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# Presentation on PAT scheme in Cement Sector

**14<sup>th</sup> March, 2023**

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**BEE**



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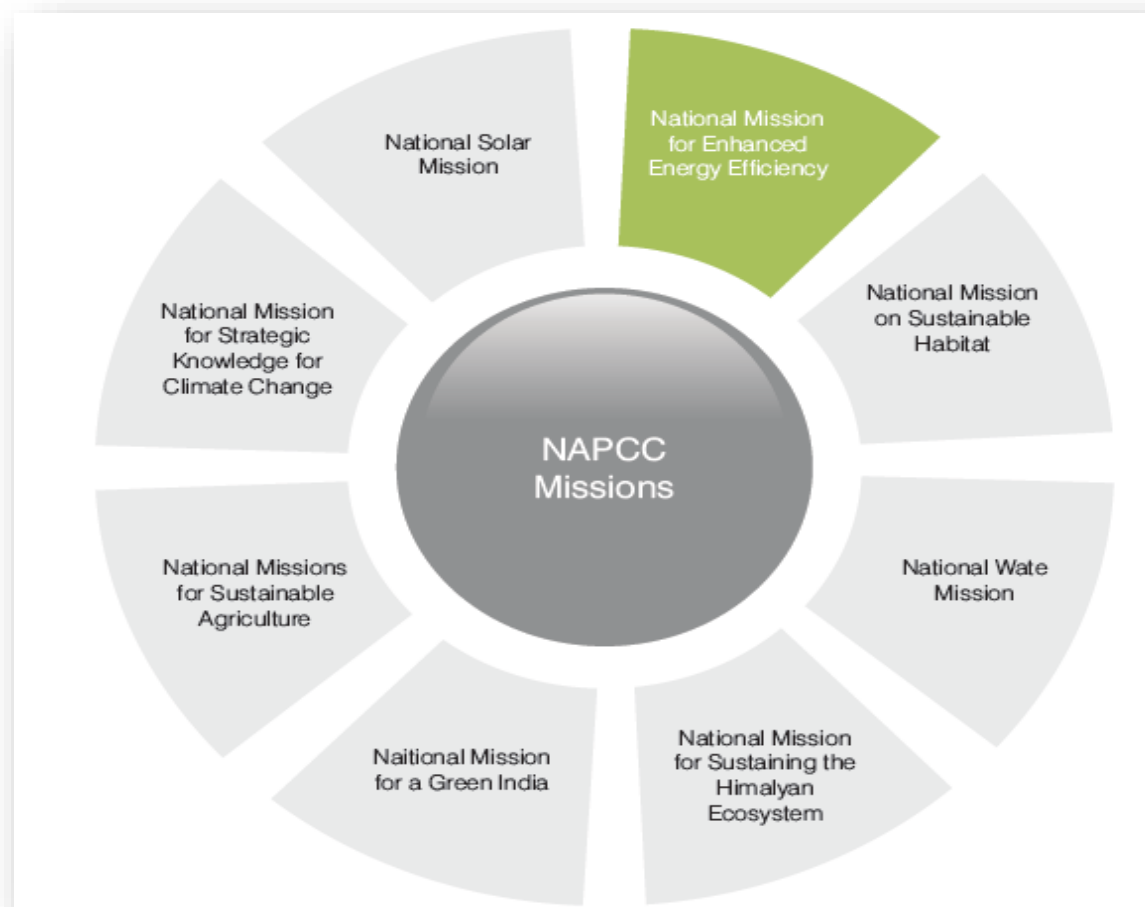
- Introduction to PAT Scheme.
- Overview of PAT Cycle for Cement
- Way Forward



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# National Action Plan on Climate Change (NAPCC)





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**Energy Intensive Industries**

Targets for Mandatory  
Energy Saving

**PAT**

**NMEEE**

**FEEP**

**Fiscal Instrument for EE**



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# 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

