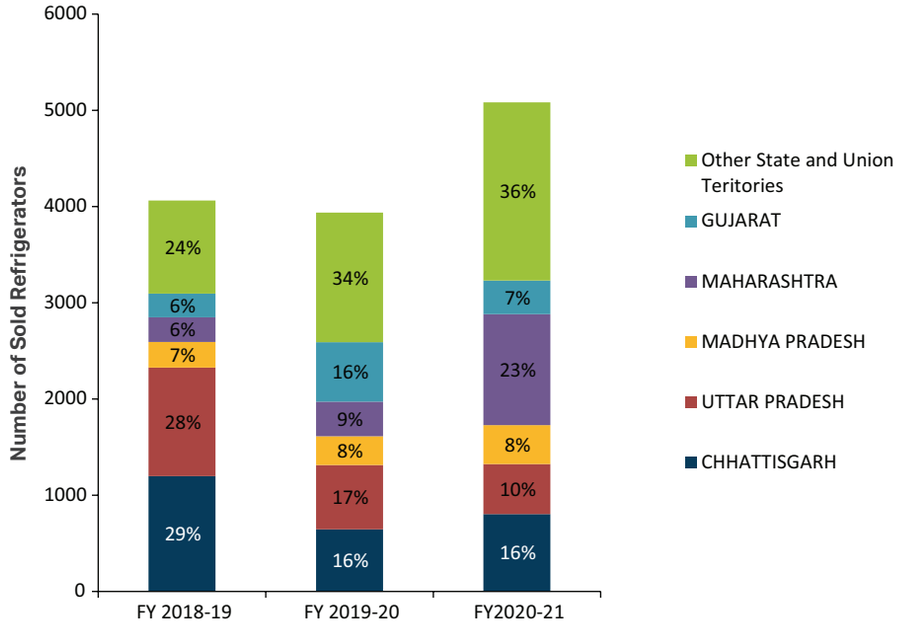


Figure 6.6 State-Wise Procurement trend of Refrigerators

Deep Freezers

A deep freezer focuses on the rapid freezing of the products to make sure the product does not lose quality over time. A deep freezer can reach a temp of -50° to -60° Celsius within an hour to a few minutes. The application of the deep freezers is varied on their size and design. Mostly the deep freezer is used for the preservation and storage of large food items, medical equipment, blood samples, medicines, and vaccines, etc. The total procurement of the deep freezers through GeM at the central and state level is shown in Figure 6.7 and it shows the major share of the procurement is done by the central ministries. To store the medical supplies and vaccines under the current immunization program for Covid in India the procurement scale of the deep freezer rapidly increased in the year 2020 that can be seen in Figure 6.7.

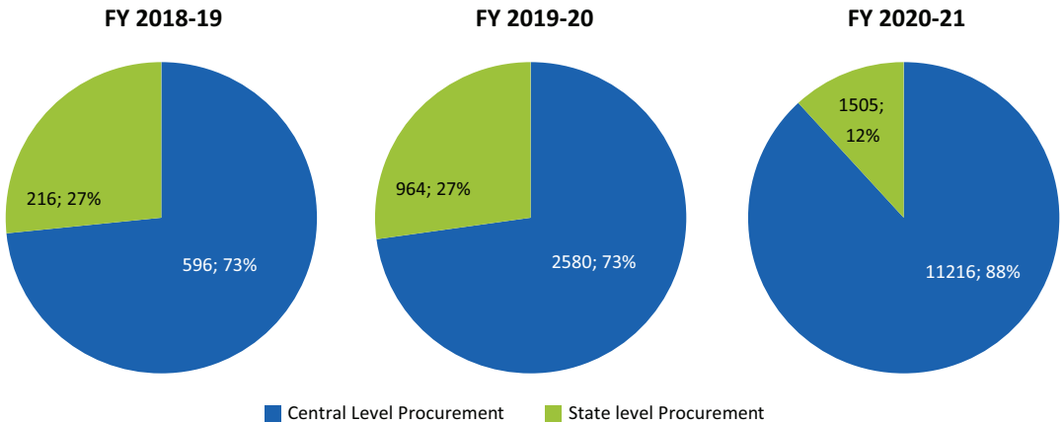


Figure 6.7 Procurement of Deep Freezers based on Central and State level

Generally, a deep freezer opens horizontally and its capacity varies from 100-liters up to 510-liters and better suited for storing large items and medical supplies. In the year 2020, the Ministry of Health and Family Welfare procured the largest number of deep freezers to provide the storage and preservation of the Covid vaccines and medical supplies in India.

