HPMP & Energy Efficiency in Buildings

Ashish Jindal
Why ?
HCFC PHASE-OUT AND ENERGY EFFICIENCY IN BUILDINGS

HCFCs

NON ODS and LOW GWP

HCFC PHASE-OUT AND ENERGY EFFICIENCY IN BUILDINGS

MONTREAL PROTOCOL

Caring for all life under the sun

Ozone Cell
Ministry of Environment, Forest and Climate Change
Government of India
New Delhi, India, 2017
Who is the handbook for?

- Building professionals
- Policy makers
- Building owners
- Academicians
- Other stakeholders
What does the handbook include?

- Overview of Montreal Protocol
- Significance of building sector
- Use of HCFCs in buildings
- Three steps to phase out the use of HCFCs in buildings
- Energy efficient building design
- Ozone and climate friendly policies
- Exhaustive list of zero-ODP and low-GWP alternatives
Where are HCFCs used in buildings?

- Refrigeration
- Air conditioning
- Building insulation
- Fire fighting equipment
HCFCs are largely used as refrigerants in buildings

HCFC consumption in India by sector, 2015

- Refrigeration: 35%
- Foam: 21%
- RAC servicing sector: 43%
- Others: 1%

78% of HCFCs used are R-22

- R-22: 77%
- R-141b: 20%
- R-123: 1%
- R-142b: 1%

77% of R-22 are used for room AC

Cooling energy demand and refrigerant charge go hand-in-hand

HCFC-22 consumption in Air conditioning 2014-2015

- Room AC: 77%
- Ducted split: 14%
- Chillers: 1%
- Other nond-bldg use: 8%
Steps to phase out HCFCs from buildings

- Reduce demand for refrigerants through energy efficient equipment and buildings.
- Replace HCFCs with zero-ODP and low-GWP alternatives.
- Use not-in-kind alternative technologies that do not rely on use of fluorocarbon refrigerants.
  - Evaporative cooling
  - Earth tunnel system
  - Radiant cooling
  - Absorptive chillers
  - Phase change materials
  - Tri-generation system
  - District cooling
## Status & Summary – Ozone & Climate Friendly policies

<table>
<thead>
<tr>
<th>Policy/Program</th>
<th>Address ODS in air conditioning</th>
<th>Address ODS in building insulation</th>
<th>Address ODS in fire fighting</th>
<th>Address building energy efficiency</th>
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<tbody>
<tr>
<td>HCFC Phaseout Management Plan</td>
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<td>National Building Code</td>
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<td>Energy Conservation Building Code</td>
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<td>Kigali Amendment</td>
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<td>Standards and Labeling program for appliances and equipment</td>
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<td>Regulations for foams and firefighting industry</td>
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Kigali Conference to Montreal Protocol

<table>
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<th>Countries</th>
<th>Developed</th>
<th>China</th>
<th>India</th>
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<tr>
<td>Baseline</td>
<td>2011-13</td>
<td>2020-22</td>
<td>2024-26</td>
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<td>Freeze Year</td>
<td>2019</td>
<td>2024</td>
<td>2028</td>
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<tr>
<td>Target Year</td>
<td>2036</td>
<td>2045</td>
<td>2047</td>
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<tr>
<td>Reduction (%)</td>
<td>85%</td>
<td>80%</td>
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India’s Commitment

- 10% (2032)
- 20% (2037)
- 30% (2042)
- 85% (2047)
Energy Efficiency in India - Transition

1970-2001

Pre EC Act Era

Voluntary Initiatives by Industry

Voluntary Professional Involvement (NPC, TERI & PCRA)

Not much impact on energy intensity
Savings not reported

2001 - 2008

Post EC Act Era

Enactment of EC Act (2002)

Establishment of BEE (March 2002)

Launch of EE Programs (2006)

Impact on energy intensity felt after 2007
Savings reported

2008 ……..

Post NMEEE Era

NAPCC (June 2008)

NMEEE (Aug 2009)

Amendment of EC Act (2010)

Launch of Programs (2011...)

