PAT Scheme & Way Forward – CCTS Scheme

लुग्दी एंवम कागज़ सेक्टर:

Pulp & Paper Sector

प्रवहणी:

नवीन कुमार/Naveen Kumar

ऊर्जा दक्षता ब्यूरो/Bureau of Energy Efficiency

13th February 2024 | Amritsar, Punjab

Presentation Outline

1. PAT Overview
2. Role of Paper Industry in achieving India's advance towards De-carbonization
3. About Indian Carbon Market – CCTS

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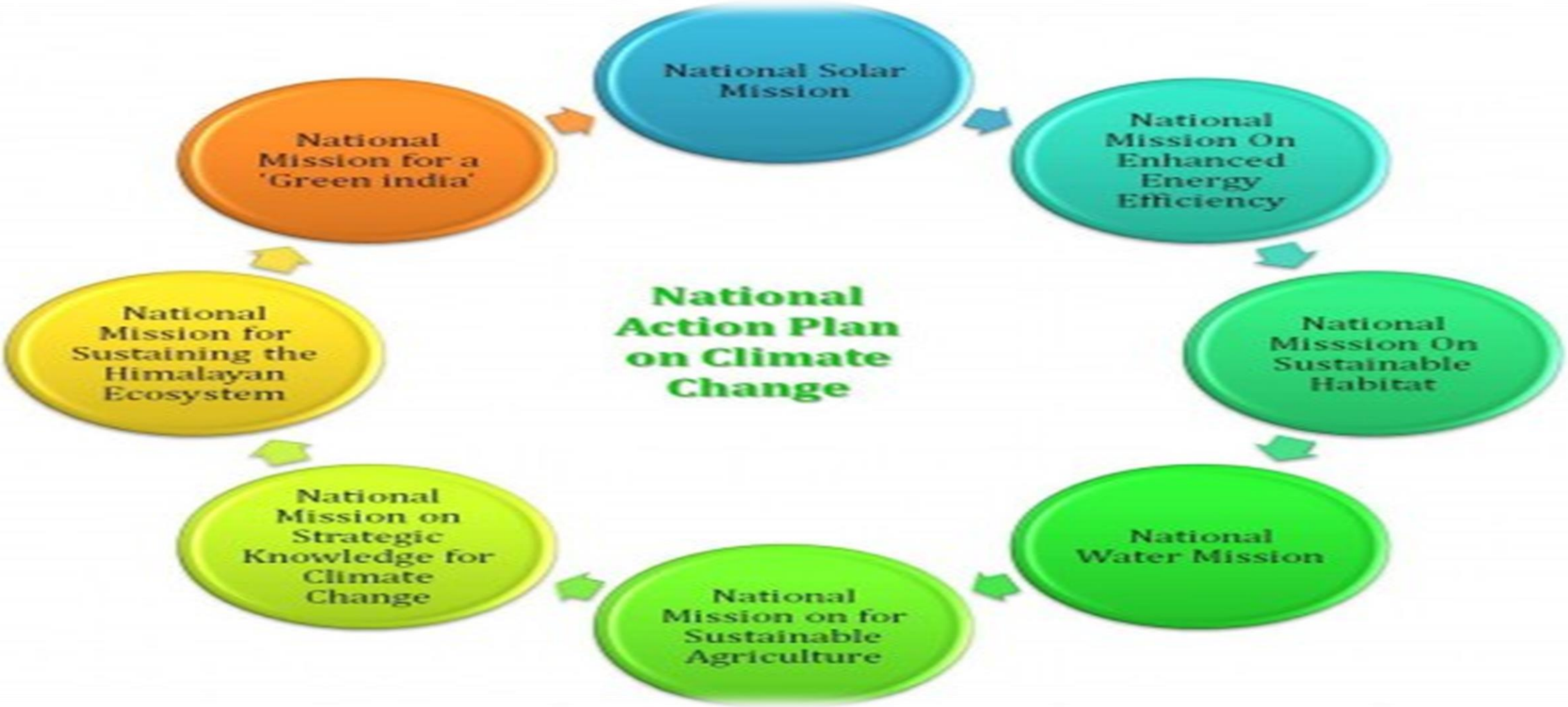
PAT Scheme Overview

Bureau of Energy Efficiency

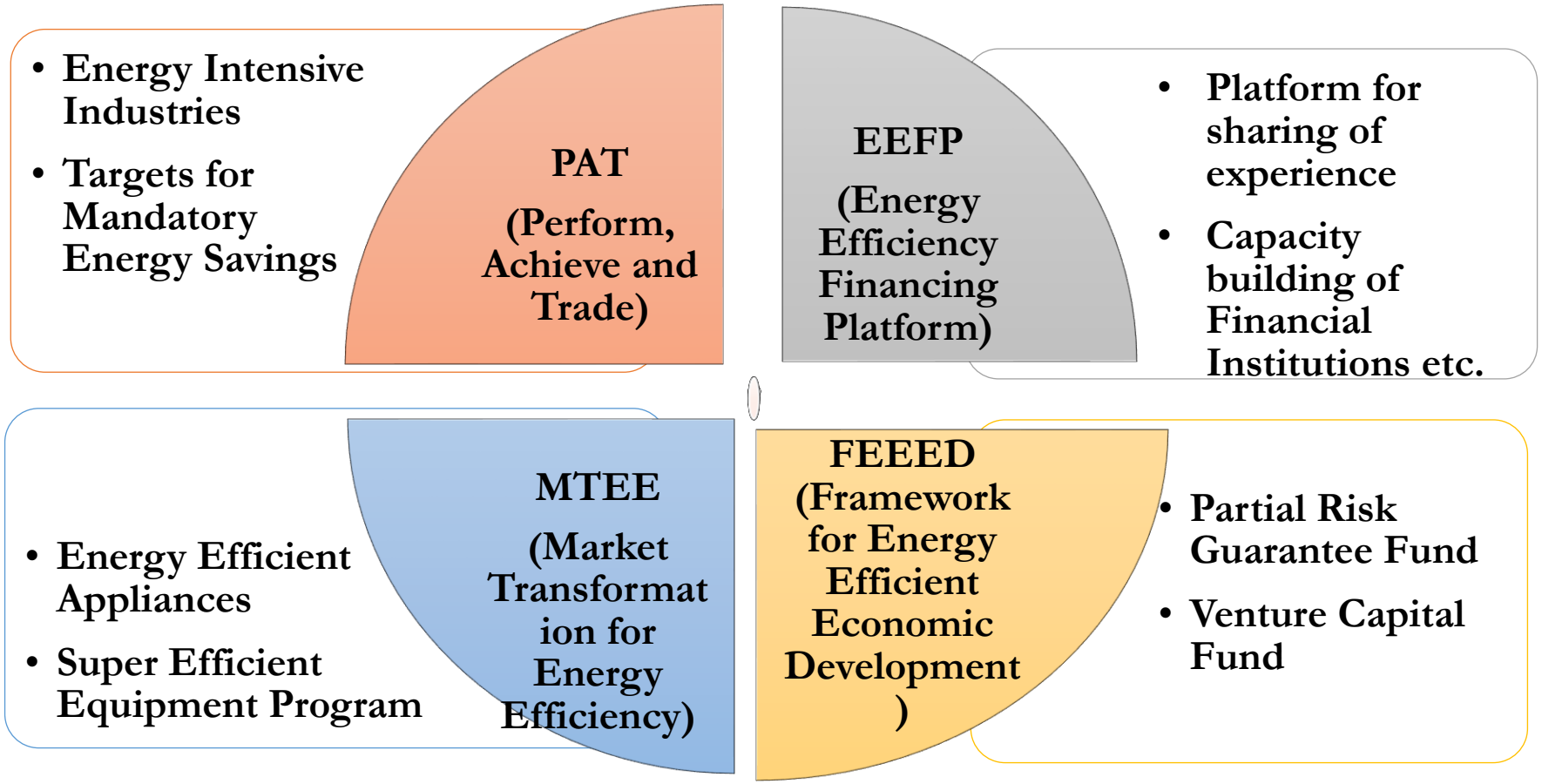
Ministry of Power

NMEEE


National Solar Mission
National Mission On Enhanced Energy Efficiency
National Misssion On Sustainable Habitat
National Water Mission
National Mission on for Sustainable Agriculture
National Mission on Strategic Knowledge for Climate Change
National Mission for Sustaining the Himalayan Ecosystem
National Mission for a 'Green india'
National Action Plan on Climate Change

Background

A Mission under National Action Plan on Climate Change (NAPCC)



Perform, Achieve and Trade

Perform Achieve and Trade (PAT): A **regulatory instrument** to reduce specific energy consumption in energy intensive industries, with an associated **market based mechanism** to enhance the cost effectiveness through certification of excess energy saving which can be traded.