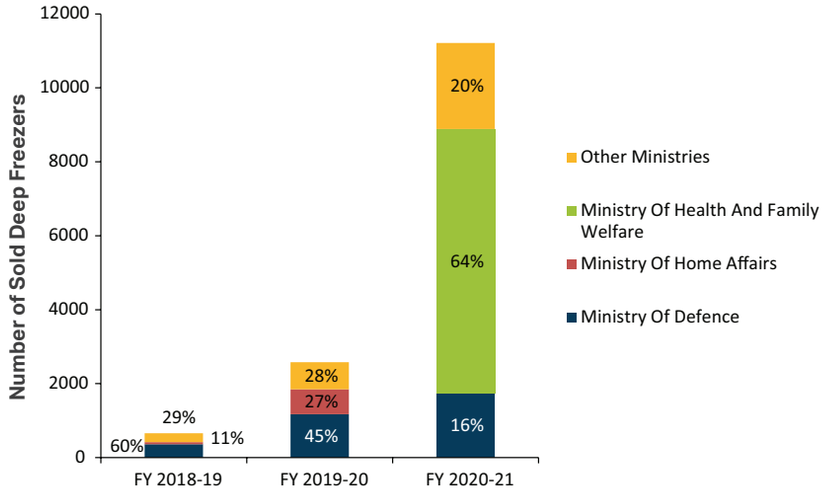


Figure 6.8 Central- Level Procurement trend of Deep Freezers

Maharastra and Uttar Pradesh are the two largest buyers in the state-level procurement of deep freezers through the GeM portal.

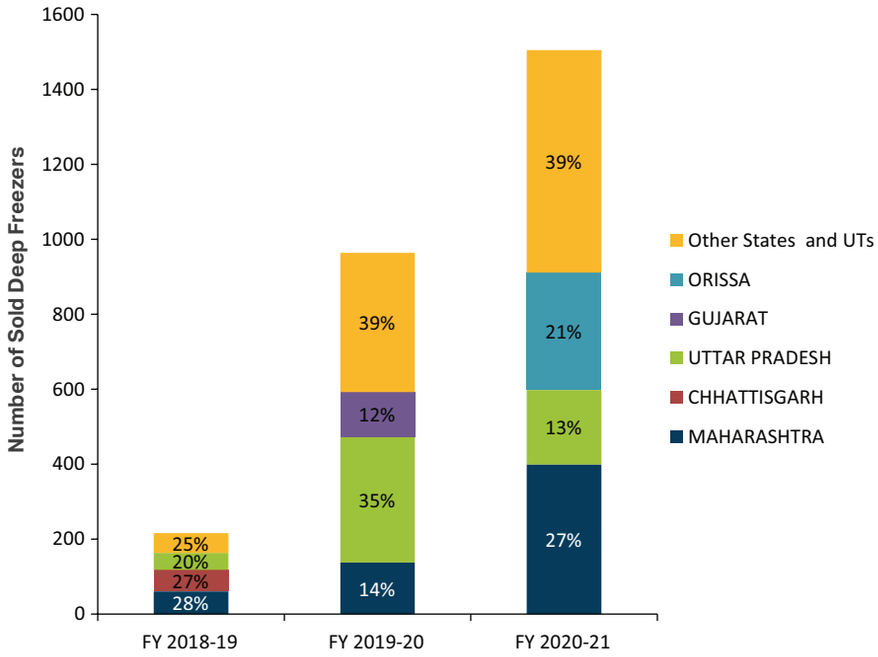


Figure 6.9 State-Wise Procurement trend of Deep freezers

Drinking-Water Coolers

The drinking water cooler is a very common product that is found in every office building, hospital, and school to get chilled water to drink. While some water coolers provide chilled water some models provide both hot and cold water. Aside from different models two main types of water cooler available in the market bottled water coolers and bottle-less water coolers. Both of these water coolers provide chilled water but the water source is different. Currently the majorly used refrigerants are R-134a and R-22 which has zero ODP

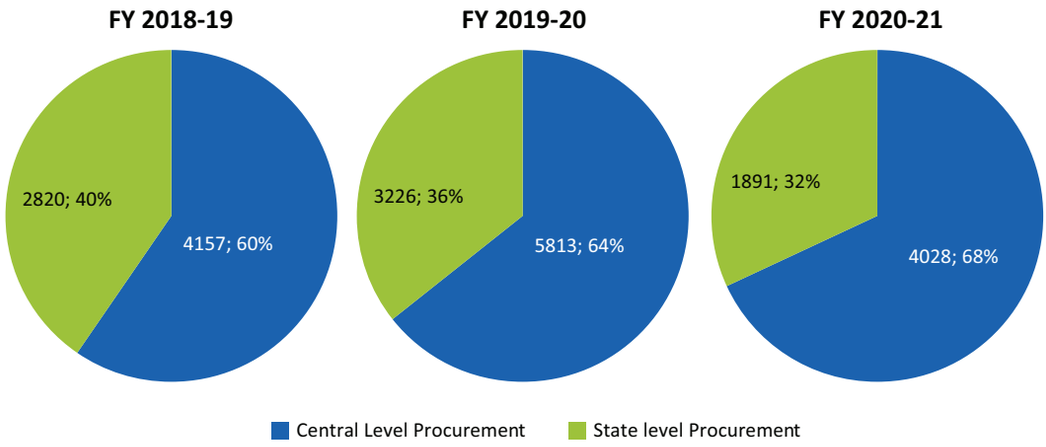


Figure 6.10 Procurement of Drinking water cooler at Central and State level

but high value of GWP. This product is available in the GeM portal based on its capacity to store water. The total number of procurement of the product is decreased at the central and state level in the year 2020 due to the situation of Covid lockdown.