## Perform, Achieve & Trade

- A **market based regulatory instrument** to reduce specific energy consumption in industries, **to enhance the cost effectiveness** through tradable **energy saving certificates**.
- Section 14 (g): Establish norms
- Section 14 (n): Direction to Industries
- Section 14A: Energy Saving Certificates
- Section 26: Penalty & Enforcement
- Section 27: Adjudication



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# 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

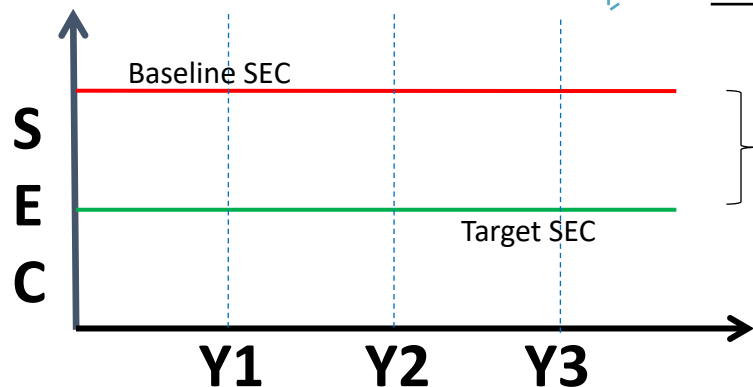
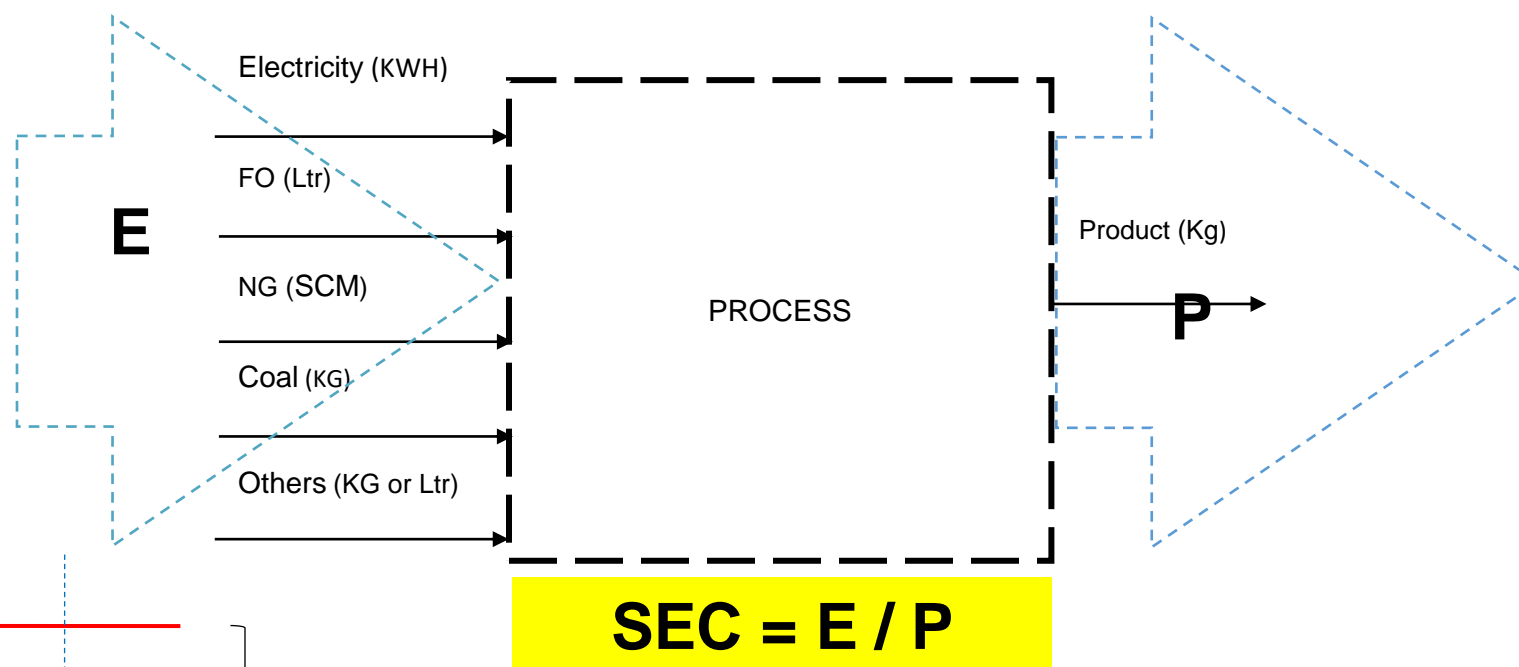
1. Aluminum;
2. Fertilizers;
3. Iron and Steels;
4. Cement;
5. Pulp and Paper;
6. Chlor Alkali;
7. Textile;
8. Thermal Power Stations,
9. Railways;
10. Petroleum Refinery
11. Electricity transmission companies and distribution companies;
12. Commercial Buildings or Establishment
13. Petro-Chemicals



