



Perform Achieve & Trade

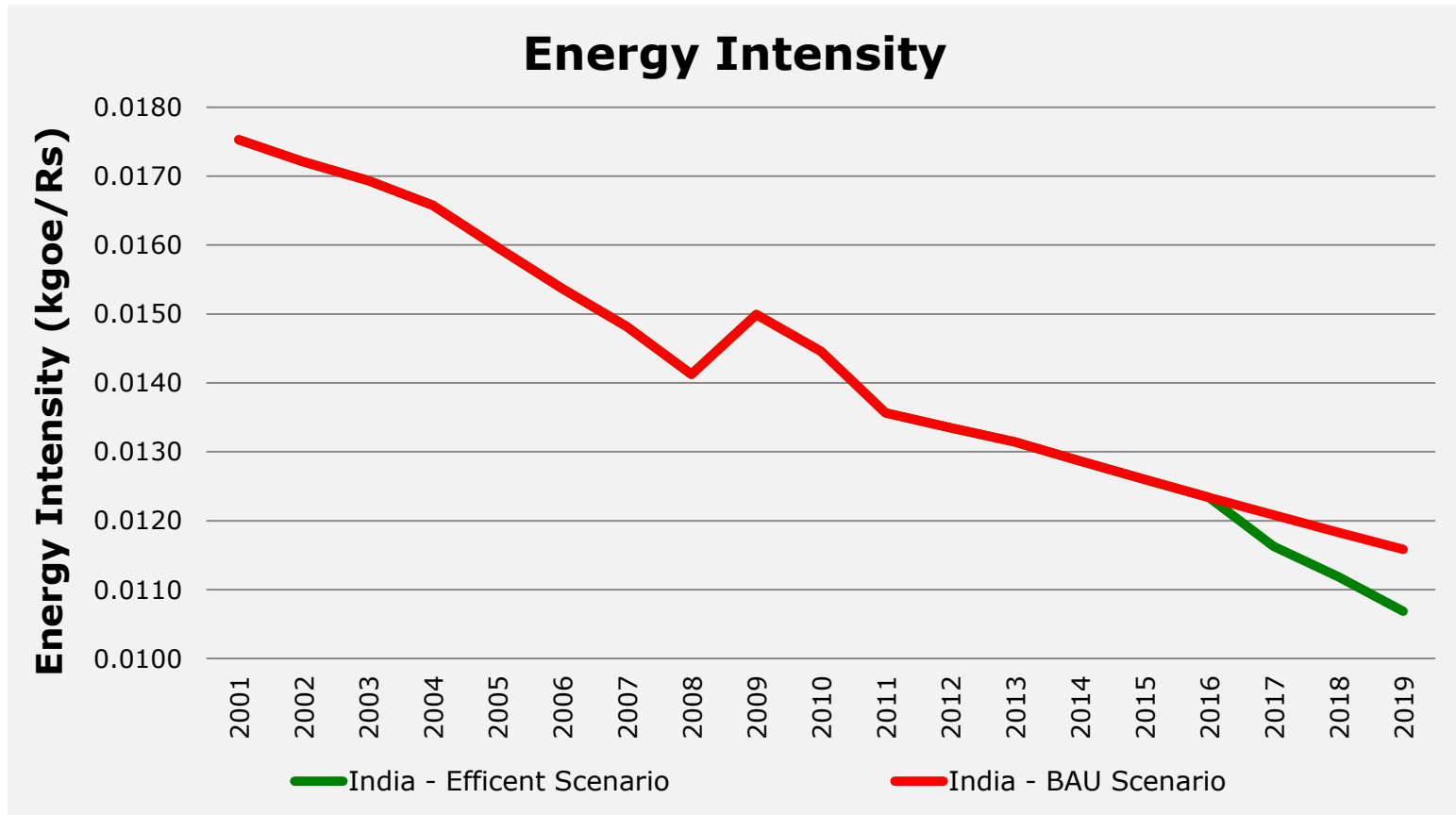
Cycle II – The Next Step Forward

New Delhi

13th Jun 2016

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GIZ/BEE

Expected Impact