Background

Regulatory Framework

- **Energy Conservation (EC) Act 2001**
- **Norms for Energy Intensive Industries**
- Standard & Labeling
- Energy Conservation Building Code
- Demand Side Management
- Certification of Energy Professionals

EC Act Empowers Central Government w.r.t to PAT :-

- Establish Energy Consumption norms and standards for Designated Consumers (DCs).
- Direct DCs to comply with above norms and standards.
- Issue ESCerts to DCs who overachieve for trading

Background

Sectoral Coverage

Criteria for Identification of Sectors

- Listed in Schedule of EC Act.
- Intensity or quantity of energy consumed.
- Amount of investment needed.
- Capacity to invest.
- Availability of energy efficient technology.

Sectors in PAT Cycle I-VIII (2012-23)

1. Aluminum;
2. Fertilizers;
3. Iron and Steels;
4. Cement;
5. Pulp and Paper;
6. Chlor Alkali;
7. Sugar;
8. Textile;
9. Chemicals;
10. Railways;
11. Port Trust
12. Transport Sector (Industries and Services)
13. Petrochemical, Gas Crackers, Naphtha Crackers and Petroleum Refinery
14. Thermal Power Stations, Hydel Power Stations, Electricity transmission companies and distribution companies;
15. Commercial Buildings or Establishment

Sectoral Coverage as per EC Act 2001

As per EC Act 2001 Schedule II	As per Amendment in Schedule II of EC Act 2001 (vide S.No. 09 (E) dt. 3rd Jan 2022	As per Amendment in Schedule II of EC Act 2001 (vide S.No. 2523 (E) dt. 6th Jan 2023
1. Aluminum; 2. Fertilizers; 3. Iron and Steels; 4. Cement; 5. Pulp and Paper; 6. Chlor Alkali; 7. Sugar; 8. Textile; 9. Chemicals; 10. Railways; 11. Port Trust; 12. Transport Sector (Industries and Services); 13. Petrochemical, Gas Crackers, Naphtha Crackers and Petroleum Refinery; 14. Thermal Power Stations, Hydel Power Stations, Electricity transmission companies and distribution companies; 15. Commercial Buildings or Establishment.	1. Aluminum; 2. Fertilizers; 3. Iron and Steels; 4. Cement; 5. Pulp and Paper; 6. Chlor Alkali; 7. Sugar; 8. Textile; 9. Chemicals; 10. Railways; 11. Port Trust 12. Transport Sector (Industries and Services) 13. Petrochemical, Gas Crackers, Naphtha Crackers and Petroleum Refinery 14. Thermal Power Stations, Hydel Power Stations, Electricity transmission companies and distribution companies; 15. Commercial Buildings or Establishment. 16. Ceramic; 17. Glass; 18. Zinc; 19. Copper; 20. Mines Including exploration.	22. Dairy; 23. Automobile Assembly Units; 24. Tyre Manufacturers; 25 Forging; 26. Foundry; 27. Refractory;

PAT Family…

Sector / No. of DCs	PAT Cycle I (FY'12-15)	PAT Cycle II (FY'16-19)	PAT Cycle-III (FY'17-20)	PAT Cycle-IV (FY'18-22)	PAT Cycle- V (FY'19-22)	PAT Cycle-VI (FY'20-23)	PAT Cycle-VII (FY'22-25)	PAT Cycle-VIII (FY'23-26)	Total Notified DCs Notified till Apr'2023
Aluminum	10	12	1	-	1	-	12	1	14
Cement	85	111	14	1	12	37	120	25	200
Chlor- Alkali	22	24	-	2	2	-	24	1	29
Fertilizer	29	37	-	-	-	-	0	0	37
Iron & Steel	67	71	29	35	23	5	134	66	270
Paper & Pulp	**31**	**29**	**1**	**2**	**8**	**2**	**24**	**7**	**55**
Textile	90	99	34	7	16	7	120	38	206
Thermal Power Plant	144	154	37	17	17	-	152	0	239
Refinery	-	18	-	-	-	20	0	0	20
Railways	-	22	-	-	-	-	26	0	26
DISCOMs	-	44	-	-	-	-	95	0	96
Petrochemical	-	-	-	8	-	-	0	0	8
Buildings	-	-	-	37	31	64	0	0	133
Total	**478**	**621**	**116**	**109**	**110**	**135**	**707**	**138**	**1333**

Process Flow

Step 1: Identification of Sectoral Threshold Level and Potential of Energy Saving for given Sector in EC Act.

Step 2: Identification of Prospective DCs in given sector and Conduct Baseline Audit.

Step 3: Fixation of Baseline Production, Baseline SEC and Target SEC for DCs whoever above sectoral Threshold.

Step 4: PAT Cycle of 3 years initiated for DC to achieve the Target SEC

Step 5: Conducting M&V Audit (to be carried out by DCs)

Step 6: Evaluation of M&V Audit Reports and all Forms.

Step 7: Finalize the DC Achieved SEC and accordingly finalize the Final No. of ESCerts for DC.

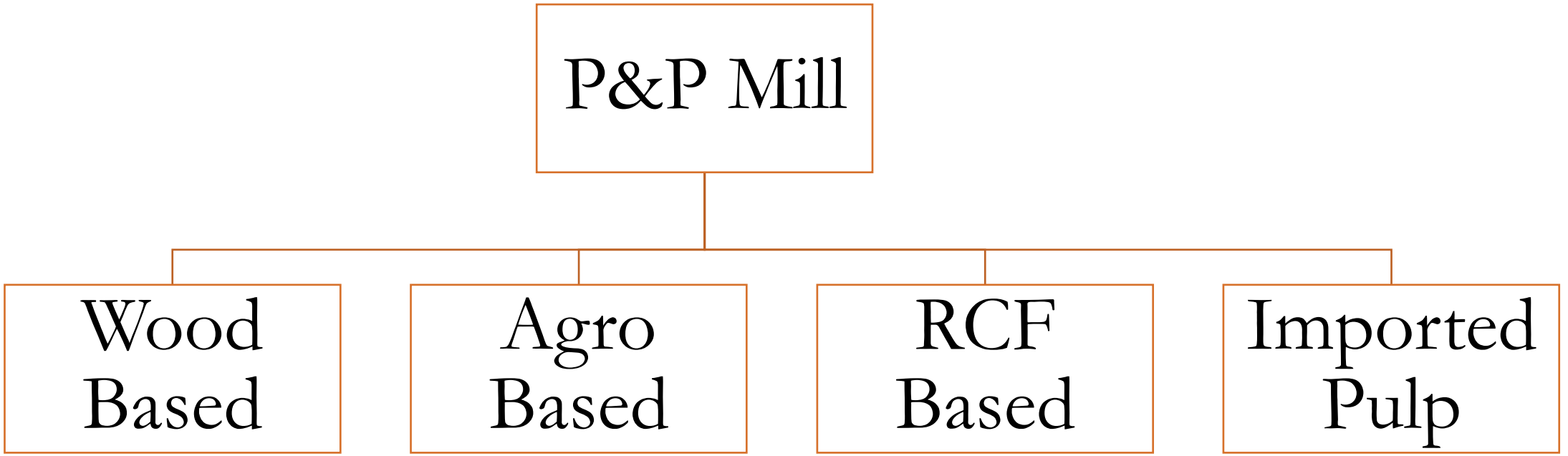
Step 8: Recommendation of ESCerts to MoP for issuance.

