



NORMALIZATION DOCUMENT AND MONITORING & VERIFICATION GUIDELINES

Iron & Steel Sector



सत्यमेव जयते

MINISTRY OF POWER
GOVERNMENT OF INDIA



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Developed specifically for Designated Consumers notified under Perform Achieve and Trade (PAT) Program for National Mission for Energy Efficiency (NMEEE)

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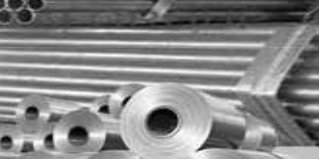
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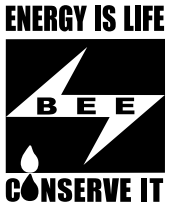
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BUREAU OF ENERGY EFFICIENCY

(Government of India, Ministry of Power)

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Foreword

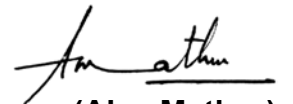
Perform Achieve and Trade (PAT), a flagship initiative under National Mission for Enhanced Energy Efficiency (NMEEE), is a regulatory intervention for reduction of specific energy consumption, with an associated market based mechanism through which additional energy savings can be quantified and traded as ESCerts.

Iron & Steel sector is one of the 8 notified energy intensive sectors under which a total of 67 plants are participating in this program. These plants have been mandated to reduce their Specific Energy Consumption (SEC) from baseline year of 2009-2010. It is expected that these plants may save 1.486 million tons of oil equivalent annually by the end of PAT cycle –I.

The publication of “**Normalization Document and M&V Guidelines**” for **Iron & Steel Sector** is an effort to facilitate the DCs to comply with notified PAT rules to participate with the PAT scheme and contribute towards achieving national target of energy savings. This document will also be helpful to all empanelled Accredited Energy Auditors (EmAEAs) and State Designated Agencies (SDAs) in the monitoring and verification process of PAT.

I want to record my appreciation for members of the Sectoral Expert Committee on Iron & Steel Sector, chaired by Shri T.K Chakravarty, Shri S.K Khandare, Energy Economist, BEE, Shri Himanshu Chaudhary, Project Engineer, BEE and Shri Rakesh Kesri, Sector Expert, who worked tirelessly to put together the baseline data, normalization factors and M&V methodology for the sector. I especially want to record my appreciation for Shri S. Vikash Ranjan, Technical Expert, GIZ who has put together the data and methodology associated with normalization.

I also compliment the efforts of all participating industrial units towards their endeavor in contributing to the national energy saving targets.


(Ajay Mathur)

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1. Introduction

The National Action Plan on Climate Change (NAPCC) released by the Prime Minister on 30 June, 2008, recognises the need to maintain high economic growth to raise the living standards of India's vast majority of people and simultaneously reducing their vulnerability to the impacts of climate change.

The National Action Plan outlines eight national missions that represent multi-pronged, long-term, and integrated strategies for achieving key goals to mitigate the impact of climate change. These missions are listed below:

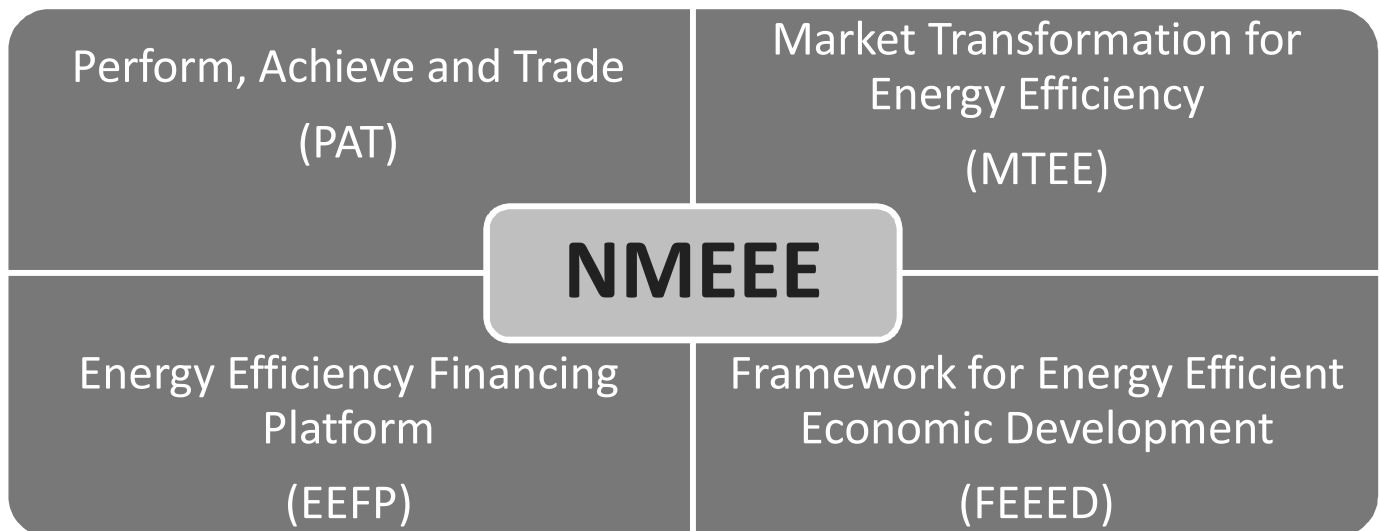
- National Solar Mission
- National Mission for Enhanced Energy Efficiency
- National Mission on Sustainable Habitat
- National Water Mission
- National Mission for Sustaining the Himalayan Ecosystem
- National Mission for a Green India
- National Mission for Sustainable Agriculture

- National Mission for Strategic Knowledge for Climate Change

1.1 National Mission for Enhanced Energy Efficiency

The National Mission for Enhanced Energy Efficiency (NMEEE) is one of the eight national missions with the objective of promoting innovative policy and regulatory regimes, financing mechanisms, and business models which not only create, but also sustain, markets for energy efficiency in a transparent manner with clear deliverables to be achieved in a time bound manner. It also has inbuilt provisions for monitoring and evaluation so as to ensure transparency, accountability, and responsiveness. The Ministry of Power (MoP) and Bureau of Energy Efficiency (BEE) were tasked to prepare the implementation plan for NMEEE.

NMEEE spelt out the following four new initiatives to enhance energy efficiency, in addition to the programmes on energy efficiency being pursued. These are:

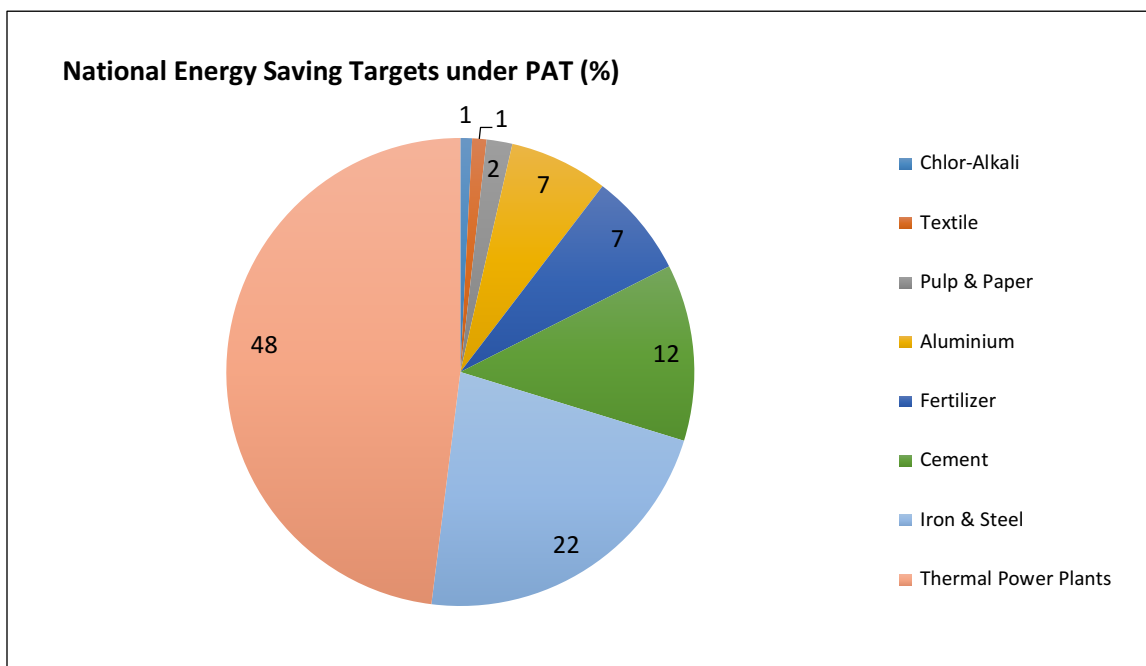




- **Perform, Achieve and Trade (PAT)**, a market based mechanism to make improvements in energy efficiency in energy-intensive large industries and to make facilities more cost-effective by certification of energy saving that can be traded.
- **Market Transformation for Energy Efficiency (MTEE)** accelerates the shift to energy-efficient appliances in designated sectors through innovative measures that make the products more affordable.
- **Energy Efficiency Financing Platform (EEFP)**, a mechanism to finance demand side management programmes in all sectors by capturing future energy savings.
- **Framework for Energy Efficiency Economic Development (FEEED)**, for developing fiscal instruments to promote energy efficiency.

1.2 Perform, Achieve and Trade (PAT) Scheme

Under the National Mission on Enhanced Energy Efficiency (NMEEE), a market based mechanism known as **Perform, Achieve and Trade (PAT)** has been developed and launched to improve energy efficiency in the large energy intensive industries. It is envisaged that 6.686 million tonnes of oil equivalent will be reduced by 2014-15, which is about 4% of energy consumed by these industries. Under the PAT scheme, targets have been specified for all energy intensive industries notified as designated consumers (DCs) under the Energy Conservation Act, including thermal power stations.



2. Background

The methodology of setting targets for designated consumers is transparent, simple and easy to use. It is based on reduction of specific energy consumption (SEC) on a gate-to-gate (GtG) basis to achieve targeted savings

in the first commitment period of 3 years (2012-2015); the reduction in this phase is of about 4.1% which is estimated at 6.686 million tonnes of oil equivalent (mtoe). Of the 23 mtoe set as target from NMEEE, the PAT scheme is focussed on achieving 6.686 mtoe by 2015.



The threshold limit of 30,000 tonnes of oil equivalent (toe) has been marked as the cut-off limit criterion for any unit in the iron & steel sector to be identified as designated consumer (DC) under PAT. Cycle 1 of the scheme has identified 67 iron & steel plants as designated consumers with coal/lignite/gas/diesel as primary energy sources. The iron & steel sector has been categorised on the basis of their products/processes into eight sub-sectors, i.e. integrated steel plant, sponge iron, sponge iron

+ steel melting shop, sponge iron + steel melting shop + others, ferro alloys, ferro chrome, mini blast furnace and steel processing units. The total reported energy consumption of these designated consumers is about 25.32 million tonne of oil equivalent (mtoe). By the end of the first PAT cycle, energy savings of 1.486 million tonnes of oil equivalent/year is expected to be achieved, which is around 22% of the total national energy saving targets assessed under PAT.