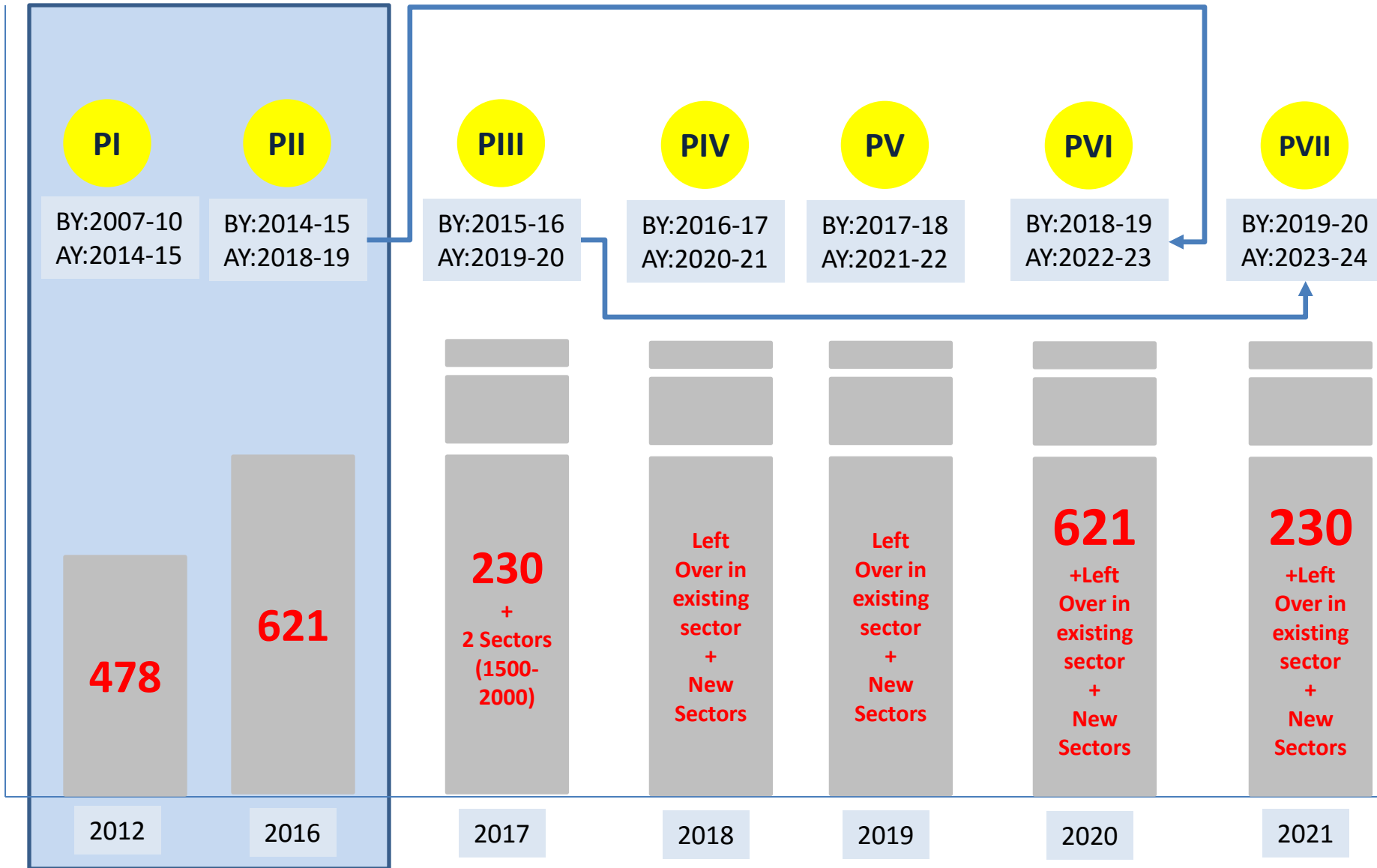


Total Avoided Capacity - 28,600 MW

Annual Fuel savings - 44 million toe

Energy Intensity is the ratio of total primary energy supply to GDP of the country

PAT II and Beyond (Rolling Cycle)



