

General Information w.r.t OZONE LAYER Protection:

1. "Understanding Ozone Layer Dynamics: Formation, Protection, and Depletion":

Formation: This refers to the natural process by which ozone (O₃) is formed in the Earth's stratosphere. Oxygen molecules (O₂), the most prevalent form of oxygen in the atmosphere, are broken down by ultraviolet (UV) radiation from the sun. These UV rays split oxygen molecules into individual oxygen atoms. Some of these oxygen atoms then combine with intact oxygen molecules to form ozone molecules. This ongoing process maintains an equilibrium between ozone and oxygen in the stratosphere.

Protection: The ozone layer plays a crucial role in protecting life on Earth by absorbing the majority of harmful ultraviolet (UV) radiation emitted by the sun. UV rays, while essential for life in moderation, can cause skin cancer, cataracts, and harm to ecosystems. The ozone molecules in the stratosphere act as a shield, absorbing and filtering out much of the UV radiation before it reaches the Earth's surface. This protective function helps safeguard human health and the environment.

Depletion: Despite its protective role, the ozone layer faces threats from human activities, particularly the release of ozone-depleting substances (ODSs) such as chlorofluorocarbons (CFCs), halons, and hydrochlorofluorocarbons (HCFCs). These substances contain chlorine and bromine atoms that, when released into the atmosphere, can catalyze chemical reactions that destroy ozone molecules. One notable example is the chain reaction triggered by HCFC-22, where UV radiation causes HCFCs to release chlorine radicals, leading to the depletion of ozone molecules. This depletion of the ozone layer poses significant risks to human health, as increased UV radiation can lead to higher rates of skin cancer, cataracts, and other health issues.

2. "Ozone Depleting Substances (ODSs)":

Ozone Depleting Substances (ODSs) have a variety of applications. HCFCs are used as refrigerants in refrigerators, air-conditioners and other cooling appliances. ODSs are also commonly used as foam blowing agents in the process of manufacturing foam, and as solvents in industrial cleaning operations. Another important ODS application is in fire extinguishing systems. Lastly, the ODS methyl bromide is used as a fumigant for soil and grain storage, as well as quarantine and pre-shipment applications.

Refrigerants: domestic, commercial, and transport refrigeration, air-conditioning & heat pump systems; (R-22, R-123....)

Foam Blowing agents: Foam blowing agent for the manufacture of polyurethane, polystyrene and polyolefin foam plastics. (R-141b, R-142b)

Cleaning solvents: for electronic assembly production processes, precision cleaning & general metal degreasing. Also, for dry cleaning & spot cleaning in textile industry (R141b, methyl chloroform)

Fire extinguishers: Halons & HBFCs (fixed and portable systems (Halon & HBFCs)

Fumigants: Methyl bromide, pesticide for soil fumigation, pre-shipment & quarantine applications.

3. "Protecting the Ozone: Milestones and Strategies in International Environmental Agreements"

1. **Vienna Convention for the Protection of the Ozone Layer:** The Vienna Convention, adopted in 1985, is an international treaty aimed at protecting the ozone layer by phasing out substances that deplete it. It laid the foundation for subsequent agreements, including the Montreal Protocol.
2. **Montreal Protocol on Substances that Deplete the Ozone Layer:** This treaty, established in 1987, is designed to phase out the production and consumption of ozone-depleting substances (ODSs) such as chlorofluorocarbons (CFCs) and halons. It has been hailed as one of the most successful environmental treaties, as it has effectively reduced the production and use of ODSs worldwide.
3. **Kigali Amendment to the Montreal Protocol:** Adopted in 2016 in Kigali, Rwanda, the Kigali Amendment aims to further strengthen the Montreal Protocol by phasing down the production and consumption of hydrofluorocarbons (HFCs). HFCs were introduced as alternatives to ozone-depleting substances but are potent greenhouse gases, contributing to global warming.
4. **HCFC Phase-out Management:** Hydrochlorofluorocarbons (HCFCs) are transitional substances used as alternatives to fully halogenated CFCs and are less harmful to the ozone layer. However, they still have ozone-depleting potential. The HCFC Phase-out Management Plan (HPMP) is part of the Montreal Protocol and outlines the gradual phase-out of HCFCs, with developed countries generally leading in this effort.
5. **HFC Phase-down Management:** Hydrofluorocarbons (HFCs) are potent greenhouse gases used primarily as refrigerants in air conditioning and refrigeration systems. The phase-down management refers to the gradual reduction of HFC production and consumption, particularly under the Kigali Amendment to the Montreal Protocol. This aims to mitigate climate change by transitioning to more environmentally friendly alternatives.
6. **India's Role:** India is a signatory to the Montreal Protocol and the Kigali Amendment. As a developing country, India has certain obligations under these agreements, including phasing out ODSs like CFCs and HCFCs. India's role involves implementing policies and strategies to meet its commitments while considering its developmental needs and challenges. This may include technology transfer, capacity building, and financial assistance from developed countries and international organizations to facilitate the transition to ozone-friendly and climate-friendly alternatives.

