Perform, Achieve & Trade (PAT) (National Mission for Enhanced Energy Efficiency)

Ms. Abha Shukla, Secretary, Bureau of Energy Efficiency, Government of India, Ministry of Power (India)
NATIONAL MISSION FOR ENHANCED ENERGY EFFICIENCY (NMEEEEE)

- The National Action Plan on Climate Change June 2008
- Creation of institutional and policy framework
- Industrial energy efficiency is the need of the hour
- 25% contribution in GDP with 44% energy consumption
ENERGY SAVING POTENTIAL OF DIFFERENT SECTORS

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>SAVING POTENTIAL IN PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>30</td>
</tr>
<tr>
<td>Industry</td>
<td>25</td>
</tr>
<tr>
<td>Transport</td>
<td>20</td>
</tr>
<tr>
<td>Domestic and Commercial</td>
<td>20</td>
</tr>
</tbody>
</table>
NMEEE – Four New Initiatives

NMEEE

PAT
- Energy Intensive Industries
- Targets for Mandatory Energy Saving

MTEE
- Energy Efficient Appliances
  - BLY
  - SEEP
  - DSM

EEFP
- Stimulate Funding for ESCOs

FEEED
- Fiscal Instrument for EE
- PRGF
- VCF
- Public Procurement
TARGETS OF NMEEE

• Annual fuel saving of more than 23 million ToE
• Cumulative avoided electricity capacity addition of 19000 MW
• CO2 emission mitigation of 98 million tones per year
<table>
<thead>
<tr>
<th>SECTOR</th>
<th>MINIMUM ANNUAL ENERGY CONSUMPTION IN TONNES OF OIL EQUIVALENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALUMINIUM</td>
<td>7500</td>
</tr>
<tr>
<td>CEMENT</td>
<td>30000</td>
</tr>
<tr>
<td>CHLOR-ALKALI</td>
<td>12000</td>
</tr>
<tr>
<td>FERTILIZER</td>
<td>30000</td>
</tr>
<tr>
<td>IRON AND STEEL</td>
<td>30000</td>
</tr>
<tr>
<td>PAPER AND PULP</td>
<td>30000</td>
</tr>
<tr>
<td>TEXTILE</td>
<td>3000</td>
</tr>
<tr>
<td>THERMAL POWER PLANTS</td>
<td>30000</td>
</tr>
<tr>
<td>Sector</td>
<td>MTOE</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Power (Thermal)</td>
<td>104.14</td>
</tr>
<tr>
<td>Iron &amp; Steel</td>
<td>28.00</td>
</tr>
<tr>
<td>Cement</td>
<td>11.87</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>7.86</td>
</tr>
<tr>
<td>Aluminium</td>
<td>7.73</td>
</tr>
<tr>
<td>Paper</td>
<td>2.09</td>
</tr>
<tr>
<td>Textile</td>
<td>1.62</td>
</tr>
<tr>
<td>Chlor-Alkali</td>
<td>0.84</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>164.15</strong></td>
</tr>
</tbody>
</table>

About 70% of DCs Contribute 97% of Total Consumption

About 30% of DCs contribute rest 3% of Total Consumption
**APPROACH FOR SETTING THE TARGETS**

**Total Saving Objective = 6.6 MTOE**

<table>
<thead>
<tr>
<th>Sector</th>
<th>No. of Identified DCs</th>
<th>Reported Energy Consumption (MTOE)</th>
<th>Share of Consumption (%)</th>
<th>Apportioned Energy reduction (MTOE)</th>
<th>Target for each Sector (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron &amp; Steel</td>
<td>76</td>
<td>28.00</td>
<td>46.66%</td>
<td>1.647</td>
<td>5.88</td>
</tr>
<tr>
<td>Cement</td>
<td>82</td>
<td>11.87</td>
<td>19.78%</td>
<td>0.698</td>
<td>5.88</td>
</tr>
<tr>
<td>Fertilizers</td>
<td>29</td>
<td>7.86</td>
<td>13.10%</td>
<td>0.462</td>
<td>5.88</td>
</tr>
<tr>
<td>Aluminium</td>
<td>10</td>
<td>7.73</td>
<td>12.88%</td>
<td>0.455</td>
<td>5.88</td>
</tr>
<tr>
<td>Paper &amp; pulp</td>
<td>31</td>
<td>2.09</td>
<td>3.48%</td>
<td>0.123</td>
<td>5.88</td>
</tr>
<tr>
<td>Textile</td>
<td>85</td>
<td>1.62</td>
<td>2.70%</td>
<td>0.095</td>
<td>5.88</td>
</tr>
<tr>
<td>Chlor-Alkali</td>
<td>22</td>
<td>0.84</td>
<td>1.40%</td>
<td>0.049</td>
<td>5.88</td>
</tr>
<tr>
<td><strong>Sub_Total</strong></td>
<td><strong>335</strong></td>
<td><strong>60.01</strong></td>
<td><strong>100%</strong></td>
<td><strong>3.53</strong></td>
<td><strong>5.88</strong></td>
</tr>
<tr>
<td>TPPs</td>
<td>142</td>
<td>104.56</td>
<td><strong>100%</strong></td>
<td><strong>3.10</strong></td>
<td><strong>3.0</strong></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>477</strong></td>
<td><strong>165.57</strong></td>
<td></td>
<td><strong>6.63</strong></td>
<td><strong>4.0</strong></td>
</tr>
</tbody>
</table>
PAT SCHEME: BACKGROUND AND SCOPE