market transformation due to PAT

Common Areas of Investment

Energy Efficient Technologies and Processes

Power, Steel, Cement, Fertiliser, Pulp & Paper, Aluminium, Chlor Alkali, Textile

Waste Heat Recovery/ Co Generation

Steel, Cement, Pulp & Paper, Aluminium, Chlor Alkali, Textile

High Pressure Boiler for Optimum power output

Pulp & Paper, Aluminium, Textile

Alternate Fuel and Raw Material

Steel, Cement, Pulp & Paper, Aluminium, Chlor Alkali, Textile

Renewable Energy

Steel, Cement, Pulp & Paper, Aluminium, Chlor Alkali, Textile

Biomass as Fuel

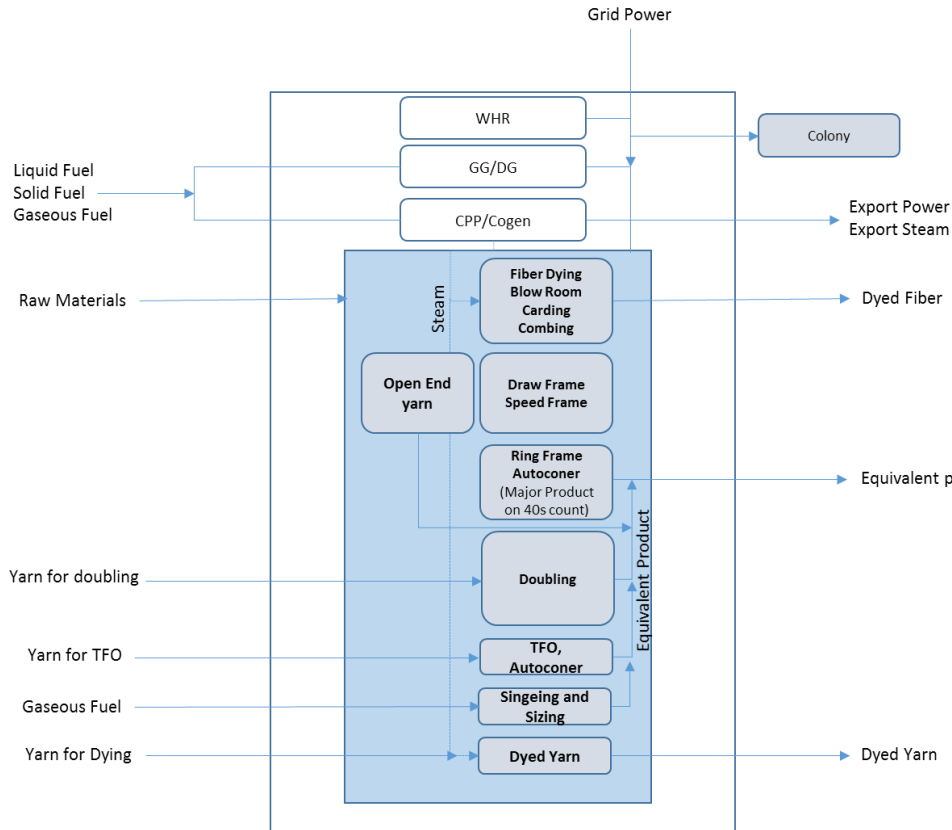
Steel, Cement, Pulp & Paper, Aluminium, Chlor Alkali, Textile

Topics

- 1 Understanding Sector Specific Pro-forma
- 2 Normalisation Factors
- 3 Examples (Products Mix)

1 Understanding Sector Specific Form I

Gate to Gate Boundary



- ☐ Output Product: Equivalent Product in tonnes
- ☐ Input Net Energy: Fuel and Power in tonnes of oil equivalent

Specific Energy Consumption (SEC) is the division of Input Net Energy by Output Equivalent Product

$$SEC = \frac{\text{Input Net Energy}}{\text{Output Equivalent Product}}$$

toe/Te

Form I- An Insight

The Energy Conservation (Form and Manner for submission of Report on the Status of Energy Consumption by the Designated Consumers) Rules, 2007 directs every designated consumers to submit the status of energy consumption in electronic form as well as hard copy, within three months, to the designated agency with a copy to Bureau of Energy Efficiency at the end of the previous financial year in Form-1.

Form & Manner & Time for Furnishing Information with regard to Energy Consumed & Action Taken on Recommendation of Accredited Energy Auditor-Rule 2008 (After Mandatory Energy Audit Notification)

Pro-forma: Classification

PAT II

Industries

TPP

Railways

Discom

Cement

I&S

Textile

Aluminium

Pulp & Paper

Chlor Alkali

Fertilizer

Refinery

Coal Based

Gas Based

Zonal

Production Unit

Discom

ISP

Sponge Iron

Spinning

Composite

Processing

Fibre

Refinery & Smelter

Cold Sheet

Pro-forma: Highlights

- **Sector Specific Pro-forma**
 - Customised for individual sector and Sub-sectors
 - 2 Different Pro-form (S_{j1} & S_{j2}) for Railways subsector
(Zonal and Production Unit)
 - Additional data input field
 - Covers the basic data for Normalisation
 - Inbuilt Performance Index Calculation Sheet
 - Conditional approach for calculation
 - Formulae cells are locked due to data security and reliability

Pro-forma: Sections

Railways

- Instruction for Pro-forma filling (Locked)
- General Information Sheet
- Form I(Locked)
- Sector Specific Pro-forma (Formulae Cell Locked)
 - General data on Coaches, Tracks, Stations, Workshops
 - Traction (diesel/electricity) wise details of Passengers and good trains
 - Electricity and Renewable Consumption
 - Generation (DG/GG/GT/STG/Wind/Solar)
 - Fuel Consumption (Solid/Liquid/Gas/Biomass or Alternate Fuel)
 - Miscellaneous Data for Normalisation
- Additional Equipment installation due to Environmental Concern
- Project Activities details Sheet
- Power Sources Details
- Baseline Parameters (Locked)
- Summary Sheet (Locked)
- Normalization Calculation sheets (Locked)



