Perform Achieve and Trade (PAT)-

Methodology- Baseline Normalization, Energy Performance Indicators, Targets, Energy Saving Certificates, Trading and M&V

Energy Efficiency Certification Experience Sharing and Consulting Workshop
6th- 7th February,2013

K . K. Chakarvarti
Bureau of Energy Efficiency
New Delhi (INDIA)

NATIONAL MISSION FOR ENHANCED ENERGY EFFICIENCY (NMEEE)

- The National Action Plan on Climate Change was released by Prime Minister of India in June 2008
- The Action Plan Outlines **8 Missions** including National Mission for Enhanced Energy Efficiency (**NMEEE**)
- The basic objective of the NMEEE mission is to ensure a sustainable growth by an approximate mix of 4 E's, namely-Energy, Efficiency, Equity and Environment

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Missions under NAPCC

- 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

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NMEEE – Four New Initiatives

- ***Perform Achieve and Trade (PAT):*** A market based mechanism to enhance cost effec-tiveness of improvements in energy efficiency in energy-intensive large industries and facilities, through certification of energy savings that could be traded.
- ***Market Transformation for Energy Efficiency (MTEE):*** Accelerating the shift to energy efficient appliances in designated sectors through innovative measures to make the products more affordable
- ***Energy Efficiency Financing Platform (EEFP):*** Creation of mechanisms that would help finance demand side management programmes in all sectors by capturing future energy savings.
- ***Framework for Energy Efficient Economic Development (FEEED):*** Developing fiscal instruments to promote energy efficiency

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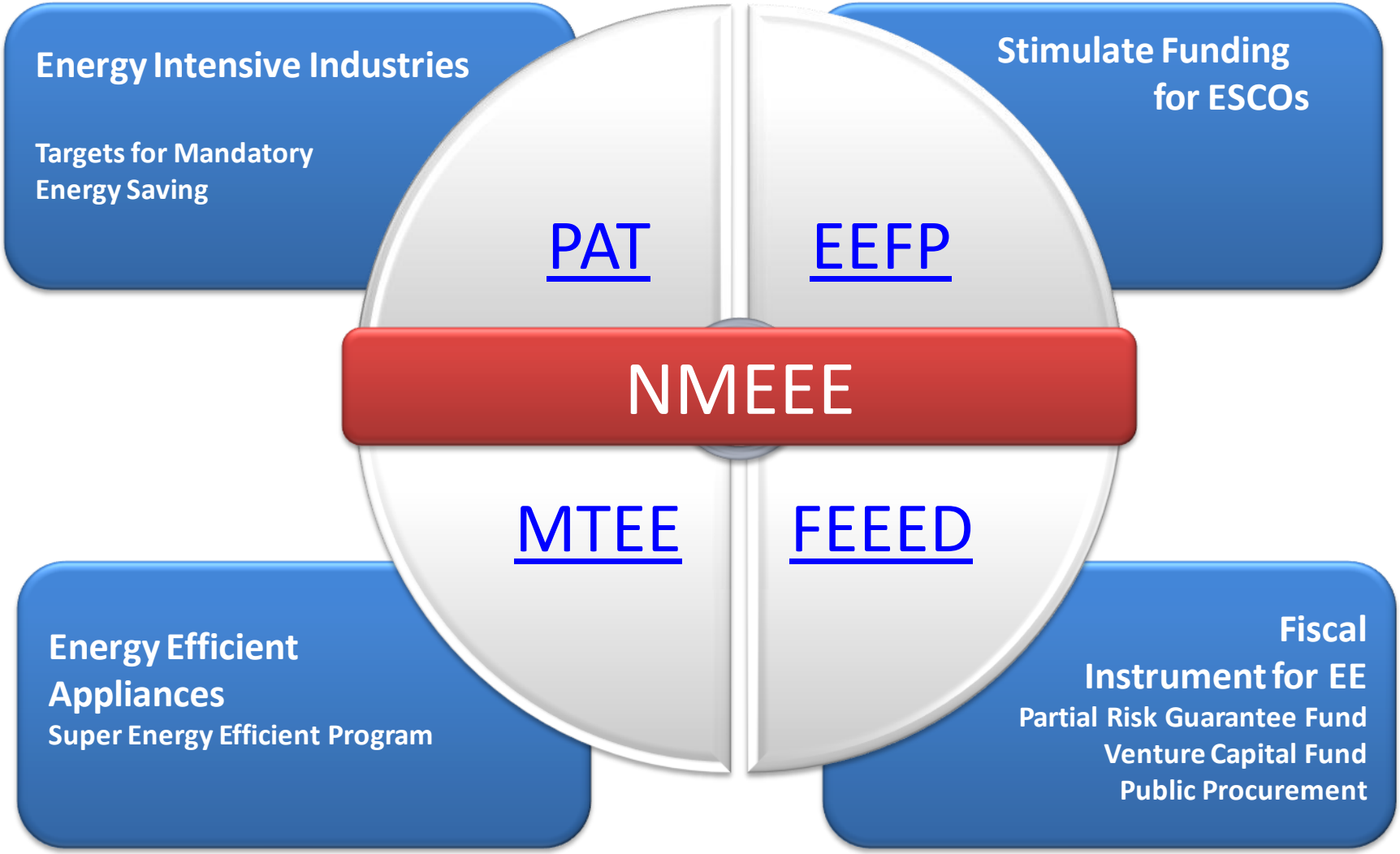
NMEEE – Four New Initiatives