Step 9: ESCerts issuance on PATNET.

Step 10: Trading of ESCerts.

Step 11: New PAT Cycle.

Pulp & Paper Plant Classification



P&P Sector DCs in PAT Scheme	
Category	Total DCs
Wood Based	22
Agro Based	8
RCF Based	23
Imported Wood Pulp	2
Total	55

Type of Paper Manufactured	
Category	Type of Paper
Wood Based	Writing & Printing, Tissue Paper, Paper Board & Kraft Paper
Agro Based	Writing & Printing Paper, Tissue Paper, Biodegradable Food Packaging Paper, Kraft Paper
RCF Based	Paper Board & Kraft Paper
Imported Wood Pulp	Specialty Paper

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Role of Paper Industry in achieving India's advance towards De-carbonization"

Bureau of Energy Efficiency

Ministry of Power

Background

- In recent times, climate change has attracted global attention as it is transforming the overall ecological imbalance, threatening the very survival of mankind.

- Decarbonisation has gained immense importance recently with India's commitment in UNFCCC towards the goal to achieve net zero emission status by 2070. This entails intermediate goals to achieve 45% reduction in carbon intensity by 2030 through enhancement of efficiency in consumption of all possible energy sources.

- Pulp & Paper Sector is one of the energy intensive sector. The energy demand and total energy emissions for the sector is estimated to reach 12.62 mTOE and 42.87 $MtCO_2$ respectively by FY 2030-31 under business-as-usual scenario.

Pulp & Paper Sector Overview

Pulp & Paper Sector In India

No. of Mills	**- ~ 700**
Total Installed Capacity, million tons	**- 27.15**
Operating Installed Capacity, million tons	**- 23.64**
Production, million tons	**- 20.61**
Capacity Utilization %	**- ~87**
No. of Operational units	**- 526**
Per capita Consumption (kgs)	**- ~16.0**
Employment (million people)	**- 0.46**
Global Share	**- 4.72%**
Energy (million TOE)	**- ~15**

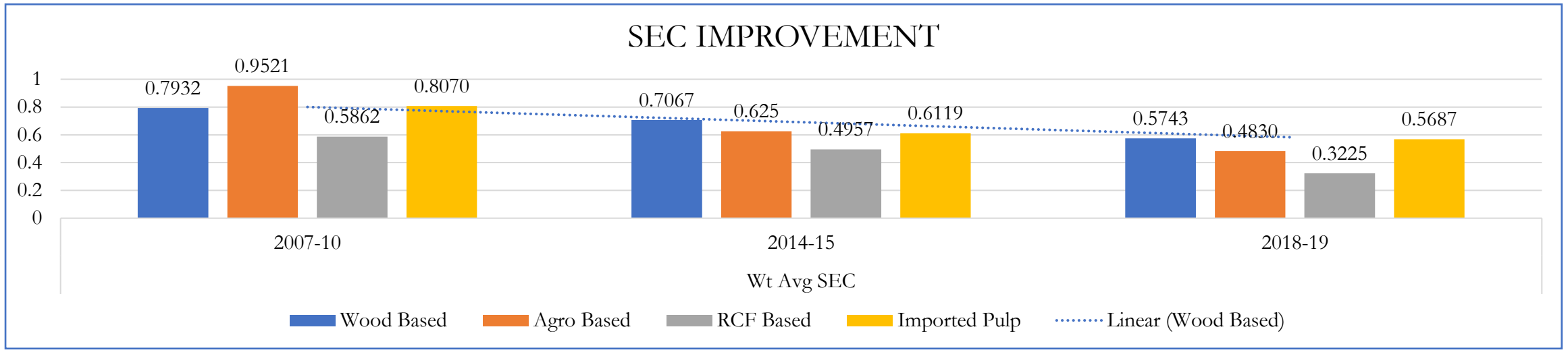
Pulp & Paper Sector under PAT Scheme

No. of Mills	- 55
Total Installed Capacity, million tons	- ~18
Operating Installed Capacity, million tons	- 15.35
Capacity Utilization, %	- ~85.28
Energy Consumption, million TOE	- 3.2

Pulp & Paper Sector under CCTS Scheme (Proposed: FY 2024-27)

No. of Mills	- 09
Total Emission, million tCO2	- 1.46
Total Production, million tons	- 1.04
Emission Intensity, tCO2/t	- 0.90 to 2.68

Pulp & Paper Sector: Energy Profile



S.No.	Category	Wt Avg SEC (TOE/T)			
		2007-10	2014-15	2018-19	2017-20
1	Wood Based	0.7932	0.7067	0.5743	0.5875
2	Agro Based	0.9521	0.625	0.4830	0.4795
3	RCF Based	0.5862	0.4957	0.3225	0.3208
4	Imported Pulp	0.8070	0.6119	0.5687	0.5687

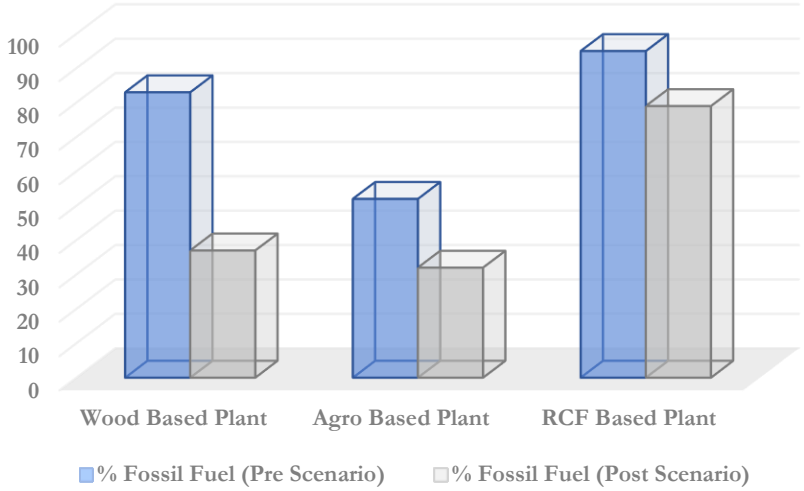
S.No.	Category	Electrical SEC (kWh/T)	Steam SEC (T/T)
1	Wood Based	750 - 900	5.5 – 7.5
2	Agro Based	500 – 800	4.5 – 6.0
3	RCF Based	250 - 450	1.5 – 3.5
4	Imported Pulp	450 - 600	2.5 – 4.5

Pulp & Paper Sector: Fuel Mix Pattern

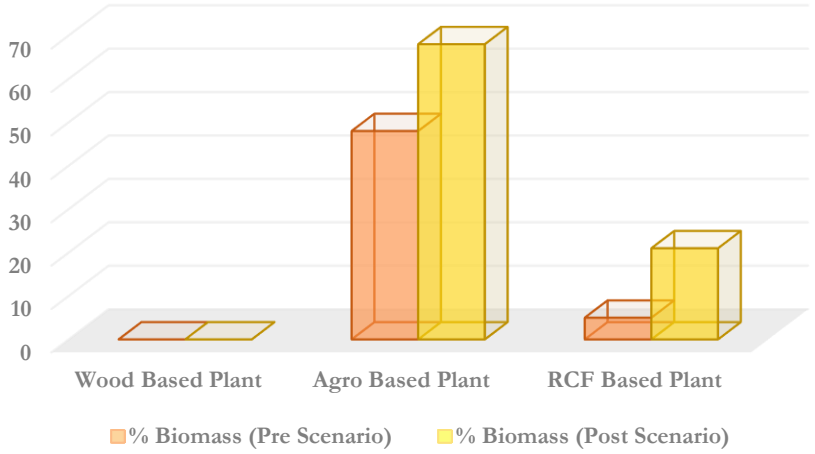
Prior PAT Scenario			
Category	% Fossil Fuel	% Biomass	% Process Waste
Wood Based Plant	83	0	17
Agro Based Plant	52	48	0
RCF Based Plant	95	5	0

