MODULE: 2
PERFORM, ACHIEVE AND TRADE (PAT)
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INTRODUCTION
National Mission on Enhanced Energy Efficiency (NMEE) is one of the eight missions which formed India’s National Action Plan on Climate Change (NAPCC).
PAT CONCEPT
INTRODUCTION

• PAT mandates specific energy efficiency improvements for the most energy intensive industries.

• The scheme is based on the wide variations in specific energy consumptions (baseline SECs) of different units in each notified sector.

• The units in terms of SECs range from among the best in the world to some of the most inefficient.
BASELINE ASSESSMENT
• PAT study begins with assessment of baseline specific energy consumption (SEC) using Form-1.

• SEC is calculated on a Gate-to-Gate (GtG) concept after determining the plant boundary.

• Energy consumption and production details are collected in sector specific pro-forma from DCs.

• The baseline is reviewed and evaluated by BEE in consultation with relevant sector specific technical committee, and target SEC along with target year is notified and communicated to DCs.
NORMALIZATION
Normalization is a process of rationalization of the energy and production data considering the impact of quantifiable external variables that are beyond the control of the DCs.

**Internal Factors for Normalization**
- Capacity utilization
- Product mix & intermediary product
- Fuel mix (e.g. Pet coke utilization in kiln)
- Power mix Fuel quality in CPP
- Low PLF in CPP
- Raw material quality
- Biomass/Alternate fuel unavailability
- Addition of new line/Unit
- Renewable energy

**External Factors for Normalization**
- Grid failure/Breakdown (Grid not synchronized with CPP)
- Natural disaster (flood, earthquake etc.)
- Major change in Government policy (affecting plant process system)
- Environmental concerns (additional environmental equipment requirement due to major change in government policy on environmental requirements)
- Unforeseen circumstances (labour strike / lockouts / social unrest / riots)
VERIFICATION
The verification involves review of Sector Specific Pro-forma, Form 1 and Summary Sheet. The following forms are to be submitted by the concerned DC and EmAEA:

- Sector Specific Pro-Forma and Form I by DC.
- Performance Assessment Documents (Form A) by DC.
- Certificate of Verification (Form B) by EmEA.
- Compliance of Energy Consumption Norms Document (Form D) by DC.
The Sector Specific Pro-forma covers following aspects of GtG information:

- Production and capacity utilisation details
- Section-wise details of various products
- Electricity and renewable energy consumption
- Power generation (DG/GG/GT/STG/Cogeneration/WHR)
- Fuel consumption (Solid/Liquid/Gas/Biomass, and others)
- Heat rate of different power sources and coal quality
- Miscellaneous data for normalization
- Installation of additional equipment to protect the environment
- Project activity details
- Summary sheet
- Normalization calculation sheets
Process of Verification

**Form 1**
Form 1 contains details of Information regarding total energy consumed, production, and specific energy consumption per unit of production.

**Form A**
Form A is the Performance Assessment Document (PAD) prepared by the DCs in the assessment year for monitoring and verification.

**Form B**
Form B is the certification of verification by EmAEA on completion of M&V study in the assessment year.

**Form C**
Form C is the certification of cross-verification by EmAEA.

**Other Forms to be submitted by DC under EC Act:**

**Form–2:** Details of energy savings measures recommended in mandatory energy audit report. This will be submitted to the SDA with a copy to BEE within specified period of time.

**Form–3:** Details of energy efficiency improvement measures implemented, investment made and savings in energy achieved and progress made.
CERTIFICATION OF ENERGY SAVINGS
It is the process of certifying the verification report or the check-verification report by the Empanelled Accredited Energy Auditor (EmEA). The report is reviewed by BEE before recommending the energy savings.

The procedure for issuing of EScerts is as follows:

- Central Government—after receiving recommendation from Bureau (BEE) – issue ESCerts of desired value to DC within 45 days.
- ESCerts are issued in electronic form.
- ESCerts issued in current cycle is valid till compliance period of next cycle.
- DCs who have been issued energy savings certificates may sell them through the power exchange.
- ESCerts purchased by DC for compliance shall after their submission to Bureau stand expired.
ES Certs Determination

ES Certs is issued to the eligible DC based on the following criteria:

\[
\text{No. of ESCerts} = \text{Production in Baseline Year} \times (\text{SEC Base year} - \text{SEC Target Area})
\]

Sample Calculation:

Baseline year: 2014-15
Baseline SEC = 10 toe/unit of production
Baseline production = 10000 units
Target = 4% reduction in baseline SEC
Baseline SEC = 9.6 toe/unit of production
If achieved SEC = 9.8 toe/unit (unit has to buy 2000 ESCerts equivalent to 2000 toe) If achieved SEC = 9.4 toe/unit (unit is awarded 2000 ESCerts equivalent to 2000 toe)
PAT Achievement