Market Transformation for Energy Efficiency (MTEE)

- Accelerating the shift to energy efficient appliances in designated sectors through innovative measures to make the products more affordable.

- Initiatives such as Bachat Lamp Yojana (BLY) and Super Efficient Appliance Programme (SEEP) for ceiling fans and LEDs for residential consumers are to be taken up.

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Framework for Energy-Efficient Economic Development (FEEED)

- Developing fiscal instruments to promote energy efficiency project implementation

- Ministry of Power has approved rules for Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE) and Venture Capital Fund for Energy Efficiency (VCFEE) in April 2012.
- **PRGFEE:** Debt guarantee to Financial Institutions for ESCO (Energy Service Companies) investments (upto Rs 30 million or 50% of loan, whichever is less)
- **VCFEE:** Equity investments in ESCO projects (upto Rs 20 million or 15% of equity, whichever is less)

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Legal Frame Work – PAT SCHEME

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Legal Frame Work

The genesis of the PAT mechanism flows out of the provision of the Indian Energy Conservation Act, 2001.

Section 14 (e) of the Act empowers the Central Government to notify energy intensive industries, as listed out in the Schedule to the Act, as Designated Consumers (DCs)

As per Section 14(g) of EC Act, 2001

"[Establish and prescribe such energy consumption norms and standards for designated consumers as it may be considered necessary: provided that the central government may prescribe different norms and standards for different designated consumers having regard to such factors as may be prescribed] the central government can stipulate energy usage norms for designated consumers.

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The Energy Conservation (Amendment) Act , 2010

Main Amendments

- **The Central Government may issue the energy savings certificate to the designated consumer whose energy consumption is less than the prescribed norms and standards in accordance with the procedure as may be prescribed.**

- **The designated consumer whose energy consumption is more than the prescribed norms and standards shall be entitled to purchase the energy savings certificate to comply with the prescribed norms and standards.**

- **The Central Government may, in consultation with the Bureau, prescribe the value of per metric ton of oil equivalent of energy consumed.**

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Perform, Achieve and Trade (PAT) Scheme

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Perform, Achieve and Trade (PAT) Scheme

Perform: Industry has to compete with their own benchmark set by themselves by achieving high standards in each and every aspect of plant performance and sustain them through out the period

Achieve: Industry to achieve better energy efficiency improvements than their specified SEC improvement target in a cost-effective manner beating their own standard

Trade: The additional certified energy savings can be traded with other designated consumers who could use these certificates to comply with their SEC reduction targets.

The guiding principles for developing the PAT mechanism are Simplicity, Accountability, Transparency, Predictability, Consistency, and Adaptability

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Perform, Achieve & Trade (PAT)

- The key goal of the PAT scheme is to mandate specific energy efficiency improvements for the most energy intensive industries.
- The scheme builds on the large variation in energy intensities of different units in almost every sector, ranging from amongst the best in the world, to extremely inefficient units as well.
- The energy intensity reduction target mandated for each unit is dependent on its current efficiency : the reduction target is less for those who are more efficient, and is higher for the currently less-efficient units.
- The design of PAT is the result of extensive consultations over the last two years (2010-11 and 2011-12), which have contributed to its robustness and simplicity.