Figure 6.11 shows various ministries involved under the central level procurement of drinking water cooler in three years through GeM. Ministry of Railway and Ministry of Defence is the largest procurer of the water coolers in three years.

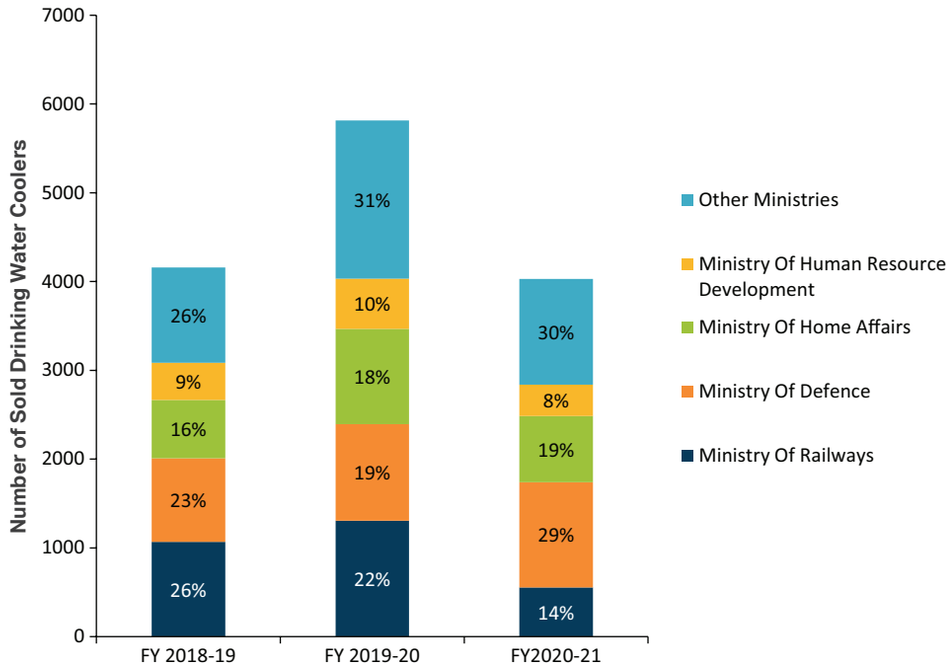
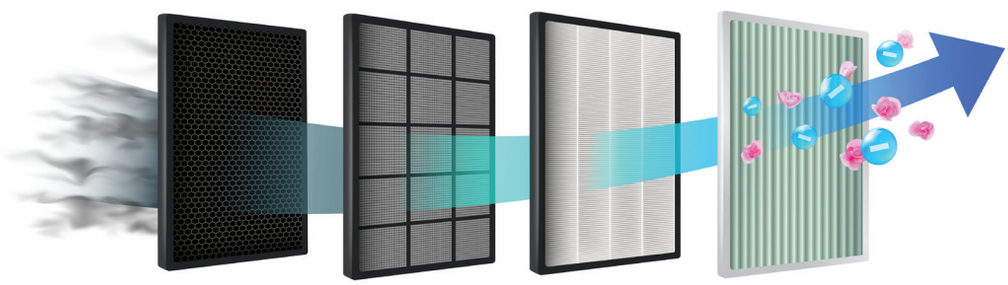


Figure 6.11 Central- Level Procurement trend of drinking water coolers

Figure 6.12 shows the various states involved in the procurement of the drinking water coolers through GeM in three years. Uttar Pradesh and Madhya Pradesh are the largest procurers of water coolers in three years.