- PAT-I cycle has achieved an energy saving of 8.67 million tonne of oil equivalent. The table shows achievements of PAT–I.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Sectors</th>
<th>No. of DCs</th>
<th>Target Reduction (MTOE)</th>
<th>Savings (MTOE)</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aluminum</td>
<td>10</td>
<td>0.46</td>
<td>0.73</td>
<td>59%</td>
</tr>
<tr>
<td>2</td>
<td>Cement</td>
<td>75</td>
<td>0.82</td>
<td>1.44</td>
<td>76%</td>
</tr>
<tr>
<td>3</td>
<td>Chlor- Alkali</td>
<td>22</td>
<td>0.05</td>
<td>0.13</td>
<td>100%</td>
</tr>
<tr>
<td>4</td>
<td>Fertilizer</td>
<td>29</td>
<td>0.48</td>
<td>0.83</td>
<td>73%</td>
</tr>
<tr>
<td>5</td>
<td>Iron &amp; Steel</td>
<td>60</td>
<td>1.49</td>
<td>2.10</td>
<td>41%</td>
</tr>
<tr>
<td>6</td>
<td>Paper &amp; Pulp</td>
<td>26</td>
<td>0.12</td>
<td>0.26</td>
<td>117%</td>
</tr>
<tr>
<td>7</td>
<td>Textile</td>
<td>82</td>
<td>0.07</td>
<td>0.12</td>
<td>71%</td>
</tr>
<tr>
<td>8</td>
<td>Thermal Power Plant</td>
<td>123</td>
<td>3.21</td>
<td>3.06</td>
<td>-5%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>427</td>
<td>6.69</td>
<td>8.67</td>
<td>29%</td>
</tr>
</tbody>
</table>
Deepening of PAT scheme was carried out by identifying new DCs from existing sectors of PAT scheme. As a result of deepening of PAT, 89 DCs were notified under PAT cycle –II.

PAT Cycle –II has been notified in March 2016 in which 621 DCs from 11 sectors have been notified with a target reduction of 8.869 MTOE.

The breakup of 621 DCs notified in PAT cycle –II is as follows:

- Existing DCs of PAT Cycle –I : 448
- New DCs from existing 8 sectors of PAT: 89
• All zonal railways with annual energy consumption for traction of 70,000 TOE per year and above and Workshop/Production units with annual energy consumption of 30,000 TOE or above are included as DCs.
• Zonal Railways: Each zonal railway provides transport services for both passenger and goods. The energy input for the mentioned services is in the form of diesel or electricity. Specific fuel consumption or specific energy consumption for a specific service (passenger or goods), is calculated by dividing the total amount of fuel input in liter or kWh by the total gross tonne kilometrage for the respective service.
• The specific energy/fuel consumption norms of electric & diesel traction have been considered for setting up the target for reduction as shown in Table below:

<table>
<thead>
<tr>
<th>SEC Norms for electric/ Diesel Traction of Zonal Railways</th>
<th>Diesel</th>
<th>Electrical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Litres/ 1000 GTkm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goods Liters/ 1000 GTkm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>kWh/ 1000 GTkm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

GTkm – Gross Tonne kilometers
**Check Verification**

**Bureau appoints EmAEA to conduct Check Verification**

EmAEAs shall assess and verify that the activities performed by the DC.

The DC shall furnish full and complete data, provide necessary documents and other facilities required by the AEA for the purpose of performing the function of check-verification under these rules.

The AEA in-charge of check-verification function shall report the results of his assessment in certificate of check – verification (Form C) to BEE and the concerned SDA.
Electricity Distribution Companies (DISCOMs)

- Energy losses occur in the process of supplying electricity to consumers due to technical and commercial reasons.

- Technical losses are due to energy dissipated in the conductors, transformers and other equipment used for transmission, transformation, sub-transmission and distribution of power. Although, inherent in the system, technical losses can be reduced to a certain level.

- T&D loss is the parameter chosen for reduction; DISCOMs with annual AT & C losses of 1000 MU/86000 TOE and above are included as DCs.

- The energy performance of refineries is expressed in terms of specific energy consumption, measured in thousand British Thermal Units (BTU) per barrel per Energy Factor (MTBU/BBL/NRGF). This unit, commonly referred to as MBN, was developed by the Centre for High Technology, Ministry of Petroleum & Natural Gas to provide a basis for comparing energy performance of refineries of different configurations and accounting of the throughput of secondary units. The NRG factor (NRGF) is the indicator of the level of complexity of a refinery.

\[
MBN = \left( \frac{\text{Thousand British Thermal Unit}}{\text{Barrel}} \right) / \text{NRGF}
\]
The Notification for PAT cycle -IV was issued in March, 2018 and commenced 2018 onwards and it included two new sectors namely commercial buildings (Hotels-37 No.), Petrochemical sector (8 No.) in addition to new DCs in existing sectors. For petrochemical the metric proposed is

\[ \text{toe} \]
\[ \text{ton of product} \]

For commercial building, buildings used around the clock (24 hours) are being considered. The PAT cycle IV is from 2018-19 to 2020-21. GtG for building excludes basement parking area (Figure 2.8). The metric proposed for commercial building is as follows:

For commercial building, the metric proposed is

\[ \frac{\text{Net input energy in toe}}{\text{Net build up area excluding basement parking area in (}\mu\text{000}\text{m}^2\text{)}} \]

Input net energy: fuel and power in tonnes of oil equivalent
Questions?
Thank You!

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