Instruction for Data Filling

Instruction and Documentation for Form I filling

Sr No	Details	Note	Frequency of record	Primary Documents from where the information can be sourced and to be kept ready for verification by Accredited Energy Auditor	Secondary Documents from where the information can be sourced and to be kept ready for verification by Accredited Energy Auditor
Data to be filled up in the Excel Sheets- General Information, Form I-modified, Addl Eqp List-Env, Project Activities List					
A	Production and capacity utilization details				
A1	Please provide total annual production capacity of clinker of all kilns in Tonnes	Capacity of all the kilns	Annual	1) OEM Document of kilns capacity 2) Environmental Consent to establish/operate document	1) Equipment/Section wise capacity document from OEM 2) Capacity calculation document submitted for Enviromental Consent
A2	Please provide total annual production capacity of Cement (all grinding units within the plant) in Tonnes.	Capacity of all Cement Grinding Plant	Annual	1) OEM Document of Process line 2) Environmental Consent to establish/operate document	1) Equipment/Section wise capacity document from OEM 2) Capacity calculation document submitted for Enviromental Consent
A3	Please provide total Annual Production of clinker of all kilns in Tonnes.	Production of Clinker from all the kilns	Continuous, Hourly, Daily, Monthly	1) Log Sheet 2) CCR SCADA Report/ Trends 3) DPR 4) MPR 5) SAP Entry in PP/SD module 6) Excise record (ER1) 7) Annual Report	1)Silo Level 2) Feeding Weigh feeders 3) Belt Weigher 4) Solid flow meter
A4	Please provide total Annual Production of Cement (all grinding units, within the plant) in Tonnes.	Production of Cement from all Cement mills	Continouous, Hourly, Daily, Monthly	1) Log Sheet 2) CCR SCADA Report/ Ternds 3) DPR 4) MPR 5) SAP Entry in PP/SD module 6) Excise record (ER1) 7) Annual Report	1)Silo Level 2) Feeding Weigh feeders 3) Belt Weigher 4) Solid flow meter
A5	Please provide opening clinker stock in tonnes.	Record Opening and Closing stock on daily basis	Daily, Monthly	1) Inventory Report 2) Excise Document (ER1)3) Stores Entry 4) SAP Entry in MM/PP/SD module	
A6	Please provide closing clinker stock in tonnes.	Record Opening and Closing stock on daily basis	Daily, Monthly	1) Inventory Report 2) Excise Document (ER1)3) Stores Entry 4) SAP Entry in MM/PP/SD module	
A7	Please provide opening cement stock in tonnes.	Record Opening and Closing stock on daily basis	Daily, Monthly	1) Inventory Report 2) Excise Document (ER1)3) Stores Entry 4) SAP Entry in MM/PP/SD module	Packing Plant records
A8	Please provide closing cement stock in tonnes.	Record Opening and Closing stock on daily basis	Daily, Monthly	1) Inventory Report 2) Excise Document (ER1)3) Stores Entry 4) SAP Entry in MM/PP/SD module	Packing Plant records



General Information

General Information

Form-1 (General Information)

Sector :- Textile Sector

1	Name of the Unit			
2	Year of Establishment			
3	Plant Contact Details & Address			
a	City/Town/Village			
	Post Office			
	District			
	State			Pin
	Telephone		Fax	
b	Plant's Chief Executive Name			
	Designation			
	Telephone with STD Code		Fax	
	Mobile		E-mail	-
4	Registered Office			
a	Company's Chief Executive Name			
	Designation			
	Address			
	City/Town/Village			
	Post Office			
	District			
	State			Pin
	Telephone with STD Code		Fax	
5	Energy Manager Details			
a	Name			
	Designation		Whether EA or EM	
	EA/EM Registration No.			
	Telephone		Fax	
	Mobile		E-mail ID	-

Draft : Pro-forma

Form Sj1 (Pro-forma for Zonal Railways)