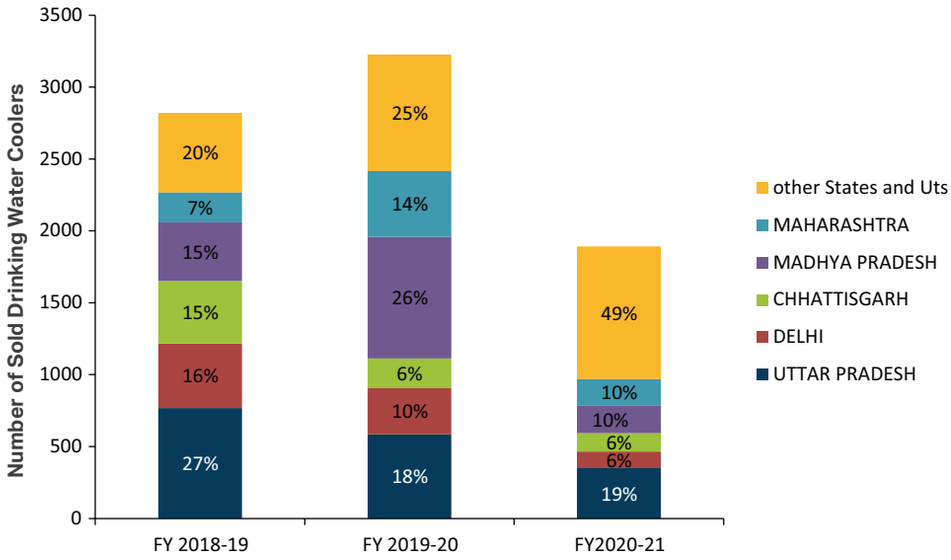


Figure 6.12 State-Wise Procurement trend of drinking water coolers

6.3 Current Technical Specifications in Procurement Process

Technical specification/parameters of products are the critical aspects of the public procurement process. GeM provides the standardized templates of technical parameters for both products and services to maximize objectivity. GeM also ensures that these parameters are demand-driven (as per buyer's requirements), market aligned (guided by market knowledge and market trends), consultative (after the consultation with buyers, sellers, and the respective domain experts) and dynamic (update and revise as per the changing needs of buyers and market) (*GeM Handbook, 2018*).

Information about the technical parameter is gathered from the GeM (*GeM Portal, 2020.*) And the bid documents used for the procurement of the products. Table 6.4 shows current technical specifications in procurement:

Table 6.4 Current technical specification in Procurement Practices

Products	Subtype	Star ratings	Standards	Generally used Refrigerant (as per GeM portal)
Room Air conditioner	Window	Mandatory BEE Star rating	IS 1391 (Part 1, Part 2) & ISO 16358	R-22/R-32/R-410A/R-290
	Variable speed split AC	Mandatory BEE Star rating		
	Fixed speed split AC			
Refrigerator	Direct cool	Mandatory BEE Star rating	IS 1476:2000	Only Eco-friendly refrigerant (refrigerants with GWP < 700) such as R600a and R-32*
	Frost free		IS 15750:2006	

Products	Subtype	Star ratings	Standards	Generally used Refrigerant (as per GeM portal)
Deep Freezer**	-	Voluntary BEE star rating (2020)	IS 7872	R717/R407C/ R404A/R134a/ KCN430/R600a
Drinking water cooler	-	No labelling system	IS 1475	R-134a
*R32 may be replaced by R134a on GeM portal				
**For deep freezers, the recommended refrigerants should be R404A, R134a, R290, and R600a on GeM portal.				

Room Air Conditioners

In the GeM portal, all Air conditioners available conform to all the requirements of the quality, safety, and performance prescribed in IS 1391 (part1, part2) & ISO 16358 standards. Inverter RACs are more energy-efficient, economical, and smooth in operation as compare to the fixed RACs, both RAC options are available in the portal for procurement. Star rating of the RACs based on the ISEER value GeM recommends the purchase of the star-labelled air conditioner, however, infographic containing details about the ODP and GWP is not available. About the refrigerant used, GeM allows the manufacturer to specify if the air conditioner has an eco-friendly refrigerant but it is not a mandatory criterion and it is up to the procurement agency. There is no option for the procurement agency to 'buy back' and 'take back' with safe disposal of the products.

Refrigerators

These Refrigerators available in the GeM portal comes under the household refrigerator category. GeM conforms to all the requirements of safety, quality, and performance prescribed standard available in the present. BEE star rating of the refrigerator decided by the CEC (Comparative Energy Consumption) criteria for the frost-free and direct cool refrigerator. GeM portal mandated the star rating for the product but doesn't specify the preference as per star rating. GeM portal only provides option for choosing refrigerant as eco-friendly or not but it doesn't specify any particular refrigerant or criteria for value of GWP allowed.

Deep Freezers

In the GeM portal, various types of deep freezers available like laboratory deep freezer, ultra-low temp laboratory deep freezer, walk-in cooler, and walk-in freezer as per standard available GeM allows for the procurement of the deep freezer. The star labelling program for the deep freezer is voluntary and available only for the chest-type deep freezer.

Drinking-Water Coolers

In the GeM portal, as per their cooling capacity and as per Indian standard IS 1475 available. GeM also allows the use of the ISI mark in this product. As per refrigerant used for cooling of water, mention of non-ODS refrigerant but there is no special mention of the refrigerant GWP limit type of refrigerant other than CFC refrigerant.