- Covers 477 designated consumers in 8 sectors
- All DCs consume about 165 mtoe energy
- **Targets** would be given to all DCs to achieve the same within a time frame
  - Achievement > Target: E-Scerts
  - Achievement < Target: Purchase Escerts
- National Target = 6.6 mtoe at the end of 1st PAT Cycle (by 2014-15)
APPROACH TOWARDS TARGET SETTING

- Sectoral Target are on **pro-rata basis** of energy consumption among 8 sectors to achieve National Target

- Establishment of Baseline :
  - As per reported data of last 5 years (2005-06 to 2009-10)
  - Normalization Factor (capacity utilization)
  - Arithmetic Average of last 3 years value
TARGETS, INCENTIVES AND PENALTIES

Baseline SEC

Target

Target SEC

Scenario 1

Issued Escerts

Achieved SEC

Penalty

Compliance

Scenario 2

Purchase Escerts
METHODOLOGY FOR ESTABLISHING BASELINE

- Definitions:
  - Baseline Year: 2009-10
  - Baseline Production ($P_{\text{base}}$): Avg. of 2007-8, 2008-9 & 2009-10
  - Baseline SEC ($SEC_{\text{base}}$): Avg. of 2007-8, 2008-9 & 2009-10
  - Baseline CU% ($CU_{\text{base}}$): Avg. of 2007-8, 2008-9 & 2009-10
  - Target SEC ($SEC_{\text{target}}$): SEC as estimated in 2013-14
  - Target: % reduction from $SEC_{\text{base}}$

- Estimation of Energy Saving (MTOE):

\[ P_{\text{base}} \left( SEC_{\text{base}} - SEC_{\text{target}} \right) \]
APPROACH TOWARDS TARGET SETTING

• Targets to be statistically calculated based on relative SEC approach after grouping the DCs suitably

• Estimated targets to be justified by the saving potential available
  • Baseline Energy Audits

• The target to be reviewed by an expert committee before notification
GROUPING OF DCs

PULP & PAPER SECTOR
(31 DCs)

WOOD
(20 DCs)
- Chemical
  (18 DCs)
    - Speciality Paper
      (2 DCs)
    - Non-Speciality Paper
      (16 DCs)
- Chemi-Mechanical
  (1 DCs)

AGRO
(6 DCs)
- 100% Market Pulp
  (1 DCs)

RCF
(5 DC)
- Chemical
  (2 DCs)
- Chemi-Mechanical
  (3 DCs)
Analytical Approach for Target Setting

**Analytical Approach**

- Setting Up of Unit Level Targets
- Energy Efficiency Enhancement Option
- Establish Baseline SEC of Each Unit/Plant

**Potential Saving, Cost Benefit etc**

- National Level / Sector Level / Unit Level targets
- Reported SEC
- Normalized SEC
- Baseline SEC
Suitable Grouping of DCs Done based on similar characteristics for target setting

Relative SEC concept has been adopted in DCs who are in same group after allocating group target (in absolute term) in a pro-rata basis

Although SEC value is high as compared to all DCs in the sector, it is the best among that group.
Status : PAT

- Baseline SEC on Gate-to-Gate basis has been established based on 5 years data from DCs reported through notified format.
- Target for SEC reduction worked out based on:
  - Statistical Model for 6 sectors (Relative SEC and top-down approach)
  - Deviation from design Net HR for TPPs
  - Methodology suggested by FAI for Fertilizer Sector
- Report on Draft Target Setting has been approved MoP. Sectoral expert committee meetings are also held. Notification Process has been initiated.
STATUS; PAT

• Energy Audit has been started April 2011 by CEAs in all DCs to verify the reported data, its source and potential saving avenues

• PAT Operational Document (POD) has been prepared.

• About 40 stakeholder workshops conducted at National, State and Cluster level with participation of more than 2000 delegates
PAT LEGAL FRAMEWORK

• Furnish report of energy consumption to the Designated Authority of the State as well as to BEE (section 14(k)).
• Designate or appoint an Energy Manager who will be in-charge of submission of annual energy consumption returns of the Designated Agencies and BEE (section 14(l)).
• Comply with the energy conservation norms and standards prescribed under section 14 (g) of the Act.
• Purchase Energy Saving Certificates (ESCert) for compliance to section 14 (g) in the event of default. The Act has been amended with the addition of new sub-section 14A to enable this and section 14A(2) allows such trading. EScerts are defined by adding a new sub-section
• Monitoring and Verification of compliance by Designated Energy Auditors (DENA) which will be prescribed the Government/ BEE under section 14A/13 (p) of the Act.