Sector		Railways			
Sub-Sector		Zonal Railways			
Name of the zonal railways notified as Designated Consumers					
Sr No	Particluars	Basis/Formulae	Unit	Previous Year Year:	Current Year Year
A	Route Kilometers				
A1	Route Kilometers Broad Gauge (Plains)		Km		
A2	Route Kilometers Broad Gauge (Hilly Terrain)		Km		
A3	Electrified Route Kilometers		Km		
A4	Non Electrified Route Kilometers		Km		
B	No of Trains				
B1	No of Diesel Locomotives		No.		
B2	No of Electric Locomotives		No.		
B3	No of Goods Train		No.		
B4	No of Passenger Train		No.		
B5	No of Mail Train		No.		
B6	No of Superfast Train		No.		
B7	No of Express Trains		No.		
B8	No of trains running on Hilly Terrain		No.		
C	Type of Coaches				
C1	No of AC coaches		No.		
C2	No of Non AC coaches		No.		
D	Stations/Divisions/Workshops				
D1	No. of Stations		No.		
D2	No. of Divisions		No.		
D3	No. of Carriage and Wagon Repair Workshop		No.		
E	Sheds				
E1	No. of Electric loco Sheds		No.		
E2	No. of Diesel loco Sheds		No.		
E3	No. of Coaching Depots		No.		
F	Gross Tonne Kilometrage				
F1	Gross Tonne Kilometrage, Electric (Passenger)		1000GTKm		
F2	Gross Tonne Kilometrage, Electric (Goods)		1000GTKm		
F3	Gross Tonne Kilometrage, Diesel (Passenger)		1000GTKm		
F4	Gross Tonne Kilometrage, Diesel (Goods)		1000GTKm		
G	Passenger				
G1	No. of Passengers		Millions		
G2	Avg Weight of Passenger for calculating Gross Tonnage		Kg		

Draft : Pro-forma

I	Electricity Consumption				
I.1	Electricity through Grid / Other (Including colony and others)				
(i)	Purchased Electricity from grid (SEB)	Annual	Lakh kWh	0	
(ii)	Renewable Electricity (Through Wheeling)	Annual	Lakh kWh	0	
(iii)	Electricity from CPP located outside from plant boundary (Through Wheeling)	Annual	Lakh kWh		
(iv)	Renewable Purchase obligation of plant (RPO) (Solar & Non-Solar)	Annual	%		
(v)	Renewable Purchase obligation of plant (RPO) (Solar & Non-Solar)	Annual	Lakh kWh		
(vi)	Renewable Purchase obligation of plant (RPO) (Solar & Non-Solar)	Annual	MW		
(vii)	Renewable Energy generator as approved by MNRE	Annual	MW		
(viii)	Quantum of Renewable Energy Certificates (REC) obtained as a Renewal Energy Generator (Solar & Non-Solar)	Annual	MWh		
(ix)	Quantum of Energy sold under preferential tariff	Annual	MWh		
(x)	Plant Connected Load		kW		
(xi)	Contract Demand with utility		kVA		
(xvi)	Total Electricity Purchased from grid/ Other	C.1 (i)+ C.1(ii)+ C.1(iii)	Lakh kWh	0	
(xvii)	Total Electricity Purchased from grid/ Other with out colony/construction power etc	if(C.1 (xvi)> C.5 then C.1 (xvi)- C.5 otherwise 0	Lakh kWh	0	
(xviii)	Equivalent Thermal Energy of Purchased Electricity from Grid / Other without colony/construction power etc	(vii)x860/10	Million kcal	0	

Draft : Pro-forma

D	Solid Fuel Consumption				
D.1	Coal (Indian)				
(i)	Landed Cost of fuel (Last purchase)	Basic Cost+Taxes+Freight	Rs/Tonne		
(ii)	Average Gross calorific value (Power generation)	Annual (As Fired Basis)	kcal/ kg		
(iii)	Average Gross calorific value (Process)	Annual (As Fired Basis)	kcal/ kg		
(iv)	Quantity purchased	Annual	Tonne		
(v)	Average Moisture in Fuel	Annual(As Received Basis)	%		
(vi)	Quantity used for power generation	Annual	Tonne		
(vii)	Quantity used for process (if any)		Tonne		
(viii)	Quantity used in Station				
(ix)	Quantity used in Workshop				
(x)	Total Quantity Consumed	(vi)+(vii)	Tonne	0	
(xi)	Thermal Energy Used in Power Generation	(ii)x(vi)/1000	Million kcal	0	
(xii)	Thermal Energy Used in Process	(iii)x(vii)/1000	Million kcal	0	
(xiii)	Thermal Energy Used in station	(iii)x(vii)/1000	Million kcal	0	
(xiv)	Thermal Energy Used in workshop	(iii)x(vii)/1000	Million kcal	0	

2 Normalization Factors

Normalization Factor

- Normalisation is a very important and rational process of modifying energy data in order to account for changes in quantifiable variables that impacts energy performance and static factors to compare energy performance under equivalent conditions
- There are several factors that need to be taken into consideration in the assessment year such as change in product mix, capacity utilization, change in fuel quality, import/export of electricity etc.
- The undue advantage or disadvantage could not be imposed on a DC while assessing the performance in the assessment year as compared to the baseline year for any change in above factors.