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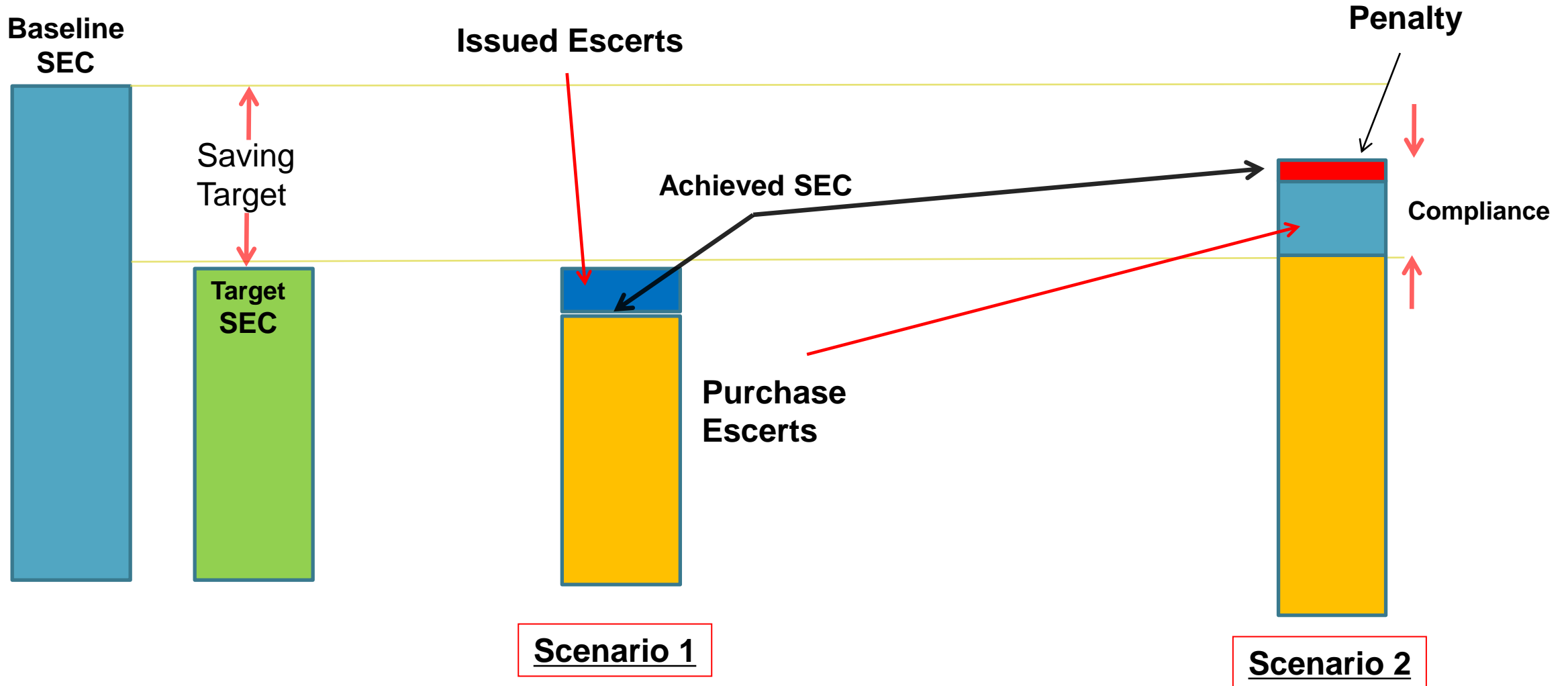
# Gate-to-Gate Concept