Post PAT Scenario			
Category	% Fossil Fuel	% Biomass	% Process Waste
Wood Based Plant	37	0	63
Agro Based Plant	32	68	0
RCF Based Plant	79	21	0

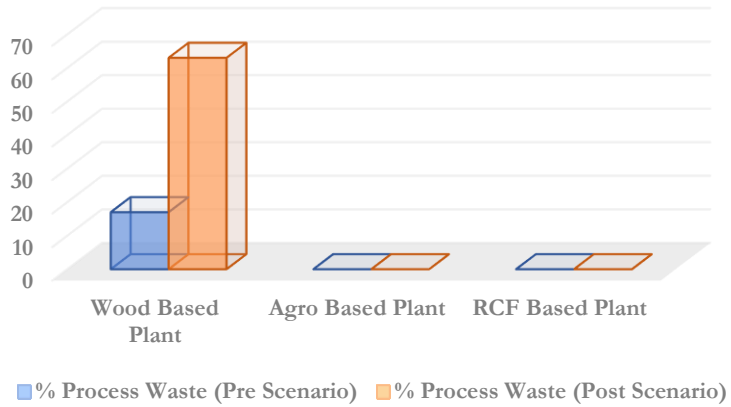
PAT Scheme: Fossil Fuel Share



PAT Scheme: Biomass Share

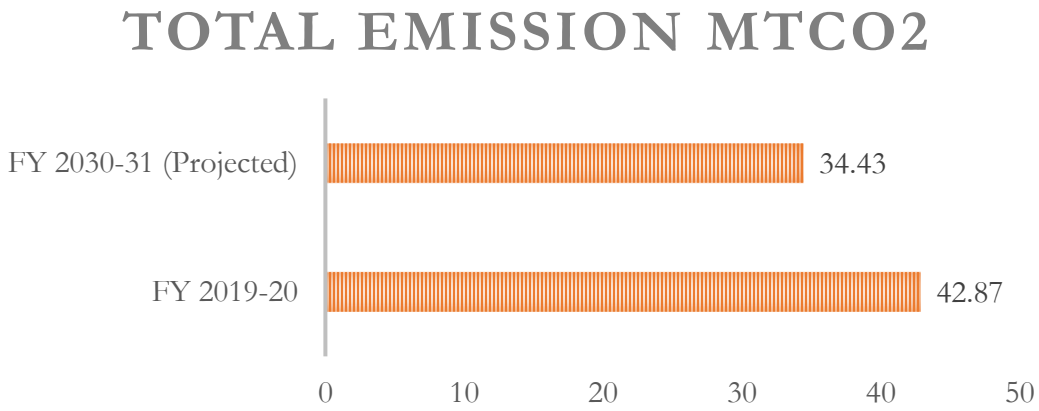


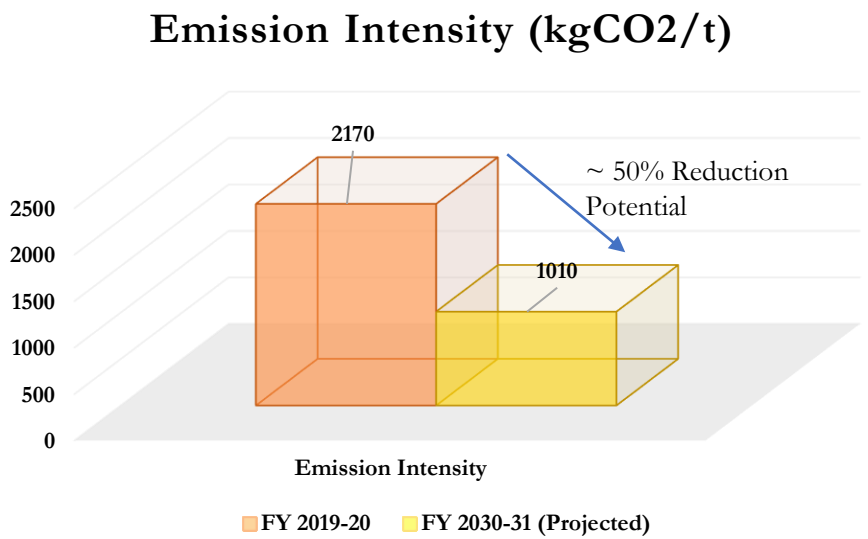
PAT Scheme: Process Waste Share



Pulp & Paper Sector: Emission Profile

Year	Total Emission	Emission Intensity	Emission Reduction
	MtCO2	kgCO2/ton	MtCO2
FY 2019-20	42.87	2170	--
FY 2030-31 (Projected)	34.43	1010	39.7





Scope of Carbon intensity Reduction and Decarbonisation in Paper

- The major scope of improvement lies with the RCF category of Paper Mills. The majority of RCF based paper mills are still not in reach of PAT Scheme due to sectoral threshold level. These remaining RCF based mills about to cover in forthcoming PAT Cycles by means of PAT Deepening and redefining sectoral threshold level as well as a separate Scheme for SME based Paper Mills.

- Measures such as switch to low carbon or clean fuel, renewable energy, alternate source such as process waste etc. is a potentially proven way to reduce the GHG emission as the sector still dependent on fossil fuel (>50%) for energy requirements.

- Deployment of BAT for process & utility, importantly in RCF based mills where majority of mills are still using the conventional process & utility technologies

- Scaling up penetration renewable energy across sector as a substitute for grid electricity.

Action plan and Roadmap

The **experience of energy efficiency improvement through PAT scheme** in pulp and paper sector has shown that many opportunities already exist in paper mills and various other will become available in the future as we advance in our drive towards the net zero carbon target in paper sector by 2070.

Apart from overall SEC reduction target, it has to parallelly identify the significant and insignificant sources **of GHG emission in Paper Plant Process** (Pulp making, Utility, anaerobic wastewater treatment or sludge digestion operations, on-site vehicles and machinery, lime kilns and calciners, CH4 and N2O emission from black liquor and pith etc.) and develop a stringent & naturalistic GHG emission norms and standards for paper sector including the provision of technology intervention and financial support by Government of India.