Normalization Factors- Broad Categorization in all sectors

- **Capacity Utilization**
 - **Availability of Fuel/Raw Material** (Effect on Capacity Utilisation)
 - **Natural Calamity/Rioting/Social Unrest/Labor Strike/Lockouts** (Effect on Capacity Utilisation)
 - **Start/Stop**
- **Product Mix & Intermediary Product** (Import/Export)
- **Fuel Mix (Pet Coke Utilization in Kiln)**
- **Power Mix** (Imported & Exported from/ to the grid and self-generation from the captive power plant)
- **Fuel Quality in CPP**
- **Low PLF in CPP**
- **Raw Material Quality**
- **Environmental Concern** (Additional Environmental Equipment requirement due to major change in government policy on Environment)
- **Biomass/Alternate Fuel Unavailability**
- **Construction Phase or Project Activities**
- **Addition of New Line/Unit** (In Process & Power Generation)
- **Unforeseen Circumstances**
- **Renewable Energy**

External Factors for Normalisation

- **Market Demand**
- **Grid Failure/Breakdown** (Grid not Sync with CPP)
- **Raw Material Unavailability**
- **Natural Disaster** (Flood, Earthquake etc)
- **Major change in Government policy** (Hampering plant's process system)
- **Unforeseen Circumstances** (Labour Strike/Lockouts/Social Unrest/Riots)

Normalization Factors- Proposed for Railways sector

- **Line Capacity Utilization**
- **Product Mix & Intermediary Product** (Different type of Goods Wagon)
- **Changes in nos of AC coaches**
- **Power Mix** (Imported & Exported from/ to the grid and self-generation from the captive power plant)
- **Average Speed Changes (Including Nos of halts)**
- **Increase in nos of stations/workshops**
- **Environmental Concern** (Additional Environmental Equipment requirement due to major change in government policy on Environment)
- **Biomass/Alternate Fuel Unavailability**
- **Construction Phase or Project Activities**
- **Addition of New Line/Unit** (In Process & Power Generation)
- **Unforeseen Circumstances**
- **Renewable Energy**

Monitoring and Verification

- ▶ A reliable monitoring, reporting and verification (M&V) system forms the backbone of assessment process of the PAT scheme
- ▶ The objective of the M&V system is to streamline the activities to be carried out for verifying the energy performance achieved by the Designated Consumer in the target year.
- ▶ The Assessment of performance verification involves an independent evaluation of each activity undertaken by the DCs for compliance under PAT rules
- ▶ Verification plays a crucial role in maintaining the integrity of the scheme and ensuring transparent validation.

Monitoring

- Quarterly, Yearly and End of Cycle Data Monitoring by DCs
- Energy Efficiency Project Monitoring
- Internal Energy Audit Reports

Reporting

- Reporting the Annual data yearly from Baseline year to assessment year through different Forms
- Through Sector Specific Pro-forma & Form I
- Form A, Form B

Verification

- The verification process will ensure that the information and data in Form 1 and Pro-forma are free from material omissions, misrepresentations and errors
- The verification must be completed between 1st April to 30th June of the year, following the assessment year

Way Forward

Document Prepared

- BEE** ▶ **Sector Specific Pro-forma**
- BEE** ▶ **Normalisation Formulae & Document**
- BEE** ▶ **Monitoring and Verification (M&V) Guidelines**
- AEA** ▶ **Reporting Format for M&V (Verification Report)**
- SDA** ▶ **Check List**

Important Document for M&V

- ✓ Accepted Baseline Audit Report (Available with BEE and DC)
- ✓ Form 1 & Sector Specific Pro-forma
- ✓ Form A,B,C,D as covered in PAT rules
- ✓ Normalisation Factors Document available with BEE
- ✓ Normalisation Guidelines Document available with BEE
- ✓ Check List to be used by all stakeholders
- ✓ Reporting Format for EmAEA

Trading

- ▶ **Draft**
 - ▶ CERC regulation
 - ▶ Exchange Business Rules
- ▶ **Platform**
 - ▶ Fees and Structure
 - ▶ Interlinking

EC Act 2010 Amendments

- ▶ **Committee setup**
 - ▶ Change in Energy definition
 - ▶ Renewable Energy advantage
 - ▶ Inclusion of New Sector

PAT III

- ▶ **Two sectors identified**
 - ▶ Petro-chemicals
 - ▶ 24 hours running building
- ▶ **Standard Operating Procedure (SOPs)**
- ▶ **ISO 9001 for PAT**