Reduction in SEC  
Expressed in %

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

# Concept of Target, Compliance, ESCerts & Penalty







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## PAT - I Target

Sector	No. of DCs in PAT –I
<i>Cement</i>	<b>85</b>

### PAT Cycle I

Baseline Year: 2007-08; 08-09, 2009-10  
PAT Cycle : 2007-15  
Assessment Year: 2014-15

### National Target

**0.815** Million toe

**Total Energy Consumption 15.01 mtoe**



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## PAT-I Realized Impacts



**Energy Saving**

**1.48 mtoe**



**Emission Reduction**

**4.34 million tonnes of CO2**



**Skill Development**

Capacity building: **5000+** Engineers and operators  
**13718** Energy Auditors & Managers  
**219** Accreditation



**Savings**

**Rs 1623 Crores**  
Saved due to **energy consumption**



**Investment**

Encouraged investments for energy efficient technologies for domestic manufacturing  
**Rs 4500Crore**



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## PAT-I Realized Impacts

- Increase of Renewable Energy Share ~ 13%
- Power Generation through WHRS increase from 109 MWh to 16486 MWh
- Capacity utilization of plant during baseline ~90% (except PSC plants) whereas during assessment year it is decreased to ~70%
- PPC clinker factor decreased by ~3%
- PSC clinker factor decreased by ~13%
- Specific Power Consumption Reduction for PPC ~9%, for PSC ~19% & for OPC 1%
- Specific Thermal Energy Consumption Reduction for PPC~4%, for OPC~2%



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## PAT - II Target

Sector	No. of DCs in PAT -I	Additional DC in PAT Cycle-II	Total no. of DCs under PAT
<i>Cement</i>	<i>85</i>	<i>27</i>	<i>111</i>

### PAT Cycle III

Baseline Year: 2014-15  
PAT Cycle : 2016-19  
Assessment Year: 2018-19

### National Target

1.11 Million toe

Total Energy Consumption 21.43 mtoe



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## PAT-II Realized Impacts



**Energy Saving**

**1.56 mtoe**



**Emission Reduction**

**5.50 million tonnes of CO2**



**Skill Development**

Capacity building: **5000+** Engineers and operators

**13718** Energy Auditors & Managers

**219** Accreditation



**Savings**

**Rs 2889 Crores**

Saved due to **energy consumption**



**Investment**

Encouraged investments for energy efficient technologies for domestic manufacturing

**Rs 6961 Crore**



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## PAT-II Realized Impacts

- Increase in AFR utilization. TSR % increased from 1.5% to 5%
- Increase in the Power Generation through WHRS.
- Increase in share of Solar Power Generation.
- Improvement in Clinker Factor.