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Reasons for Large Energy Usage Bandwidth

The energy usage pattern varies widely in industries of a particular sector due to various **diversities** like

-Scale of Production (Installed Capacities)
- Use of Raw Material
- Process Technology
- Vintage
- O & M Practices
- Type of Product Output etc.

Factors of Diversity	Most Affected Sectors
a) Raw Material Input	Pulp & Paper, Fertilizer, Power Plant, Textile
a) Quality of Raw Material / Fuel	All sectors
a) Process & Technology	Aluminium, Iron & steel, Chlor-Alkali, Paper
a) Final Product output	Textile, Iron & Steel, Aluminium
a) Vintage	All Sectors
a) Capacity Utililization	All sectors

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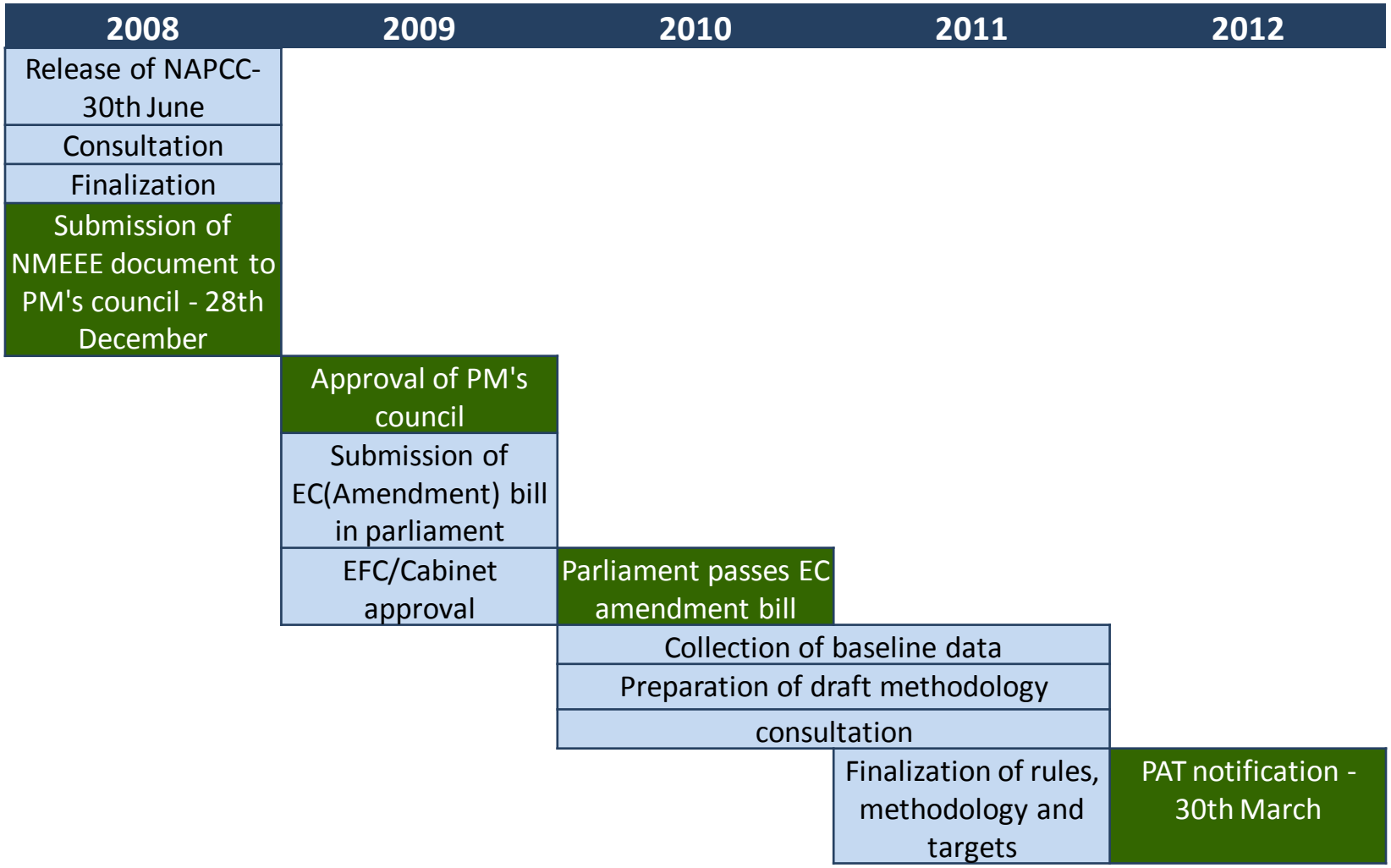
PAT Preparation Process