PAT I Forward

ESCerts Issuance

PATNet Data Verification, MoP Approval, Software Updates

Expected by June 2nd Week

ESCerts Trading

CERC Regulation, Exchange Business rules

Expected to start from July 2016

Check-Verification

Guidelines frame out, Identification for check-verification

From June 16 onwards

Capacity Building

Trainer's Training, EmAEA capacity building on MRV

Selection Procedure, Training Manual

Expected to start from Sept 2016



Product Normalisation Concept

Product Mix

Need to Normalization

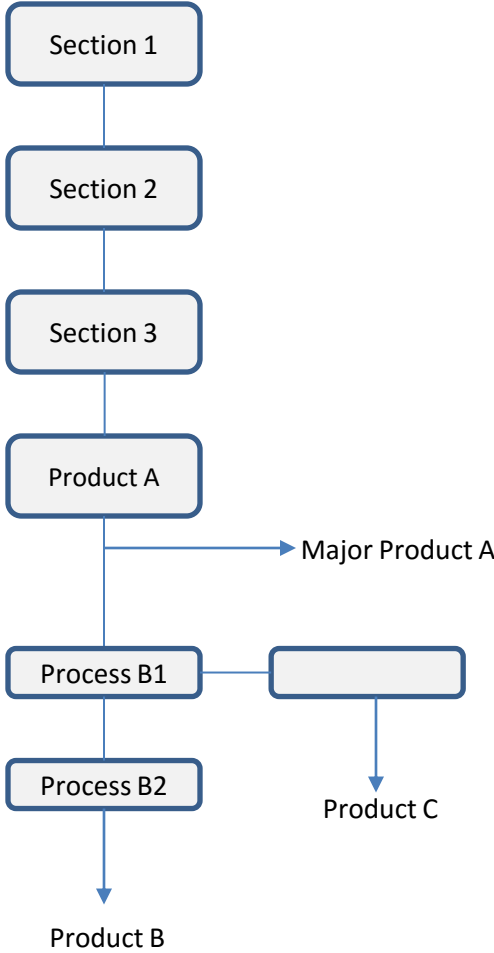
- Product mix (some products consume higher energy whereas other consume comparatively less) may change in Assessment year w.r.t. baseline year.
 - For all the Product mix change in assessment year with respect to Baseline year, there is a need to develop and impose proper Normalisation factors, so that any change in the product mix could be nullified and the concerned plant should not suffer / or gain advantage due to this change only.
- Partially processed product import by the plant (for which part of the energy is not required to be used by the plant) and export from the plant for which energy has been used but it is not taken into account in the final product
 - For example, a Composite plant can import or export Yarn, which is an intermediately product but not the final product i.e., Yarn, may change

Product Mix

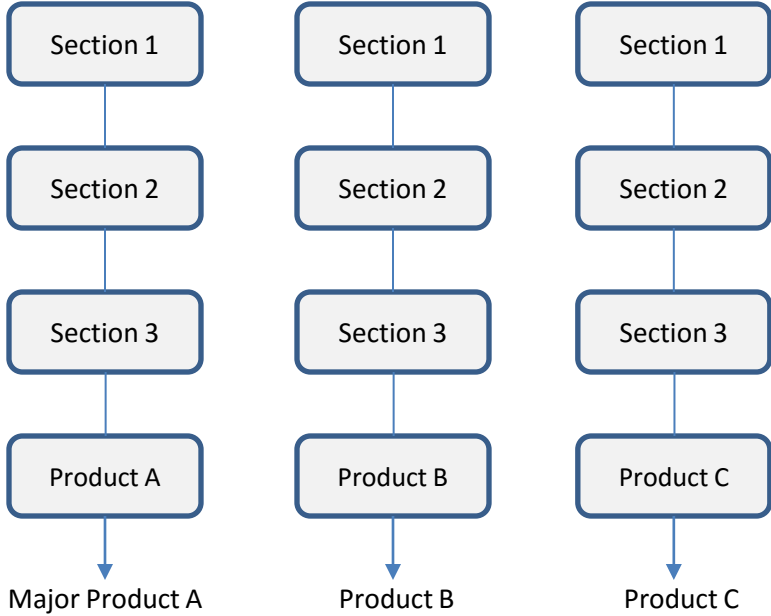
- ❑ Production quantity is an important relevant variable, but is often difficult to determine; especially for an organization producing various products, since the quantity unit and SEC differs between products
- ❑ Annual Sales differs in the Assessment years compared to the Baseline Year due to many external factors such as Market Demand, Socio Economic Condition, Government Policy etc. Such external factors sometimes affect the production quantity ratio of the organization