4. "Role of Ozone Cell, MoEF&CC":

The Ozone Cell, operating under the Ministry of Environment, Forest and Climate Change (MOEF&CC) in India, plays a pivotal role in the country's efforts to adhere to international agreements like the Montreal Protocol and the Kigali Amendment. Here's how the Ozone Cell, MOEF&CC contribute to these endeavours:

1. **Policy Formulation and Implementation:** The Ozone Cell under MOEF&CC, is responsible for formulating policies and regulations related to the phase-out of ozone-depleting substances (ODSs) and the phase-down of high global warming potential (GWP) gases like hydrofluorocarbons (HFCs). These policies align with the objectives of the Montreal Protocol and the Kigali Amendment. MOEF&CC oversees the implementation of these policies across various sectors to ensure compliance and effectiveness.

2. **Monitoring and Enforcement:** The Ozone Cell, supported by MOEF&CC, monitors the production, import, export, and consumption of ODSs and HFCs in India. They collect data, conduct inspections, and enforce regulations to prevent illegal trade and ensure adherence to phase-out and phase-down targets set under international agreements. This monitoring and enforcement mechanism helps track progress and address challenges in achieving ozone and climate protection goals.
3. **Capacity Building and Technical Assistance:** The Ozone Cell, with the backing of MOEF&CC, provides technical assistance and capacity-building support to stakeholders involved in the management and transition away from ODSs and high-GWP gases. This includes training programs, workshops, and awareness campaigns aimed at policymakers, industry professionals, and the general public. By enhancing technical expertise and awareness, they facilitate the adoption of ozone-friendly and climate-friendly alternatives.
4. **International Cooperation and Reporting:** The Ozone Cell coordinates India's participation in international forums and meetings related to ozone and climate protection, including meetings of the Parties to the Montreal Protocol and the Kigali Amendment. They engage in bilateral and multilateral cooperation with other countries and organizations to exchange best practices, share experiences, and access financial and technical assistance for implementing ozone and climate projects. Additionally, they submit periodic reports to the relevant international bodies on India's progress towards meeting its obligations under these agreements.
5. **Research and Development:** The Ozone Cell, in collaboration with MOEF&CC, supports research and development initiatives aimed at identifying alternative technologies and substances that are environmentally friendly and economically viable. This includes funding research projects, conducting pilot studies, and facilitating technology demonstrations to promote the adoption of innovative solutions for ozone and climate protection.

Overall, the Ozone Cell, operating under the auspices of MOEF&CC, plays a crucial role in coordinating and implementing India's efforts to fulfill its commitments under international agreements like the Montreal Protocol and the Kigali Amendment, thereby contributing to global efforts to protect the ozone layer and mitigate climate change.

5. Role of Energy Efficiency Services Limited (EESL):

The Energy Efficiency Services Limited (EESL) is a public sector energy service company in India that plays a significant role in various endeavours related to energy efficiency, including those aligned with international agreements such as the Montreal Protocol and the Kigali Amendment. Here's how EESL contributes:

1. **Promotion of Energy-Efficient Technologies:** EESL promotes energy-efficient technologies and practices across various sectors, including buildings, industry, and transportation. This includes the deployment of energy-efficient appliances, such as Super Energy Efficient Air Conditioners, which help reduce the demand for ozone-depleting substances and high global warming potential (GWP) gases like HCFCs.
2. **Market Transformation Initiatives:** EESL undertakes initiatives to transform markets for energy-efficient products and technologies. This involves bulk procurement, aggregation of demand, and distribution of energy-efficient appliances at affordable prices, thereby encouraging their widespread adoption. By facilitating the transition to ozone-friendly and climate-friendly alternatives, EESL supports the objectives of the Montreal Protocol and the Kigali Amendment.