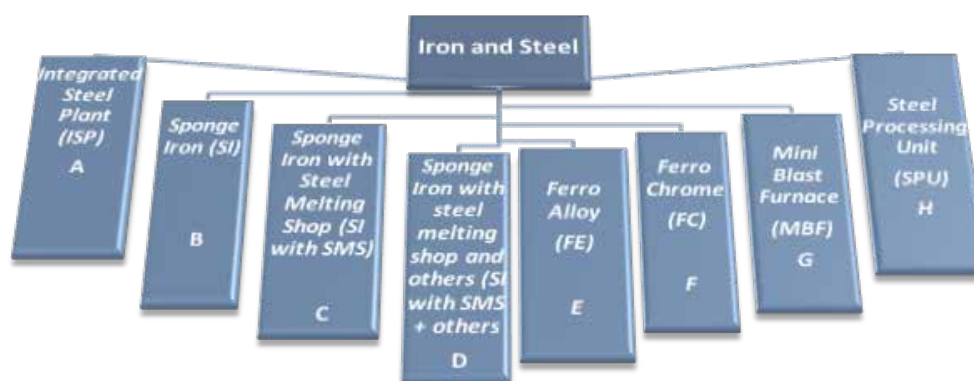
S.No.	Sector	No. of Identified DCs	Annual Energy Consumption (Million toe)	Share Consumption (%)	Apportioned Energy Reduction Consumption For PAT Cycle -1 (%)
1	Power (Thermal)	144	104.56	63.38%	3.211
2	Iron & Steel	67	25.32	15.35%	1.486
3	Cement	85	15.01	9.10%	0.815
4	Aluminium	10	7.71	4.67%	0.456
5	Fertiliser	29	8.20	4.97%	0.478
6	Paper & Pulp	31	2.09	1.27%	0.119
7	Textile	90	1.20	0.73%	0.066
8	Chlor- Alkali	22	0.88	0.53%	0.054
	Total	478	164.97	100.00%	6.686

3. Categorisation and Distribution

For the establishment of energy consumption norms and standards in the iron & steel sector, designated consumers have been grouped based on similar processes and profiles. This is

to arrive at a logical and acceptable spread of SECs among DCs which may be compared in setting targets.

The iron & steel sector DCs have been categorised on the basis of their process into the following sub sectors.





4. Baseline value establishment

The complexities of the iron & steel sector made it difficult to arrive at standardised specific energy consumption (SEC). However, the best possible combination and categorisation have been worked out so that no designated consumer has any grievance on the targets set out. While developing the target setting methodology for DCs, the unit which has the best SEC in the group has been set as a reference to calculate the target.

4.1 Definition

4.1.1 Baseline Year

Baseline year is declared as 2009-10.

4.1.2 Baseline Production (P_{base})

The arithmetic average of Production figures in Tonnes of 2007-08, 2008-09 and 2009-10.

4.1.3 Baseline Specific Energy Consumption (SEC_{base})

The arithmetic average of SEC figures of 2007-08, 2008-09 and 2009-10.

4.1.4 Baseline Capacity Utilization in % (CU_{base})

Arithmetic average of Capacity figures of 2007-08, 2008-09 and 2009-10.

4.1.5 Target Specific Energy Consumption (SEC_{target})

SEC as estimated in Assessment Year (FY 2014-15).

4.1.6 Estimation of Energy Saving (MTOE)

$BaselineYearProduction \times (BaselineYearSEC - AssessmentYearSEC)$

5. Methodology for establishing the target

- Sectorial target is allocated based on a pro-rata basis of total energy consumption in the Iron & Steel sector among all the 8 sectors under PAT scheme.
- Sub-Sectorial target is allocated based on a pro-rata basis of total energy consumption in the sub-sector.
- The DC level target is allocated based on a statistical analysis derived from 'Relative SEC' concept. This approach will be applicable to all the DCs of a sub-sector only.

5.1 Estimation of Gate-to-Gate Baseline SEC

The baseline Specific Energy Consumption (SEC) has estimated based on a Gate to Gate (GtG) concept which is given as:

Specific Energy Consumption (SEC)

= Net Energy Input into the Designated Consumer's Boundary

/ Total Quantity of Output Exported from the Designated Consumer's Boundary

5.2 Methodology of calculation of Target

Steps for calculating Baseline and Target Year's Specific Energy Consumption (SEC):

The calculation methodology is divided into subsequently 3 phases

A) Baseline Year Phase

B) Intermediary Phase

C) Assessment Year final Target Setting Phase



A) Baseline Phase:

The step by step methodology for the **baseline SEC calculation phase** is given below:

Step 1:

Baseline Production (Tonne)

= Arithmetic Average of Production (in Tonne) of FY 2007 – 08, 2008 – 09 & 2009 – 10

Step 2:

Baseline Total Energy Consumption (TOE)

= Arithmetic Average of Energy Consumption (TOE) of FY 2007 – 08, 2008 – 09 & 2009 – 10 (Excluding Renewable Source of Energy not connected to Grid)

Step 3:

Baseline GtG Specific Energy Consumption (TOE) = $\frac{\text{Baseline Total Energy Consumption (TOE)}}{\text{Baseline Total Production (Tonne)}}$

Step 4: Relative Specific Energy Consumption (SEC)

The relative SEC is calculated specifically for every individual group. It is ratio of SEC of individual Designated Consumer to that of the Designated Consumer having minimum SEC in that group.

Baseline Relative Specific Energy Consumption (TOE/Tonne)
= $\frac{\text{Baseline SEC of DCs (TOE/Tonne)}}{\text{Minimum SEC of DCs in Group (TOE/Tonne)}}$

Step 5: Estimation of Target SEC

Estimation of Target SEC (E) = (1 – Relative SEC(D)/100) X Baseline SEC (C)

Step 6: Approximate Saving Achieved after Assessment /Target year (F):

Approx Saving Achieved in AY (F)
= (Baseline SEC – Target Year SEC) X Baseline Production (A)

Step 7: Estimation of Sub-Group's Energy Consumption and Energy Saving Targets:

To estimate the Sub – Group's total energy consumption and total energy saving target, following data has been considered:

- (i) Total energy consumption of Sub sector
- (ii) Saving Energy from Sub- Sector (Depending on the pro-rata basis, this saving Potential has been divided into several sub group of respective sector.)



Step 8: Calculation of total saving from Sub-group of sub sector

Total Saving from Sub – Group of Sub – Sector

$$= \left(\frac{\text{Total Energy Consumption of Sub – Sector}}{\text{Saving Energy from Sub – Sector}} \right) \times \text{Total energy consumption of sub – group [Sum of value of DCs calculated with 'D']}$$

Step 9:

$$\text{Multiplication Factor } X = \frac{\text{Total Saving Calculated from Sub group of SubSector}}{\sum \text{Approx. Saving at Target Year}}$$

Factor X is calculated because the summation of saving calculated from formula F is very less as compared to the allotted saving to the sub sector. So the saving potential of each DC in the group has been extended by factor X.

Step 10:

$$\% \text{ Reduction in Baseline SEC } X = \text{Multiplication Factor } X \text{ Relative SEC}$$

Step 11:

$$\text{Target for Each Individual DC } X = \left(1 - \frac{\% \text{ Reduction in Baseline}}{100} \right) \times \text{Baseline GtG SEC}$$

Step 12:

$$\begin{aligned} \text{Estimated Total Saving (TOE)} \\ = (\text{Baseline SEC} - \text{Target SEC}) \times \text{Baseline Production (Tonne)} \end{aligned}$$

6. Book Coverage

The normalization equation will be discussed in details in the different sections of Integrated Steel Plant (ISP) sub-sector and Sponge Iron (SI) sub-sector. The different process of Sponge Iron subsector covered are

- Sponge Iron
- Sponge Iron with Steel Melting Shop
- Sponge Iron with Steel Melting Shop and Others
- Sponge Iron + SMS + Others
- Ferro Alloy
- Ferro Chrome
- Mini Blast furnace
- Steel Processing Unit

A. Sponge Iron

7. Normalization/Correction factor

There are several factors that need to be taken into consideration on capacity utilization of DCs for Normalization of a product under PAT rules, so that the undue advantage or disadvantage could not be imposed on DC. There are many factors, which can influence the Specific Energy Consumption (SEC) of a DC, are listed below:

- 7.1 Normalization for Start & Stop of the furnace
- 7.2 Product Mix
- 7.3 Import & Export of Intermediary product
- 7.4 Normalization for Scrap Use
- 7.5 Power Mix (Imported & Exported from/