Action plan and Roadmap

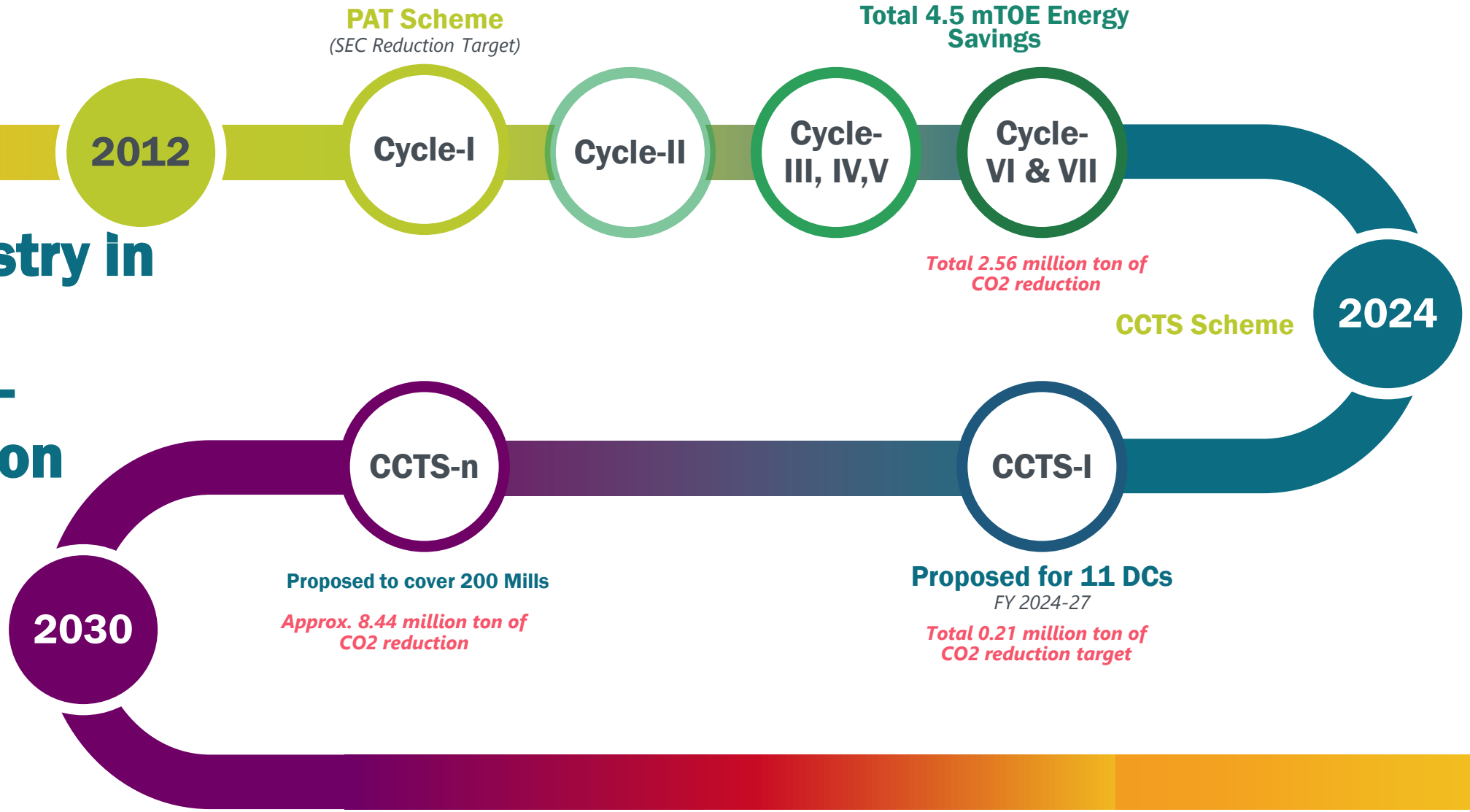
Possible Interventions

- Adoption of general measures, such as energy management systems, process integration, new equipment and efficient modes of operation;
- Increasing on-site use and production of energy from biomass residues (fuel switch) and expanding the adoption of combined heat and power (CHP) technology;
- Retrofitting the existing mills with energy-efficient technologies (e.g. BATs).
- Increased use of recovered paper and paper recycling; a reduction of about 37 % in CO2 emissions is estimated by substituting virgin wood with recycled fibres.

Paper Industry in achieving towards De-carbonization

2020-2030

10 Years Plan



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Indian Carbon Market

Bureau of Energy Efficiency

Ministry of Power

Presentation Outline

1. Indian Carbon Market Framework
2. Target setting approach (broad)

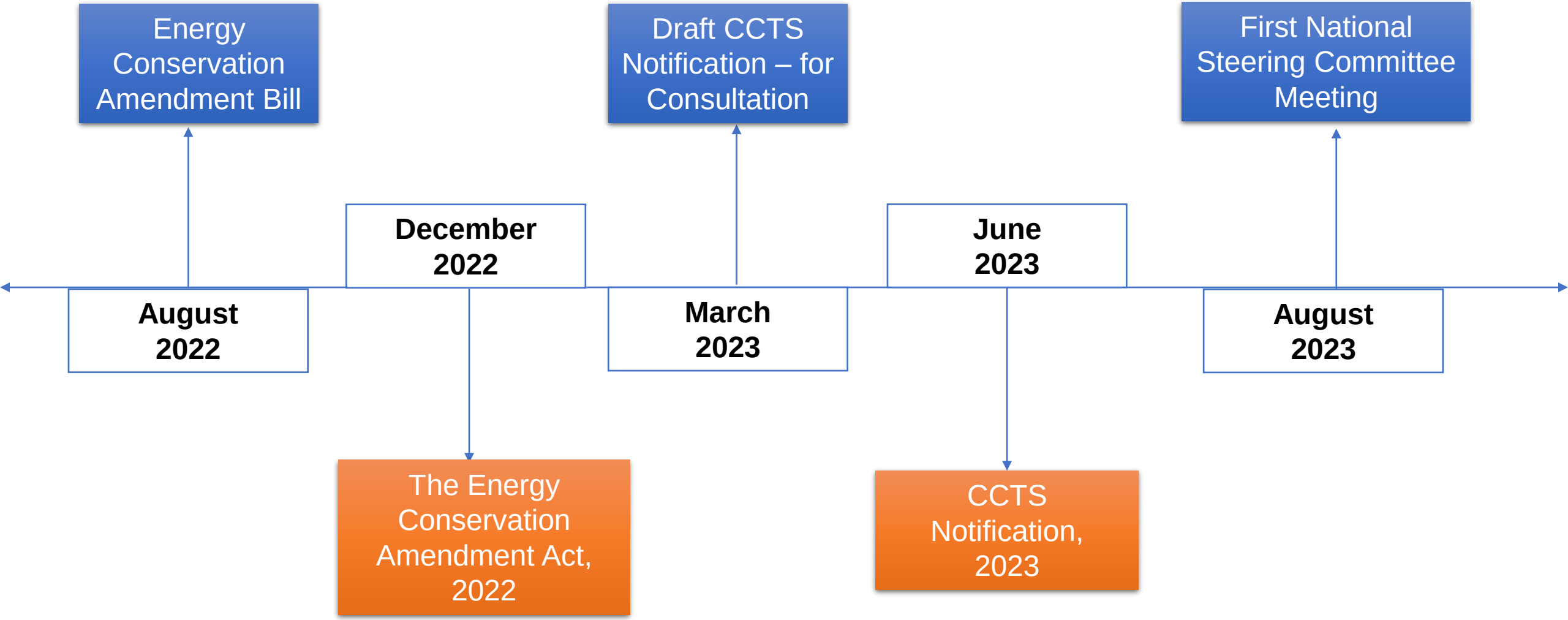
India's Climate Action Commitments

India submitted its updated Nationally Determined Contributions (NDCs) in August 2022:

- To **reduce the Emissions Intensity** of its Gross Domestic Product (GDP) by 45 percent by 2030, from 2005 level.

- To achieve about **50 percent cumulative electric power** installed capacity from non-fossil fuel-based energy resources by 2030.