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## PAT - III Target

Sector	DC notified in PAT Cycle-III	Total no. of DCs under PAT
<i>Cement</i>	<i>14</i>	<i>125</i>

### PAT Cycle III

Baseline Year:	2016-17
PAT Cycle :	2017-20
Assessment Year:	2019-20

### National Target

**0.085 Million toe**

**Total Energy Consumption 0.074 mtoe**

**Saving achieved 0.149 mtoe**



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## PAT - IV Target

Sector	DC notified in PAT Cycle-IV	Total no. of DCs under PAT
<i>Cement</i>	<i>1</i>	<i>126</i>

### PAT Cycle IV

Baseline Year: 2017-18  
PAT Cycle : 2018-22  
Assessment Year: 2021-22

### National Target

**0.004** Million toe

**Total Energy Consumption 0.074 mtoe**





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## PAT - V Target

Sector	DCs notified in PAT Cycle-V	Total no. of DCs under PAT
<i>Cement</i>	<i>12</i>	<i>138</i>

### PAT Cycle V

Baseline Year: 2018-19  
PAT Cycle : 2019-22  
Assessment Year: 2021-22

### National Target

**0.087** Million toe

**Total Energy Consumption 1.605 mtoe**



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## PAT - VI Target

Sector	DC notified in PAT Cycle-VI	Total no. of DCs under PAT
<i>Cement</i>	<i>4</i>	<i>142</i>
<i>Grinding Unit</i>	<i>33</i>	<i>33</i>

### PAT Cycle VI

Baseline Year: 2019-20  
PAT Cycle : 2020-23  
Assessment Year: 2022-23

### National Target

**0.062** Million toe

**Total Energy Consumption 1.241 mtoe**



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## PAT - VII Target

Sector	DC notified in PAT Cycle-VII	Total no. of DCs under PAT
<i>Cement</i>	120	176

PAT Cycle VII	
Baseline Year:	2020-21
PAT Cycle :	2022-25
Assessment Year:	2024-25

National Target
0.9825 Million toe

Total Energy Consumption	25.55 mtoe
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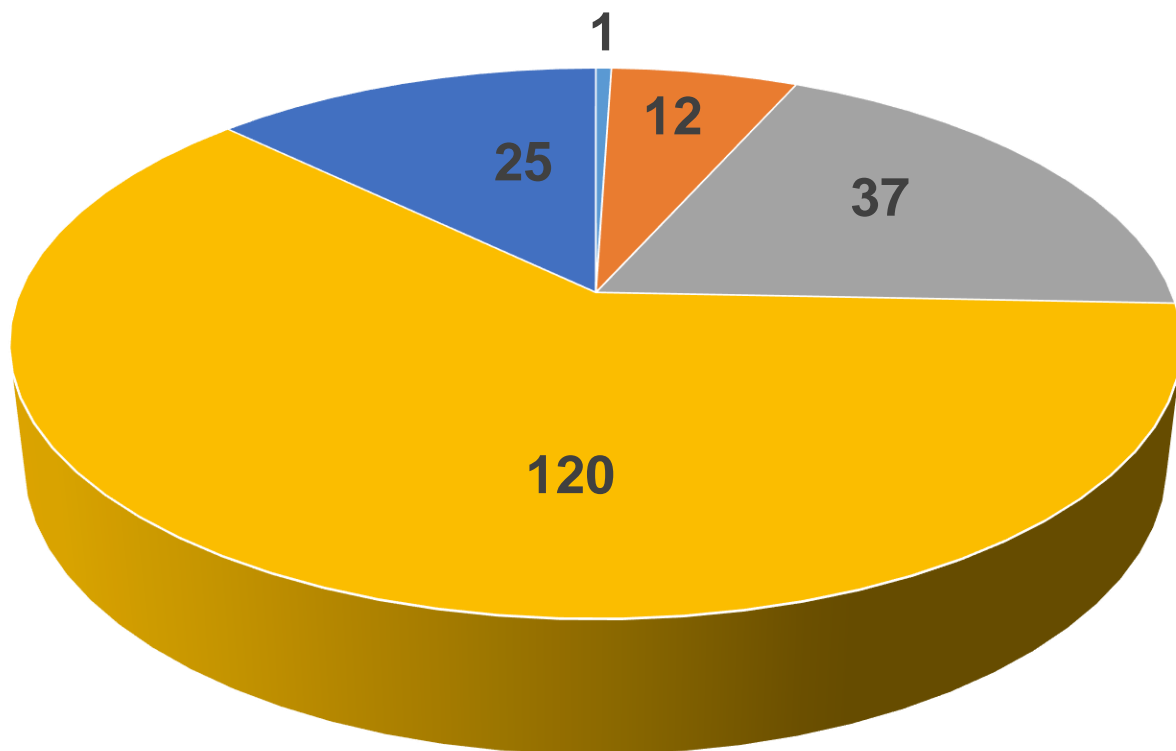