• Excess achievement of the target set would entail issuance of ESCerts under section 14A(1).

• Penalty for non-compliance being Rs. 10 lakhs and the value of non-compliance measured in terms of the market value of tones of oil equivalent by inserting a new section 26(1A).

• BEE to be the overall regulator and dispute resolution agency and Energy Efficiency Service Ltd. (EESL) to be the process manager.
Institutional Design Schematic

MoP

BEE
Market Regulator & Administrator

SDA
Updated list of DCs and DENA
Any Baselines Improvement
Any Baselines Improvement
Apply for Empanelment
Audited Result of DCs
Regular updates

DENA
Apply for ESCerts through PAT Assessment Document (PAD)
E-filing
Audit

Designated Consumers (DCs)
Issuance of ESCerts

Central Registry
Updated Obligation of DCs: Deficit or Surplus

Trading Exchange
ESCerts Trading
Updated ESCerts
Account Info Settlement Details
Thanks ....
Mission Goals

- Market-based approaches to unlock energy efficiency opportunities, estimated to be about Rs. 74,000 Crores

- By 2014-15:
  - Annual fuel savings in excess of 23 million toe
  - Cumulative avoided electricity capacity addition of 19,000 MW
  - CO$_2$ emission mitigation of 98 million tons per year
## List of DCs

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Annual Energy Consumption Norm to be DC (mtoe)</th>
<th>No. of Identified DCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>7500</td>
<td>10</td>
</tr>
<tr>
<td>Cement</td>
<td>30000</td>
<td>82</td>
</tr>
<tr>
<td>Chlor-Alkali</td>
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<td>Pulp &amp; Paper</td>
<td>30000</td>
<td>31</td>
</tr>
<tr>
<td>Power</td>
<td>30000</td>
<td>142</td>
</tr>
<tr>
<td>Iron &amp; Steel</td>
<td>30000</td>
<td>76</td>
</tr>
<tr>
<td>Textiles</td>
<td>3000</td>
<td>85</td>
</tr>
</tbody>
</table>
Target in PAT

Target is defined as the % reduction of ‘Specific Energy Consumption (SEC)’ from Baseline value.

SEC = \frac{E}{P}

Baseline SEC

Target SEC

Reduction in SEC

Expressed in %
Energy Management Action Network (EMAK) 3rd Workshop in Guilin, China November 15, 2011

Sectoral studies by BEE on ‘Setting Up of Sectoral Bandwidth for DCs’ have revealed the impact on SEC due to above diversities.

<table>
<thead>
<tr>
<th>No. of DCs</th>
<th>Range of SEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>145</td>
<td>1740 - 4028 Kcal/kwh</td>
</tr>
<tr>
<td>65</td>
<td>0.052 - 0.112 toe/ t</td>
</tr>
<tr>
<td>80</td>
<td>0.02 - 14.75 toe/ t</td>
</tr>
<tr>
<td>28</td>
<td>2.68 - 16.89 toe/ t</td>
</tr>
<tr>
<td>10</td>
<td>0.183 - 6.405 toe/ t</td>
</tr>
<tr>
<td>31</td>
<td>0.215 - 1.57 toe/ t</td>
</tr>
<tr>
<td>85</td>
<td>0.01 - 7.8 toe/ t</td>
</tr>
<tr>
<td>18</td>
<td>0.194 - 1.833 toe/ t</td>
</tr>
</tbody>
</table>

### toe / ton of product

| Sector               | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|----------------------|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|
| Cement               |   |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| Iron & Steel         |   |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| Fertilizer           |   |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| Aluminium            |   |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| Pulp & Paper         |   |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| Textile              |   |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| Chlor-Alkali         |   |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
Reasons for Large Energy Usage Bandwidth

The energy usage pattern varies widely in industries of a particular sector due to various **diversities** like
- Scale of Production (Installed Capacities)
- Use of Raw Material
- Process Technology
- Vintage
- O & M Practices
- Type of Product Output etc.

<table>
<thead>
<tr>
<th>Factors of Diversity</th>
<th>Most Affected Sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Raw Material Input</td>
<td>Pulp &amp; Paper, Fertilizer, Power Plant, Textile</td>
</tr>
<tr>
<td>a) Quality of Raw Material / Fuel</td>
<td>All sectors</td>
</tr>
<tr>
<td>a) Process &amp; Technology</td>
<td>Aluminium, Iron &amp; steel, Chlor-Alkali, Paper</td>
</tr>
<tr>
<td>a) Final Product output</td>
<td>Textile, Iron &amp; Steel, Aluminium</td>
</tr>
<tr>
<td>a) Vintage</td>
<td>All Sectors</td>
</tr>
<tr>
<td>a) Capacity Utililization</td>
<td>All sectors</td>
</tr>
</tbody>
</table>
Number of Clusters depend upon the Bandwidth of Baseline SEC

![Diagram showing the relationship between baseline SEC and the number of clusters for different plants. The diagram includes bars for each plant, with clusters 1, 2, and 3 highlighted.](image-url)