6.4 Opportunities and Benefits

Room Air Conditioner

As per the data on split RACs, the share of 5 stars and 3-star ac procurement is 54 % and 42 % respectively and this shows the procurement of these star-rated RACs is more than other star rated RACs. To show the benefits associated with higher star-rated product here, the below Table 6.5 and Table 6.6 shows the analysis of the star wise comparison with 3 stars rated product in terms of monetary saving, and payback year of the product (assumed life of unit 10 years). This analysis will be helpful to address the awareness about energy consumption and avoided emission with the use of the best option available in the market/portal. The below analysis is done for the split RACs with 1.5 TR capacity and the average acquisition cost of the product is taken from the GeM (*GeM Portal, 2020*).

Table 6.5 Star wise comparison analysis of 1.5 TR split RACs

Stars Rating	ISEER	Average Acquisition Cost (INR)	Annual Electricity Consumption (kWh/year)[2]	Annual Cost of Electricity (INR)
3 star	3.5	38800	1130.00	5650.00
4 star	4	40500	970.00	4850.00
5 star	4.5	42499	870.00	4350.00
Super-Efficient AC	5.4	41300	757.00	3785.00

Table 6.6 Star wise comparison analysis of 1.5 TR split RACs

Stars Rating	Total Cost of Ownership (INR)	Lifetime savings in comparison with 3-star (INR)	Payback (Years) of incremental cost on 3-star	Savings on Indirect Emission in comparison with 3-star (tCO_2)
3 star	95,300.00	-	0.0	0.00
4 star	89,000.00	6,300.00	2.1	1.31
5 star	85,999.00	9,301.00	2.8	2.13
Super-Efficient AC	79,150.00	16,150.00	1.3	3.06

Note: These calculations are done with the assumption of Split AC 1.5 ton variable speed, rate of electricity at INR 5/kWh, Life of AC unit 10 years, and weighted average emission factor = 0.82 tCO2/MWh for India[3]. Annual electricity consumption is taken from the BEE website.

If we consider 5-star RACs and super-efficient RACs it will provide more benefits compared to 3 star products in terms of lifetime saving, less payback period, and also helpful in curbing the emission.

As per the current scenario, 3-star AC has a decent share in public procurement. But if we replace the 3-star RACs with 5 stars RACs it will provide 23 % more saving on annual electricity bills and if we replace them with super-efficient RACs it will provide 33% more saving on annual electricity bills.

[2] http://beestarlabel.com/SearchCompare

Table 6.7 shows a comparison of the Actual procurement scenario of all the split RACs with different star ratings through GeM in the year 2019-20 with a two assumed scenario which includes the share of all RACs is 5 star-rated and super-efficient. These scenarios are helpful to address the savings that can be done by any department with the adoption of energy-efficient products.

Table 6.7 Scenario Based annual saving on split RACs procured through GeM in 2019-20

Stars Rating	GeM data (FY 2019-20) Number of Units	Annual Electricity consumption (MWh)	Annual Cost of electricity (Lakhs INR)	Annual Indirect emissions (tCO_2)
1 star	233	297.08	14.85	243.60
2 star	576	691.20	34.56	566.78
3 star	16518	18665.34	933.27	15305.58
4 star	885	858.45	42.92	703.93
5 star	21140	18391.80	919.59	15081.28
Total	39352	38903.87	1945.19	31901.17
Scenario-I (All 5 star)	39352	34236.24	1711.81	28073.72
Savings in scenario-I		4667.63	233.38	3827.45
Scenario-II(All 5.4 ISEER rating)	39352	29789.46	1489.47	24427.36
Savings in scenario-II		9114.40	455.72	7473.81

As per the analysis shows, if we have considered 5-star RACs for procurement in the year 2019-20, then we could have saved up to 12% on electricity consumption and electricity bills annually and, if we have opted for super-efficient RACs, these savings would have translated in up to 23.4% reduction in electricity consumption and bills.

Refrigerators

The type of cooling used in the refrigerator to maintain the temperature level minimum inside the refrigerator is direct cool (DC) and frost-free (FF) which is explained in the above section. The below analysis in Table 6.8 and Table 6.9 is presented for the 250-liter capacity Frost Free refrigerators in terms of life-saving (assumed life of unit 15 years), payback period, and saving in indirect emissions. The average acquisition cost of the product is taken from the GeM (*GeM Portal, 2020*).

[3] https://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver14.pdf

Table 6.8 Star wise comparison of FFR of capacity 250 liters

Stars Rating	Average Acquisition Cost (INR)	Annual Electricity Consumption (kWh/year)	Annual Cost of Electricity (INR)	Total Cost of Ownership (INR)
1 star	19690	356.25	1781.25	46,408.75
2 star	23000	290.00	1450.00	44,750.00
3 star	25000	231.25	1156.25	42,343.75
4 star	27500	186.25	931.25	41,468.75
5 star	30500	150.00	750.00	41,750.00

Table 6.9 Star wise comparison of FFR of capacity 250 liters

Stars Rating	Lifetime savings in comparison with 1-star (INR)	Payback (Years) of incremental cost on 1-star	Savings on Indirect Emission in comparison with 1-star (tCO_2)
1 star	-	0	0
2 star	1,658.75	10.0	0.81
3 star	4,065.00	8.5	1.54
4 star	4,940.00	9.2	2.09
5 star	4,658.75	10.5	2.54

Note: All calculation under the analysis is done considering the Frost-free refrigerator capacity is 250 literate of electricity 5INR/KWh, the life of the unit is 15 years and weighted average emission factor =0.82tCO2/MWh in India.