Key Milestone – Indian Carbon Market



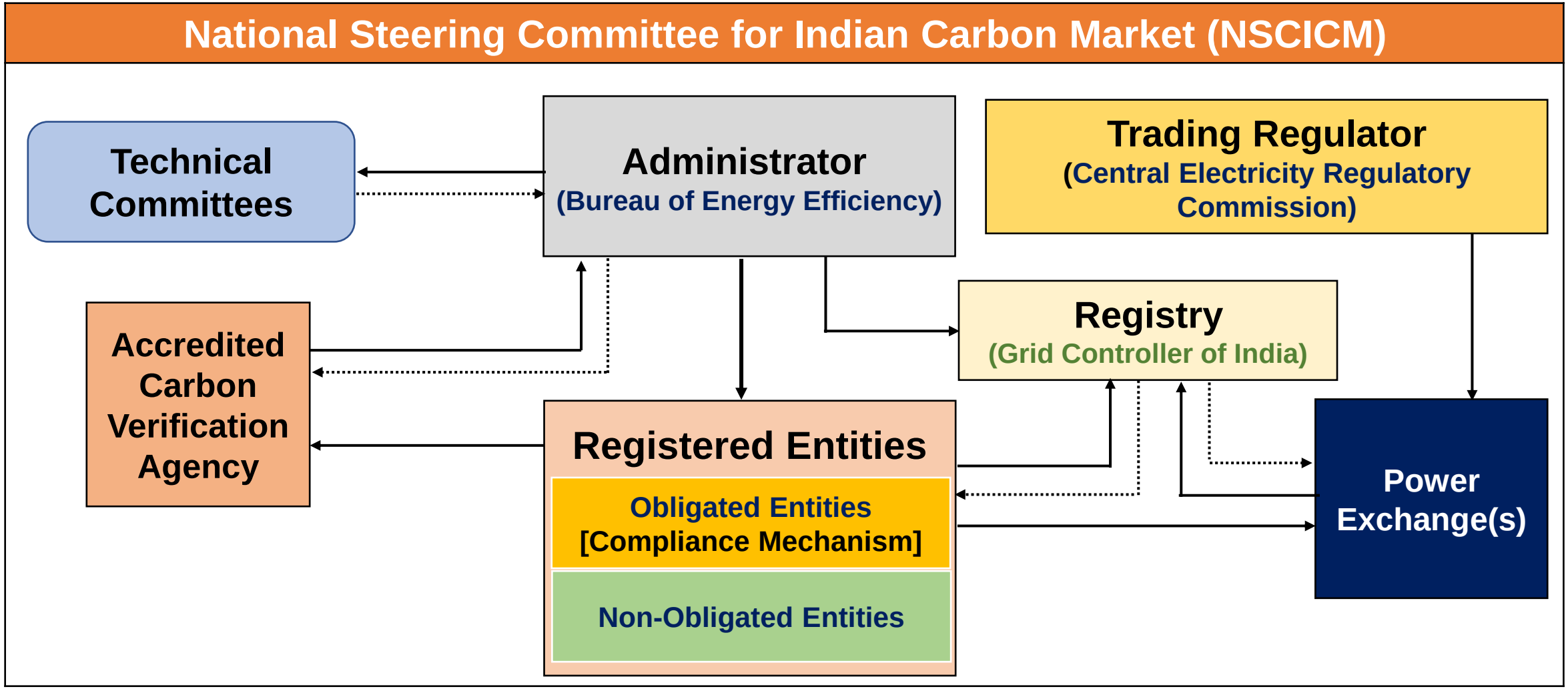
Institutional Framework

National Steering Committee for Indian Carbon Market (NSCICM)			
Chairperson		**Co-Chairperson**	
Secretary, Ministry of Power		**Secretary, Ministry of Environment, Forest and Climate Change**	
Members			
Ministry of Finance	NITI Aayog	Ministry of Power	Ministry of Environment, Forest and Climate Change
Ministry of New and Renewable Energy	Ministry of Steel	Ministry of Coal	Ministry of Petroleum and Natural Gas
Ministry of Agriculture and Farmers Welfare	Ministry of Chemical and Fertilizers	Central Electricity Authority	Grid Controller of India Limited
Department of Environment of State Government representing State – (2)	Expert Members - (2)** Other Members - (3)*	Member Secretary: Director General, Bureau of Energy Efficiency	

*CII & FICCI – also has been included as coo-opted members

**Shri Upendra Tripathy & Shri R R Rashmi as experts

Institutional Framework



Regulatory Framework

CCTS 2023

India's Carbon Credit Trading Scheme, 2023 was notified by the Government of India on 28 June 2023 under the Energy Conservation Act, 2001.

The notification underlines the necessary framework and the roles of diverse stakeholders for the development and functioning of the Indian Carbon Market (ICM).

As per Section 3 of the CCTS, NSCICM will be constituted by the Government to govern and oversee the functioning of Indian Carbon Market

Key elements of the CCTS

- Definitions and detailed procedures
- National Steering Committee and Technical Committee (Formation and Functions)
- Administrator (BEE) and Registry (GCI) and its functions
- Regulations for Trading
- Accredited Carbon Verification Agency
- Trading of Certificates
- Compliance Mechanism

Transition from Specific Energy Consumption (SEC) to Specific GHG Emissions (SGE)

SEC ~toe/t to SGE ~ tCO_2e/t

Current Approach under PAT

$$SEC = \frac{\text{Total Energy input to the plant boundary (TOE)}}{\text{Equivalent Product or Output (t)}}$$

Transition

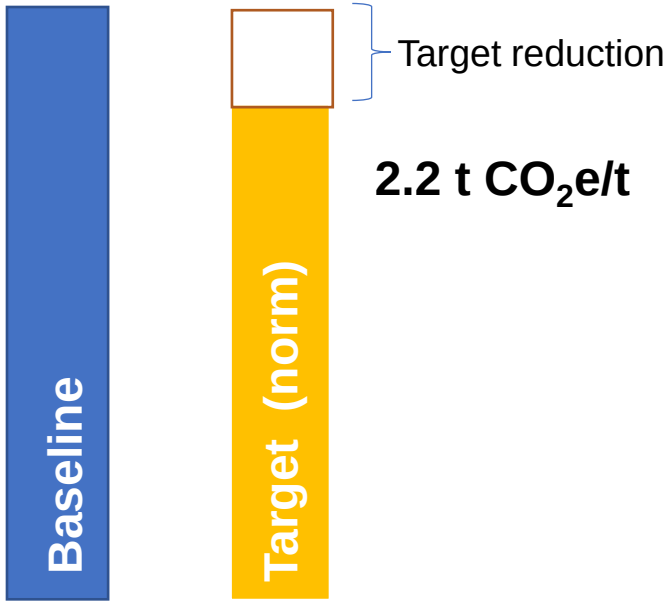
Proposed for Compliance Mechanism Approach under CCTS

$$SGE = \frac{\text{Total GHG Emissions from DCs } (tCO_2eq)}{\text{Equivalent Product or Output (t)}}$$

Compliance Mechanism

Baseline

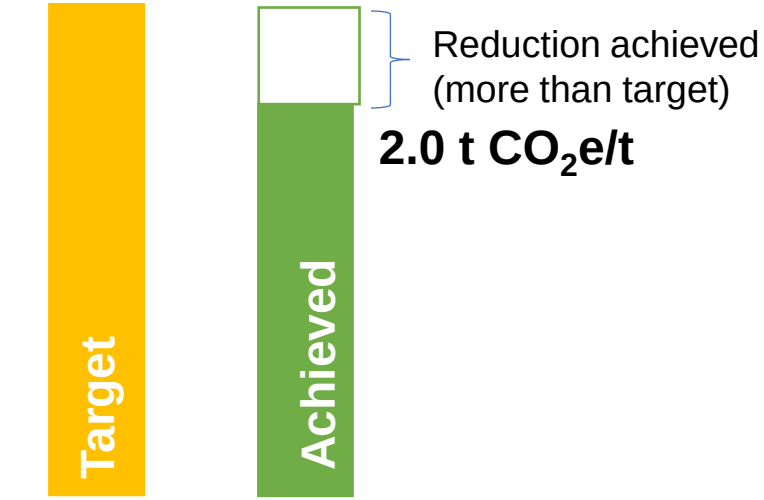
2.5 t CO_2e/t



Case I
Exceeding the Target

Credits to be issued (t CO_2e)
(0.2 t CO_2e/t * Production)