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## Overview of PAT Cycles for Cement DCs

### No. of DCs in PAT Scheme



■ PAT-4 ■ PAT-5 ■ PAT-6 ■ PAT-7 ■ PAT-8

### Energy Consumption and Saving Target of PAT Cycles

PAT Cycles	Energy Consumption (mtoe)	Energy Saving Target (mtoe)
PAT-4	0.074	0.004
PAT-5	1.605	0.087
PAT-6	1.241	0.062
PAT-7	25.55	0.982
PAT-8	0.624	0.032
<b>Total</b>	<b>29.09</b>	<b>1.167</b>



- In Cement Sector, 70% of energy consumption is Thermal Energy consumption and remaining 30% as Electrical Energy Consumption.
- PAT performa of Cement Sector captures both the Thermal Energy Consumption and Electrical Energy Consumption.
- Normalization factors such as CU, Low Quality of Fuel in CPP, Power Mix, Product Mix, Low PLF in CPP, Bond Index, Environmental Concern, Others etc incorporated in the performa.
- Performa encourages utilization of alternate fuels in the plant as its energy consumption is not accounted for gate to gate specific energy consumption.



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- Scheme helps in promotion of advanced energy efficient technologies.
- Promotes exploration of Low clinker content cement.
- Capacity building and awareness of plant personnel towards energy efficiency.
- Constitution of Sectoral Advisory Group Committee.
- Assists in mitigation of GHG emissions and reduction of carbon footprint of the industry.
- Schemes promotes adoption of Energy Management System.



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## Status of seminar of dissemination and Exhibition of WHRS in Indian Cement Industry.

Sl.No.	Description	Details
1	NCCBM, Ballabgarh	29th July 2022 <b>(Conducted)</b>
2	NCCBM, Hyderabad	02nd September 2022 <b>(Conducted)</b>
3	AKS University, Satna	16 <sup>th</sup> September 2022 <b>(Conducted)</b>
4	Ultratech Technical Training Centre, UTCL Aditya Cement Works, Chittaurgarh	13 <sup>th</sup> February 2023 <b>(Conducted)</b>



## Way Forward

- Potential Study to be conducted for determination of Targets for PAT Cycle IV and V DCs of Cement Sector based on the existing potential energy savings.
- Demonstration Centre at NPTI Nagpur for Cement Sectoral Technologies.
- Exploration of new Normalizations for Cement Grinding Units and updation of Sector Specific Performa.
- Promotion of De-Carbonization and Low Carbon Energy Efficient technologies through demonstration projects and policy formulations.
- Capacity Building Programs on AFR, Blended Cements, Renewable Energy, CCUS, Improvising Thermal Energy Consumption etc.





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## Way Forward

- Formation of Sub-committee for reporting of heat value of fuel being used in pyro-section and CPP.
- 03 Nos. of R&D proposals in association with NCCBM.
  - a. Design of an Alternative Fuel dryer for Cement plants by utilizing cooler ESP vent air.
  - b. Detailed research study of solar thermal energy for medium temperature application (150oC-400oC) in Cement Industry.
  - c. Integration of RDF/biomass gasification to cement plant calciner to enhance fuel utilization in Indian cement industry.



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JAI HIND