In the above analysis, the payback period is less for a 3-star product and more for the 5-star product because of more acquisition cost of the product but the money-saving and saving on emissions are more for the 5-star product as compare to 1-star products

As per the current scenario, the number of 3-star FF refrigerators more in number compared to 5 stars. But the 5-star refrigerators are a better option because it provides 34 % more saving on annual electricity bills as compared to 3 stars.

Table 6.10 Scenario-based annual saving on FF refrigerator through GeM in 2019-20

Stars Rating	GeM data of FY 2019-20 Number of Units (Frost Free Refrigerator)	Annual Electricity consumption (MWh)	Annual Cost of electricity (Lakhs INR)	Annual Indirect emissions (tCO_2)
1 star	0	0.00	0.00	0.00
2 star	576	167.04	8.35	136.97
3 star	2679	619.52	30.98	508.01
4 star	1043	194.26	9.71	159.29
5 star	209	31.35	1.57	25.71
Total	4507	1012.17	50.61	829.98
Scenario-I All 5 star	4507	676.05	33.80	554.36
Savings in Scenario-I		336.12	16.81	275.62

The analysis in Table 6.10 shows that if we have considered all 5- star Frost-free refrigerators in the year 2019-20 in the procurement process we could have saved up to 33% on annual electricity consumption and in annual electricity bills.

The analysis in Table 6.11 and Table 6.12 is presented for the 180-liter capacity Direct Cool refrigerators in terms of life-saving (assumed life of unit 15 years), payback period, and saving in indirect emissions. The acquisition cost of the product is taken from the GeM (*GeM Portal, 2020*).

Table 6.11 Star wise comparison of DC refrigerator of capacity 180 liters

Stars Rating	Average Acquisition Cost (INR)	Annual Electricity Consumption (kWh/year)	Annual Cost of Electricity (INR)	Total Cost of Ownership (INR)
1 star	11500	304.00	1520.00	34,300.00
2 star	13400	245.00	1225.00	31,775.00
3 star	15000	193.30	966.50	29,497.50
4 star	16000	157.00	785.00	27,775.00
5 star	17000	133.40	667.00	27,005.00

Table 6.12 Star wise comparison of DC refrigerator of capacity 180 liters

Stars Rating	Lifetime savings in comparison with 1-star (INR)	Payback (Years) of incremental cost on 1-star	Savings on Indirect Emission in comparison with 1-star (tCO2)
1 star	-	0	0
2 star	2,525.00	6.4	0.73
3 star	4,802.50	6.3	1.36
4 star	6,525.00	6.1	1.81
5 star	7,295.00	6.4	2.10

Note: All calculation under the analysis is done considering the direct cool refrigerator capacity is 180 liters. Rate of electricity 5INR/KWh, the life of the unit is 15 years, and weighted average emission factor =0.82tCO2/MWh in India.

The payback period of 3 stars and the 5-star product has less difference between them because of the acquisition cost of the products. The number of 3 stars DCR is more in the procurement process but if we replace the 3 stars with 5 stars it will provide 31% more saving on annual electricity bills.

Table 6.13 Scenario-based annual saving on DC refrigerator through GeM in 2019-20

Stars Rating	GeM data FY 2019-20 Number of UnitsDirect Cool Refrigerator)	Annual Electricity consumption (MWh)	Annual Cost of electricity (Lakhs INR)	Annual Indirect emissions (tCO_2)
1 star	0	0.00	0.00	0.00
2 star	2008	491.96	24.60	403.41
3 star	3383	653.93	32.70	536.23
4 star	1191	186.99	9.35	153.33

Stars Rating	GeM data FY 2019-20 Number of UnitsDirect Cool Refrigerator)	Annual Electricity consumption (MWh)	Annual Cost of electricity (Lakhs INR)	Annual Indirect emissions (tCO_2)
5 star	948	126.46	6.32	103.70
Total	7530	1459.34	72.97	1196.66
Scenario-I All 5 star	7530	1004.50	50.23	823.69
Savings in Scenario-I		454.84	22.74	372.97

The analysis in Table 6.13 shows that if we have considered all 5- star Direct cool refrigerators in the year 2019-20 in the procurement process we could have saved up to 31% on annual electricity consumption and in annual electricity bills.