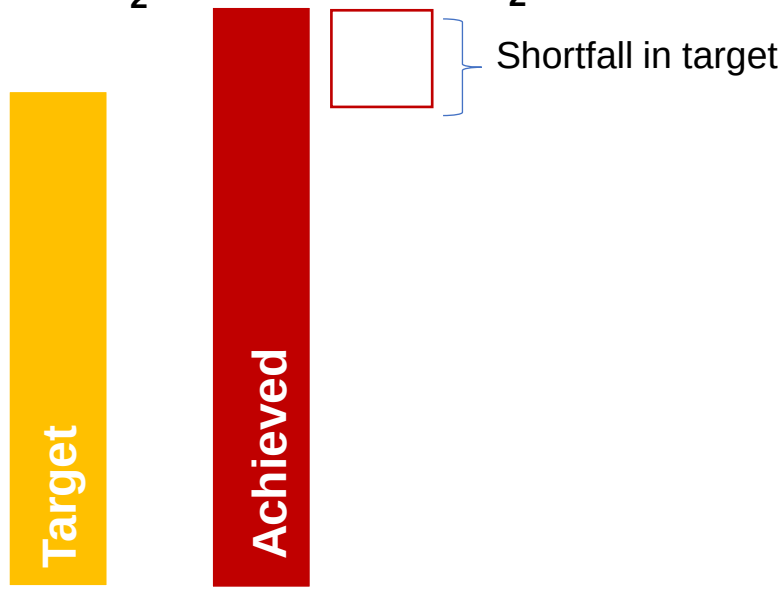
2.2 t CO_2e/t



Case II - Shortfall in target

Credits to be purchased (t CO_2e)
(0.2 t CO_2e/t * Production)

2.2 t CO_2e/t **2.4 t CO_2e/t**



Issuance/purchase of CCCs will be post verification

Transition from Perform Achieve and Trade (PAT)

Cycle	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26
Cycle – 4*	TOE/t & 3 years (109 DCs)						Targets – in t CO2/t under CCTS	
Cycle – 5		TOE/t & 3 years (110 DCs)						
Cycle – 6			TOE/t & 3 years (135 DCs)					
Cycle – 7					TOE/t & 3 years (707 DCs)			
Cycle – 8						TOE/T & 3 Years (138 DC)		

- Currently till date – eight PAT cycle have been notified
- Cycle 4 & 5 have been completed and verification also completed
- As PAT will be transitioning to compliance mechanism, the sector/DCs will be included as their PAT cycle are completed
- DCs will only have one target either in TOE/T or T CO_2/t

Targets notified | Cycle Completed

*revision in PAT Cycle from 2018-19 -2020-21 to 2018-19 to 2021-22

Draft and PAT Transition Plan under preparation

CCTS Compliance Phase I

Sectors	No. of Obligated Entities
Iron and Steel	58
Cement	13
Pulp and Paper	11
Petro-chemicals	8
Total	**90**

Sub Sector Classification

Iron & Steel : 2 ISP, 19 SI,
31 SI+SMS+Other and 6 others

Cement : Clinkerisation Units

Pulp & paper: 1 Wood, 1 Agro and 8 RCF, 1 Imported Pulp

Petrochemicals: 3 Naptha, 3 Gas and 2 mixed

CCTS – Proposed Approach for Target Setting

Compliance Mechanism – GHG Coverage

- **GHGs to be included** : CO_2 and PFC

- CO2 – From fuel combustion and process emissions

- PFC – From aluminium smelting operations

- GHGs to be converted into CO2e by using GWP as referred in India Biennial Update report to UFCCC

Proposed GHGs to be covered

GHGs	Combustion	Process
CO_2	Yes	Yes
CH_4	No	-
N_2O	No	-
PFC	-	Yes

Rationale for not including CH4 and N2O:
- Currently CH4 and N2O currently not been monitored
- Even if to include – will require to apply default factors
- E.g. – EU ETS Covers – CO2, N2O (Nitric Acid) and PFC
- Other gases contribution minimum in overall emissions

Direct and Indirect Definition – ISO 14064-1: 2018

Emissions to be considered

(i) **Direct GHG emissions** are emissions from sources that are owned or controlled by the obligated entity and includes emissions from combustion of any type of fuel (fossil) burnt in stationary (fixed) equipment, such as boilers, gas turbines, kiln, or furnaces to generate heat, mechanical work, and steam.

(i) **Direct process emissions** from industrial processes means emissions other than combustion emissions occurring because of chemical reactions between substance or their transformation

(ii) **Indirect GHG emissions** means GHG emissions that are a consequence of the activities of the obligated entity but occurred at sources outside the obligated entity establishment and shall include – indirect emissions from electricity purchased from grid, and emissions from electricity and heat imported outside plant boundary.

Note: GHG emission intensity targets within 2024-27 for the obligated entities shall be calculated only on the basis of emission related to sources as (i) and (iii) highlighted above, subsequently targets will be calculated based on (i), (ii) and (iii)

As per GHG Protocol	Covered under CCTS	Terminology used in CCTS
Scope 1	Yes	Direct
Scope 2	Yes	Indirect
Scope 3	No	-

GHG Emission Trajectory

The GHG emission intensity reduction trajectory will be developed for the considered sectors based on the:

a) India's nationally determined contribution commitments.
b) Potential for fuel switch, use of non-fossil fuel energy/feedstock and decarbonisation in the sector.
c) Available technology and associated cost of their implementation.

Technical Potential

Economic Potential

Procedure for Target

Step 1

Discussion and finalization with Technical Committee established for the sector

Recommend to BEE

Step 2

BEE to recommend targets to Sub – Working Group to finalize the targets

Sub Working group to recommend to NSCICM

Step 3

NSCICM to consider the suggestion by Sub Working Group

NSCICM to further recommend the targets to the Central Government for Notification

Target Setting Approach

Baseline emissions

- Energy related emissions
- Process related emission

- Estimated using the actual energy consumption and default factors
- Fuel wise information available in PAT

Emission Intensity Calculation (SGE)*

$$\frac{\text{Total Emissions}}{\text{Production}}$$

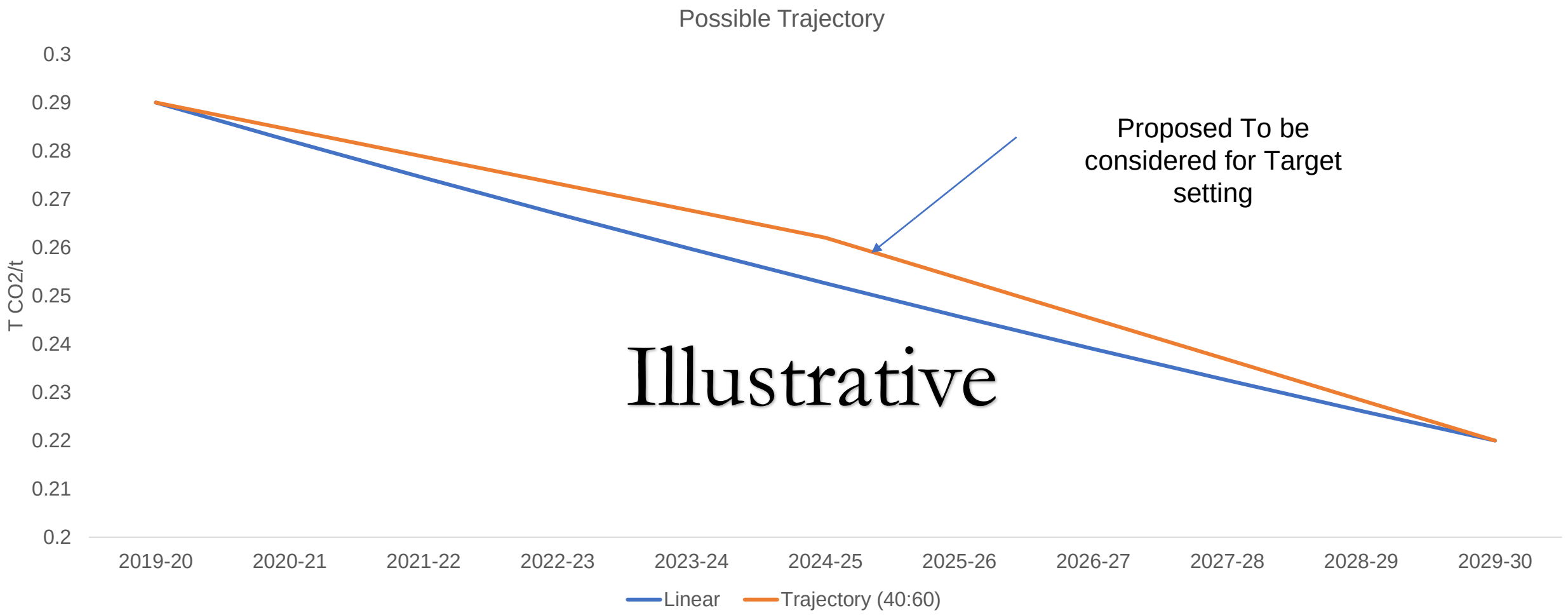
- Target on Energy-related Emissions
- Achievement on Total Emissions