Product Mix

Series Production



Parallel Production



Product Mix

Item	Unit	BY	AY	Normalisation AY	Remarks
Production A	t/y	20000	30000	30000	
SEC A	GJ/t	3.349	3.349	3.349	
Production B	1,000p/y	6000	6000	6000	
SEC B	GJ/1,000p	8.374	8.211 ↓	8.211	978
Production C	km/y	4000	4000	4000	
SEC C	GJ/km	3.14	2.101 ↓	2.101	4156
Plant Energy Consumption					
Energy A	GJ/y	66980	100470	100470	
Energy B	GJ/y	50244	49266	49266	
Energy C	GJ/y	12560	8404	8404	
Plant Energy Consumption	GJ/y	129784	158140	158140	
Energy Factor					
Energy Factor B to A (SEC B/SEC A)		2.5004	2.4518	2.5004	SEC Factor as BY
Energy Factor C to A(SEC C/SEC A)		0.9376	0.6274	0.9376	SEC Factor as BY
Major Product					
Major Product A	t/y	20000	30000	30000	
Equivalent product B to Major A (Energy Factor B to A*Production B)	t/y	15003	14710.7	15003	
Equivalent product C to Major A(Energy Factor C to A*Production C)	t/y	3750	2509.4	3750	
Total Equivalent Major Product	t/y	38753	47220.1	48753	
Specific Energy Consumption					
SEC (Plant Energy Consumption/ Total Equivalent Major Product)	GJ/t	3.349	3.349	3.2437	Normalised SEC
SEC Difference (Reporting Year-Baseline Year)	GJ/t			0.1053	
Normalised Energy Savings (SEC Difference * Total Equivalent Major Product)	GJ/y			5134	

Product Mix

Item	Unit	BY	AY	Normalisation AY	Remarks
Production A (major product)	t/y	20000	30000	30000	
SEC A	GJ/t	3.349	2.791	2.791	16740
Production B	1,000p/y	6000	5000	5000	
SEC B	GJ/1,000p	8.374	9.211	9.211	-4185
Production C	km/y	4000	4050	4050	
SEC C	GJ/km	3.14	3.101	3.101	156
Plant Energy Consumption					
Energy A	GJ/y	66980	83730	83730	
Energy B	GJ/y	50244	46055	46055	
Energy C	GJ/y	12560	12559.05	12559	
Plant Energy Consumption	GJ/y	129784	142344.05	142344	
Energy Factor					
Energy Factor B to A (SEC B/SEC A)		2.5004	3.3003	2.5004	SEC Factor as BY
Energy Factor C to A (SEC C/SEC A)		0.9376	1.1111	0.9376	SEC Factor as BY
Major Product					
Major Product A	t/y	20000	30000	30000	
Equivalent product B to Major A (Energy Factor B to A*Production B)	t/y	15003	16501.3	12502	
Equivalent product C to Major A(Energy Factor C to A*Production C)	t/y	3750	4499.8	3797	
Total Equivalent Major Product	t/y	38753	51001.1	46299	
Specific Energy Consumption					
SEC (Plant Energy Consumption/ Total Equivalent Major Product)	GJ/t	3.349	2.791	3.0744	Normalised SEC
SEC Difference (Reporting Year-Baseline Year)	GJ/t			0.2746	
Normalised Energy Savings (SEC Difference * Total Equivalent Major Product)	GJ/y			12712.95	

Product Mix

Methodology

- ❑ The Specific Energy Consumption (SEC) should be known for each product
- ❑ The methodology will be used for Parallel and Series line production
- ❑ One major product to be chosen among the products for parallel line production, the product which is sold out will be included after conversion into the equivalent product
- ❑ For Series production major product is fixed, all the products or value added product will be converted to the major product with the help of specific energy consumption (SEC) factor
- ❑ The Energy factor of baseline will be used to convert other products to the major product in the Assessment Year
- ❑ The Major product will be kept same in the Assessment Year as of Baseline Year

Conclusion

- The target setting methodology elaborated the wide bandwidth of specific energy consumption among the plant. This itself depicts the potential of Energy saving opportunities.
- PAT could be instrumental in harnessing the saving potential exist in the plant by employing different management techniques, upgraded technologies, best available practices and technologies through economical viable projects.
- Normalization of Plant parameters in the assessment year w.r.t. the baseline year is a process so as to avoid any favorable or negative impact on the specific energy consumption of the plant.
- This will also assist on evaluating the correct impact of the energy efficiency projects implemented by the plant.
- Once the Normalization factors are activated, it automatically brings all the plants under one platform. This will be another big step in terms of benchmarking the Industries as a whole.

Thanks