A similar analysis as above can also be done for deep freezers and water coolers including all of the opportunities and benefits of selecting a 5-star product over other products available on the GeM platform. However, we have not included the analysis for the deep freezers and water coolers since the required data is unavailable from the GeM portal and both of these products don't fall under the mandatory scope of BEE schedules, which have limited us to carry out a similar analysis.

7

GAPS AND OPPORTUNITIES

This section explores the gaps and opportunities identified in the public procurement process which are impeding the promotion of low GWP and energy-efficient products in the procurement process in India. The gaps have been identified through secondary research; stakeholder consultations with sectoral experts including leading AC manufacturers, policymakers, academia, and individual experts; and the data provided by the GeM. Data crunching and analysis have helped us to draw insights from sales patterns and the type of product selection by the consumers on the GeM platform. The identified gaps are categorized under three types of barriers namely – policy, process-oriented, and technological. These insights from the identified gaps have helped us to reveal possible opportunities. The opportunities are discussed below in detail.

7.1 Gaps Identification

The gaps were classified under three categories are discussed below:

(i) Policy barriers

- Unavailability of the safety standard for the flammable refrigerants and energy performance standard for refrigerant-based products like water cooler etc.
- Unavailability of enough star rated models for voluntary labeling program such as Deep freezer

(ii) Process-oriented barrier

- The technical specification differs with specific tenders
- Lack of standardized technical criteria and its mandatory provisions.
- Absence of Buyback option to manufacturers
- Information availability regarding product-wise environmental and electricity saving benefits
- L1 Bidding process without low-GWP & energy efficiency criteria, restrict procurement of super-efficient products due to high upfront cost.
- Lack of mandatory provisions on low-GWP refrigerants and energy efficiency in the conventional evaluation process.

(iii) Technological barriers

- Since Government of India under Make in India campaign has enabled a provision of minimum 50% local components in the products, it becomes difficult to produce efficient products as many of efficient product's components are import dependent.
- Flammability and toxicity issues associated with low-GWP refrigerants based products

7.2 Opportunities

The opportunities through public procurement have many dimensions including emissions of ODS refrigerants, savings in terms of energy consumption, electricity cost, and GHG emissions. The previous sections have underlined the importance of selecting an energy-efficient product with non-ODS and low GWP refrigerants over other products available on the GeM platform by highlighting the environmental and financial benefits. The analysis has shown that the energy-efficient products can break even and provide payback on the initial investments with a still life to products left to reap further gains of low energy consumption and environmental impacts. There are opportunities in improving the user experience of the government departments on the GeM platform and motivating them to transition to opt for sustainable products.

The Green Public Procurement (GPP) or green purchasing is the method that can lead public authorities to use their purchasing power to choose environmentally friendly goods, services, and works. These can contribute to sustainable consumption and production. It can help stimulate a critical mass of demand for more sustainable goods and services

which otherwise would be difficult to get onto the market. GPP is therefore a strong stimulus for eco-innovation (*European Comission, 2021*). It can provide the industry with incentives to develop environmentally-friendly works, products, and services. GPP also provides financial savings for public authorities, especially if we consider the full life-cycle costs of a contract and not just the initial purchase price. Authorities who implement the GPP would be better equipped to meet evolving environmental challenges, for example to reducing greenhouse gas emissions, energy consumption, etc. The private sector can also take the cue to implement these kinds of purchasing models to further the positive impact of this type of policy.

Let's take the case of mandating the procurement of 5-star RACs through the GeM platform. We have analysed the benefits of selecting 5-star AC procurement and also selecting the EESL super energy-efficient AC over other lower star products. These two scenarios are shown in the below Figure 7.1 and Figure 7.2 which is referred from the analysis in Table 6.10.

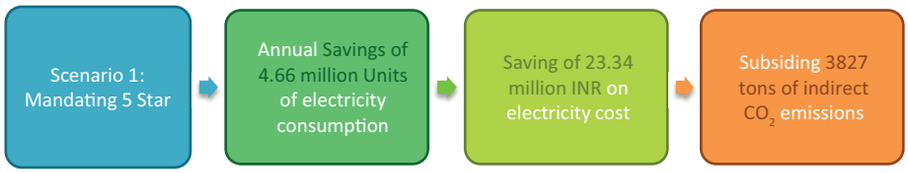


Figure 7.1 Saving Scenario of 5 stars split RACs in the year 2019-20

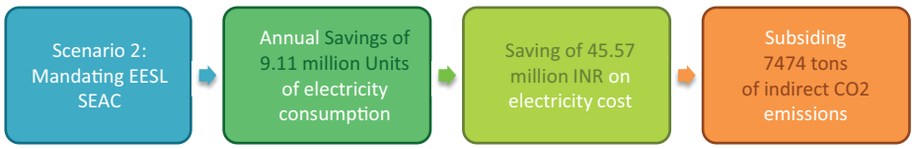


Figure 7.2 saving scenario of super-efficient RACs (ISEER-5.4) in the year 2019-20

These two scenarios seem very encouraging for thrusting the efforts to promote energy efficiency as a resource for the cooling sector. We have observed here that both these scenarios can provide a multitude of benefits in terms of saving energy, reducing operating costs, and offsetting the CO_2 emissions from the operation of cooling equipment.