3. **Implementation of Energy Efficiency Projects:** EESL implements energy efficiency projects across various sectors, including the replacement of inefficient equipment with energy-efficient alternatives. This may include projects aimed at phasing out ozone-depleting substances and high-GWP gases by replacing them with alternatives that have lower environmental impacts, as per the requirements of international agreements.
4. **Policy Support and Advocacy:** EESL collaborates with government agencies, policymakers, and international organizations to develop and implement policies and regulations that promote energy efficiency and environmental sustainability. This includes advocating for the adoption of policies aligned with the goals of the Montreal Protocol and the Kigali Amendment.
5. **Capacity Building and Awareness:** EESL conducts capacity-building programs and awareness campaigns to educate stakeholders about the importance of energy efficiency and the transition to environmentally friendly technologies. This includes training programs for technicians, engineers, and policymakers on the safe handling and use of alternative refrigerants and ozone-friendly technologies.

Overall, EESL plays a crucial role in supporting India's efforts to fulfill its commitments under international agreements like the Montreal Protocol and the Kigali Amendment by promoting energy efficiency and facilitating the transition to environmentally sustainable technologies and practices.

6. EESL Super Energy Efficient AC (SEAC):

The EESL (Energy Efficiency Services Limited) Super Energy Efficient Air Conditioner (SEAC) Program, which utilizes air conditioners with R32 refrigerant and typically has a cooling capacity of 1.5 Ton (1.5 TR), contributes significantly to ozone layer protection and climate change mitigation. Here's how:

Use of R32 Refrigerant: R32 is a hydrofluorocarbon (HFC) refrigerant with a lower Global Warming Potential (GWP) and zero Ozone Depletion Potential (ODS) compared to other commonly used refrigerants like R410A. By adopting air conditioners with R32 refrigerant, the SEAC Program reduces the emission of greenhouse gases, thus contributing to mitigating climate change. Additionally, R32 is chlorine-free, meaning it does not contribute to ozone layer depletion, making it environmentally friendly.

Energy Efficiency: The SEAC Program focuses on promoting super energy-efficient air conditioners, which typically incorporate advanced technologies such as inverter compressors, intelligent controls, and optimized heat exchange systems. These technologies improve the energy efficiency of air conditioning units, reducing electricity consumption and lowering carbon emissions. By encouraging the use of energy-efficient appliances, the program indirectly contributes to mitigating climate change by reducing the demand for electricity generated from fossil fuels. It is also BEE certified product with higher ISEER

Reduced Emissions: Air conditioners using R32 refrigerant have a significantly lower environmental impact due to their zero-ozone depletion potential, reduced Global Warming Potential (GWP), and improved energy efficiency. By replacing older, less efficient air conditioning units with super energy-efficient models, the SEAC Program helps decrease overall emissions of greenhouse gases and ozone-depleting substances. This reduction in emissions contributes to both ozone layer protection and climate change mitigation by minimizing the release of harmful pollutants into the atmosphere.

Awareness and Education: The SEAC Program also plays a role in raising awareness and educating consumers about the environmental benefits of using energy-efficient air conditioners with R32 refrigerant. Through outreach campaigns and educational initiatives, the program informs consumers

about the importance of choosing environmentally friendly cooling solutions and the positive impact of their choices on ozone layer protection and climate change mitigation.

Bulk Procurement and Distribution: EESL employs a bulk procurement model to leverage economies of scale and negotiate competitive prices for super energy-efficient air conditioners using R32 refrigerant. These air conditioners are then distributed through various channels, including government institutions, commercial buildings, residential complexes, and retail outlets, to make them accessible to consumers across different sectors.

Overall, the EESL Super Energy Efficient Air Conditioner Program, utilizing R32 refrigerant and 1.5 TR capacity air conditioners, makes significant contributions to ozone layer protection and climate change mitigation by promoting energy efficiency, reducing greenhouse gas emissions, and encouraging the adoption of environmentally friendly cooling technologies.

The following resolution has been passed by EESL Board w.r.t AC Sustainability Actions under Super-Efficient Air-Conditioner Program, this include the following:

1. Consumer Guide detailing steps to ensure safe replacement, storage and disposal of refrigerants. The Guide interalia will also include information on buy-back options (Where available and offered by the vendor).
2. Reporting Templates for AC manufacturers for periodic reporting to EESL on AC refrigerant disposal in line with guidelines notified by Ministry of Environment, Forest & Climate Change (MoEF&CC)
3. Conduct stakeholder consultations/ workshops/ side events with stakeholders like refrigerant and E-Waste recyclers, AC Manufacturers etc. on safe replacement, storage and disposal of refrigerants.
4. Other actions for promoting AC sustainability actions that may be required.

7. Useful Material Links

- https://eeslindia.org/wp-content/uploads/2020/10/Good%20Servicing%20Practises%20in%20RAC_C2C.pdf
- <https://ozonecell.nic.in/wp-content/uploads/2019/03/INDIA-COOLING-ACTION-PLAN-e-circulation-version080319.pdf>
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