Higher impact on energy intensity
National Targets

NAPCC : National Action Plan on Climate Change

EC Act : Energy Conservation Act

BEE: Bureau of Energy Efficiency

NMEEE : National Mission on Enhanced Energy Efficiency

EE: Energy Efficiency

NPC: National Productivity Council

TERI: The Energy Research Institute

PCRA : Petroleum Conservation and Research Association
Energy Efficiency Market in India

- Estimated to be 22.81 billion $ \textit{(Source: EESL’s Business Plan 2016-2021)}

- Policy interventions and Support by Multilateral/Bilateral organizations resulted in the emergence of domestic and international ESCOs

- Major constraints of ESCO
  - Limited Access to Finance
  - Limited Capacity in Public Sector
  - Government Procurement Regulations
  - Perceived Technology Bias
  - Lack of Simplified M&V Protocols
  - Payment Security Mechanism

Need of a Super ESCO

- Undertake Risk
- Demonstrate Energy Efficiency ESCO models
EESL’s Profile

Joint venture Company of 4 Public Sector Enterprises of Ministry of Power, Govt. of India

- **NTPC Limited** (India’s Largest Power Generating Company | Market Cap as on 1st March 2016 – US $15.5 billion)
- **Rural Electrification Corporation Limited** (Market Cap as on 1st March 2016 – US $2.4 billion)
- **Power Finance Corporation Limited** (Market Cap as on 1st March 2016 – US $3.1 billion)
- **Power Grid Corporation of India Limited** (India’s Largest Power Transmission Company | Market Cap as on 1st March 2016 – US $10.7 billion)

- A public Energy Service Company (ESCO) under Ministry of Power, Govt. of India
- Established in the year 2009
- 100% share holding with Public Sector Enterprises
- Board of Directors represented by Ministry of Power and Bureau of Energy Efficiency (BEE)
- Largest ESCO in the world
- Backed by Government of India and Promoters with net worth of over $32 billion
- Implementing largest Energy Efficiency Portfolio in the world
- One of the fastest growing companies in India – 10 fold growth in one year
Overview of India’s Commercial Building Sector

- Building energy consumption accounts for over 35 percent of electrical energy consumption in the country, and is rising annually at 8%.
- If buildings continue to be built and operated in the conventional manner, electricity consumption by commercial buildings may increase by more than 3 times by 2021.
- Electricity consumption by Heating/cooling appliances will grow by 180% and by lighting will grow by 80% by 2021.
Issues and Opportunities in Buildings

- Improper O&M Practice
- Under-utilization of equipment
- In-efficient system or equipment
- Wastage

Loss of Energy

- Purchase more from grid
- Generate more at site

Building Prospective
- More Energy Cost
- Less Competitive

National Prospective
- More Fossil Fuel Consumption
- High GHG Emission

Controllable (Management, Technology & Practice)
Proposed Business Models

• **Model 1:** If 100% investment is made by customer,

  - PMC
  - Walkthrough Survey
  - Facilitation in procurement
  - Warranty
  - Project Monitoring
  - One-time Fees to EESL

• **Model 2:** If 100% Investment by EESL (Preferred Model)

  - ESCO
  - Investment
  - Walkthrough Survey
  - Facilitation in procurement
  - Warranty (Extended)
  - Project Monitoring
  - Project Cost
    = Upfront Investment + PMC + Interest on Debt & Equity
**Shared Saving Approach**

**Baseline kWh**

**Estimated kWh**

**Deemed Saving** is estimated based on the reduction in wattage due to retrofits and operating Hours

- **Annual Monetized Saving (Rs.)**
- **Annual Repayment to EESL (Rs)**
- **Annual Retain of Saving by Client**

60-80%

20-40%

**Project Period:** 3-5 Years

**Project Cost:** Material Cost + PMC + ROI

**Warranty**
Activity Flow

Discussion with Building Officials
Establish Baseline & Signing of Agreement
Procurement Process
Project Implementation
Cash flow to EESL from Deemed Savings
Contact Us:

Energy Efficiency Services Limited
*(A Joint Venture of PSUs of Ministry of Power, Govt. of India)*

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