Above, the energy-efficiency benefits in terms of indirect emissions have been discussed. Direct emissions associated with refrigerant's consumptions and leakage are not analysed here since the consumption of refrigerants in the GeM data is not available. For a comparative analysis, the distribution of different refrigerants used in the procured RACs and other products from the GeM portal, is needed. If all the procured products have non-ODS and low-GWP refrigerants,, it would highlight the benefits from direct emission savings. Furthermore, the saving benefits would be even more if the super-efficient products are with non-ODS and low-GWP refrigerants.

One of the biggest hurdles in the uptake of 5-star energy-efficient RACs has the very high initial cost of the product and to address this challenge, EESL has come up with the Bulk procurement program. The bulk procurement program has been instrumental in bringing

this price hump down and further savings from the lower operating costs for the super energy-efficient AC have drastically reduced the payback period for the product. These interventions have provided feasibility to use the super energy-efficient AC for a long period.

There are opportunities present at the regulatory front as well. The BEE has been upgrading the energy labeling ratings at regular intervals to keep up with the advancement in technology. The air conditioners and refrigerators fall under mandatory compliance with the notifications from the BEE about the ISEER values for different categories of the product. But the cooling products except for the air-conditioners and refrigerators do not come under the purview of BEE notifications. BEE has already prepared schedules for products like chillers and deep freezers and they still under voluntary phase. There is an opportunity for the GeM platform to regulate these products in terms of efficiency and low-GWP refrigerants, towards the mandatory requirement for listing.

8

KEY RECOMMENDATIONS

To convert the opportunities into actions for achieving sustainable targets, works are needed to be done. To support these actions towards sustainable practices, recommendations are required to be set with definite and achievable targets. This section provides a set of recommendations to promote the low GWP energy-efficient cooling products in the public procurement process.

Based on the analysis in the previous sections, the recommendations are given to make the public procurement process more environment-friendly through the GeM portal in terms of energy-efficiency, refrigerants, and benefits such as payback period of super-efficient products, GHG emission reduction, cost, and electricity savings for more information, refer section 6.4. The GeM in their annual report can recognize the department/ministry that has done the most environment-friendly procurement and award them. This can encourage all the buyers in their procurement towards the environment-friendly products.

These recommendations include:

Type	Recommendations
Procurement Policy	The existing office memorandum (DoE OM No.26/6/2012-PPD dated 21.01.2013) has set the minimum threshold BEE star ratings for the Central Ministries/ Departments for the procurement of split-ACs and Frost Free-refrigerators. This OM can be further expanded to all refrigeration and air-conditioning products with non-ODS and low-GWP refrigerants.
	Green category should be expanded to all refrigerant based products, like it has been implemented for ACs. Guidelines for procurement of Green product category in terms of technical specifications should be made available on the GeM portal for better understanding of the buyer.
	Evaluation of bids should be based on the life-cycle cost analysis with weightage allocated to parameters such as non-ODS and GWP values of the refrigerant, energy efficiency, initial price, and operational and maintenance costs.
	There is a need to mandate the procurement of refrigeration and air-conditioning products with non-ODS and low-GWP refrigerants in government offices.
	Country made products should bear the mark of "Make in India" in the procurement process through GeM.
Information disclosure	GeM portal to display the following information in order to attract buyers to procure energy-efficient, non-ODS and low-GWP refrigeration and air-conditioning products: i. Infographics containing details about CO_2 emissions, electricity consumption, and monetary savings made by various ministries/departments while procuring such equipment. ii. Popup information box about the product on portal which includes the benefits in terms of payback period, electricity and GHG emissions saving of most-efficient product with environment-friendly refrigerant with respect to the selected product.
	Green category products should be shown separately on the portal instead of being mixed with all the existing products.
	Most energy-efficient refrigerant based product (with zero ODP and low-GWP) in each category should be displayed at the top of the searched webpages in the portal to the buyer.
	Sorting options such as Star rating, refrigerant used, energy-efficiency, model year, capacity, technology, installation, material, country of origin, price, etc. should be provided on the portal.

Type	Recommendations
Servicing sector	Empanelment of certified or ITI-trained servicing personnel should be listed on the GeM portal to ensure competitive cost and reliable servicing for zero ODS/lower GWP products.
	Information of the servicing personnel with location of their service should be added on to the portal.
End of life disposal of refrigeration and air-conditioning products	Disposal of equipment should be as per the E-waste (Management) Rules, 2016.
	Display of list of authorised E-waste recyclers

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