Target

- Derive Relative SGE
- Estimate yearly target

*SGE – Specific GHG Emissions

Possible Trajectory



Step 1 – Baseline Emissions

Unit	GHG Emission - energy (t CO2)	GHG Emission - process (t CO2)	Total GHG Emissions (t CO2)
Unit 1	245,688	No Process emissions Illustrative	245,688
Unit 2	803,310		803,310
Unit 3	870,904		870,904
Unit 4	345,629		345,629
Unit 5	309,933		309,933
Unit 6	363,991		363,991
Unit 7	899,950		899,950
Unit 8	940,885		940,885
Unit 9	347,798		347,798
Unit 10	1,132,859		1,132,859
Unit 11	435,181		435,181
Unit 12	187,243		187,243
Unit 13	215,975		215,975

Step 2 – Emission Intensity – Baseline

Unit	Production (t)	SGE - Energy (t CO2/t)	SGE Process (t CO2/t)	SGE Total (t CO2/t)
Unit 1	621,629	0.395		0.395
Unit 2	2,803,293	0.287		0.287
Unit 3	3,027,000	0.288		0.288
Unit 4	1,086,642	0.318		0.318
Unit 5	782,419	0.396		0.396
Unit 6	966,642	0.377		0.377
Unit 7	3,122,673	0.288		0.288
Unit 8	2,810,708	0.335		0.335
Unit 9	1,065,680	0.326		0.326
Unit 10	5,121,175	0.221		0.221
Unit 11	2,024,572	0.215		0.215
Unit 12	630,578	0.297		0.297
Unit 13	577,173	0.374		0.374

Illustrative

Step 3 – Calculate Relative SGE & % Target

Obligated Entity	Baseline SGE (tCO_2/t) – only energy component	Relative SGE with respect to best	Target Calculation	% Reduction
Unit 1	0.395	1.84	1.8X	12.19 %
Unit 2	0.287	1.33	1.3X	8.86 %
Unit 3	0.287	1.34	1.3X	8.86 %
Unit 4	0.318	1.48	1.5X	9.82 %
Unit 5	0.396	1.84	1.8X	12.23 %
Unit 6	0.377	1.75	1.8X	11.64 %
Unit 7	0.288	1.34	1.3X	8.89 %
Unit 8	0.335	1.56	1.6X	10.34 %
Unit 9	0.326	1.52	1.5X	10.06 %
Unit 10	0.221	1.03	1.03X	6.82 %
Unit 11	**0.215**	**1.00**	**1.0X**	**6.64 %**
Unit 12	0.297	1.38	1.4X	9.17 %
Unit 13	0.374	1.74	1.7X	11.55 %

Illustrative

SGE – Specific GHG emission

Sectoral Average Reduction 9.6% is to be achieved say in three years

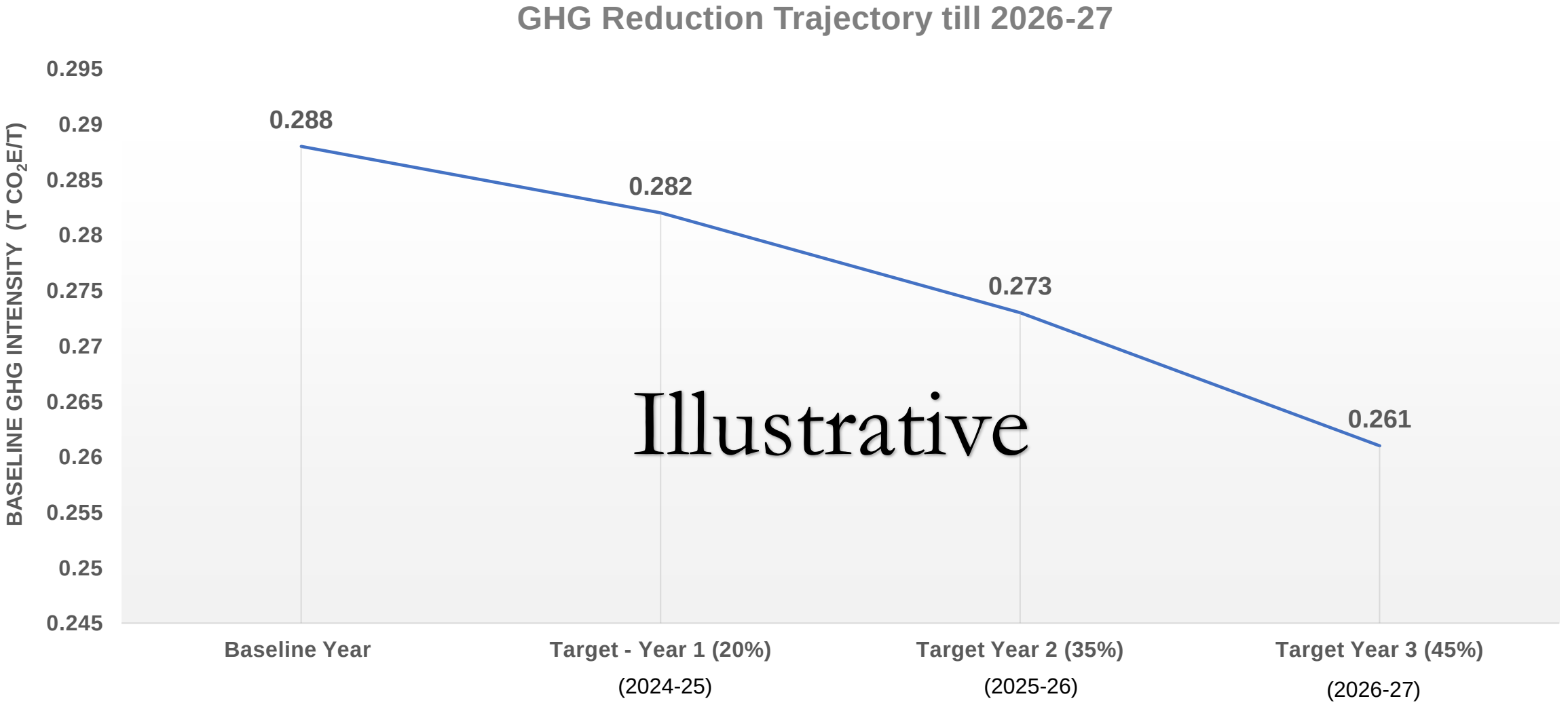
Step 4 – Yearly Targets for GHG Reduction

Obligated Entity	Baseline GHG intensity	Target - Year 1 (20%)	Target Year 2 (35%)	Target Year 3 (45%)
Unit 1	0.395	0.385	0.369	0.347
Unit 2	0.287	0.282	0.273	0.262
Unit 3	0.287	0.282	0.273	0.262
Unit 4	0.318	0.312	0.301	0.287
Unit 5	0.396	0.386	0.369	0.348
Unit 6	0.377	0.368	0.353	0.333
Unit 7	0.288	0.283	0.274	0.262
Unit 8	0.335	0.328	0.316	0.300
Unit 9	0.326	0.319	0.308	0.293
Unit 10	0.221	0.218	0.213	0.206
Unit 11	0.215	0.212	0.207	0.201
Unit 12	0.297	0.292	0.282	0.270
Unit 13	0.374	0.365	0.350	0.331
Wt. Average	**0.288**	**0.282**	**0.273**	**0.261**

Illustrative

All units in t CO_2e/t -

Step 4 – Yearly Targets for GHG Reduction



Illustrative Representation of target setting approach

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