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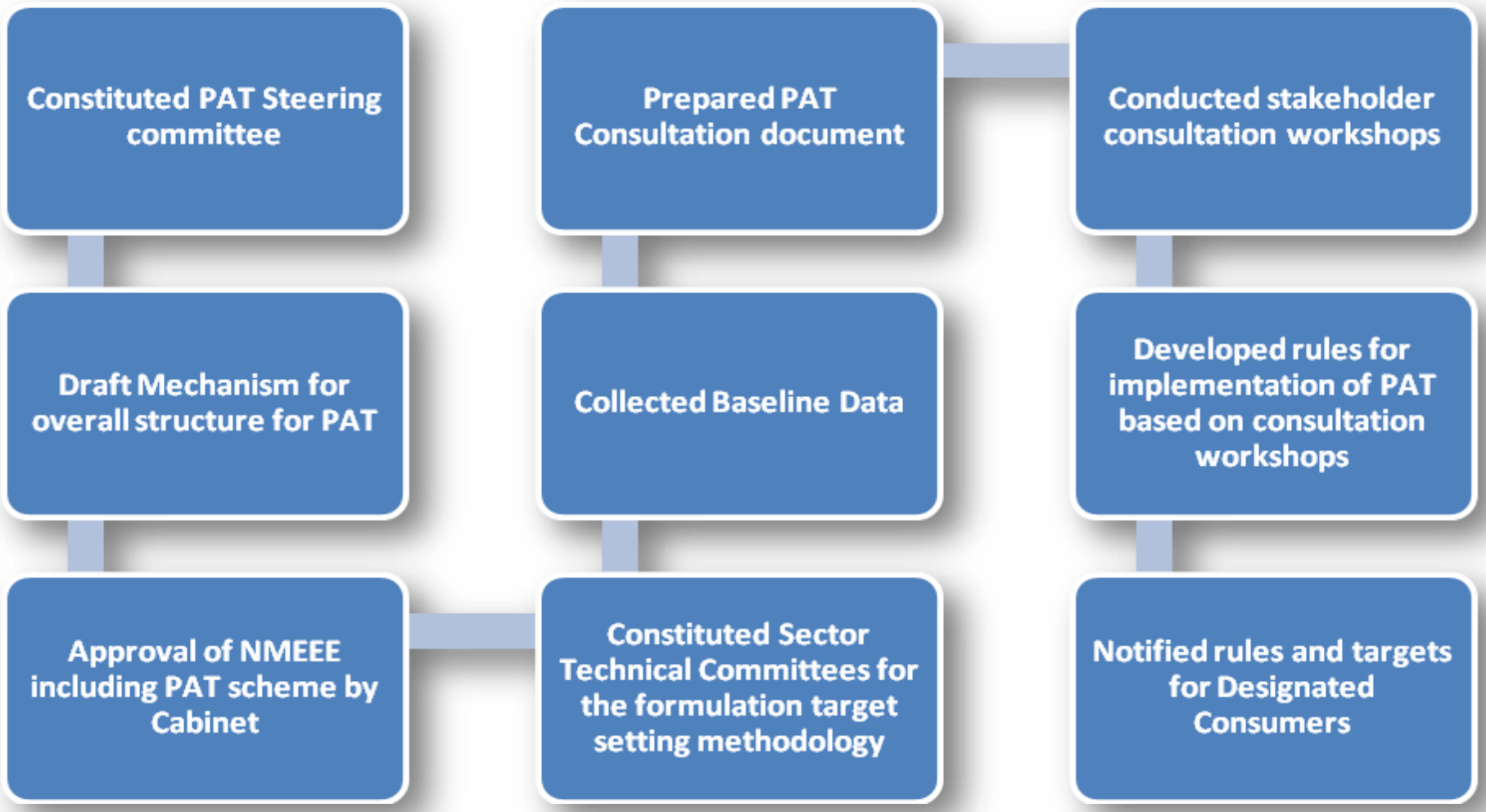
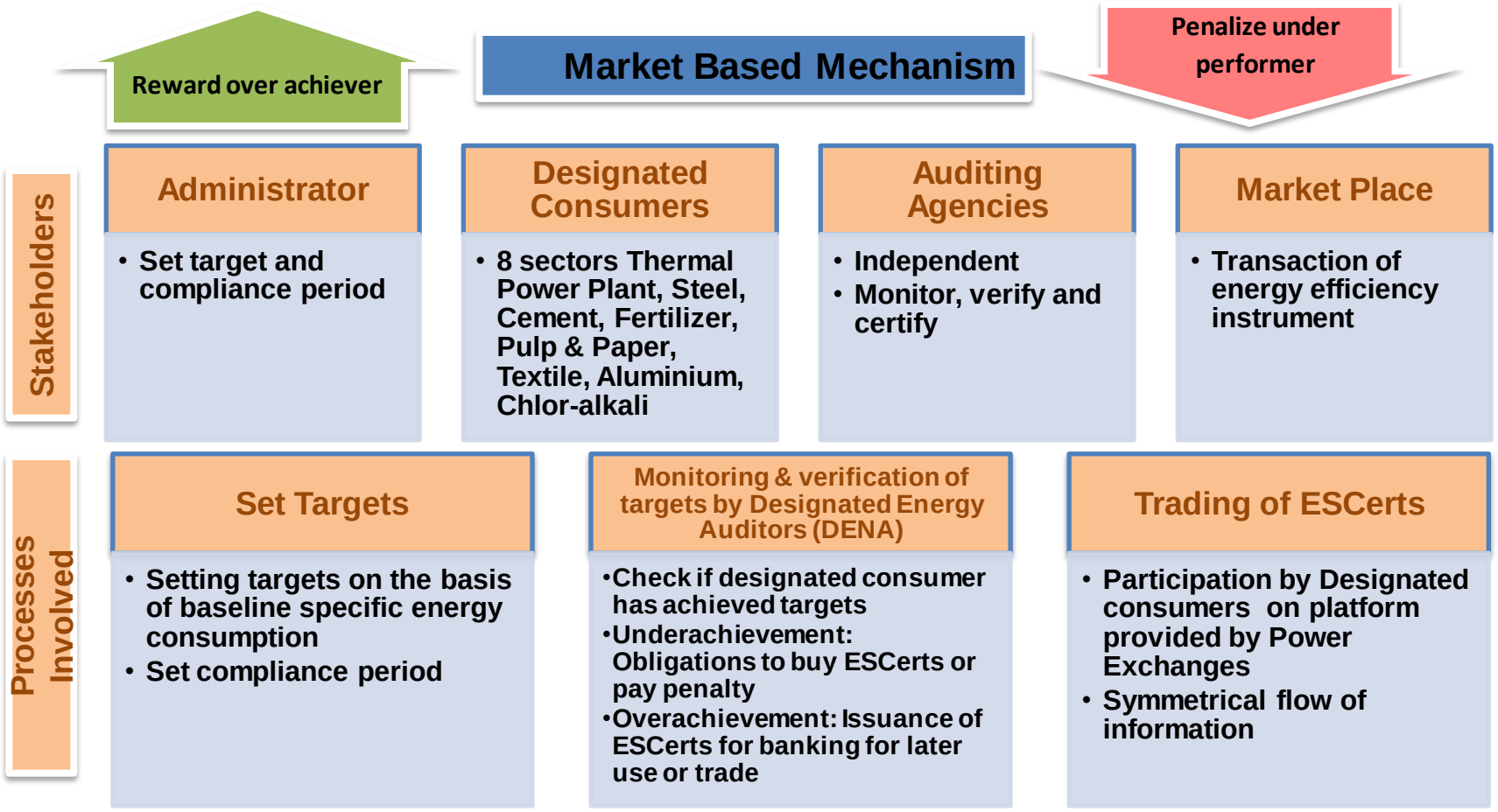
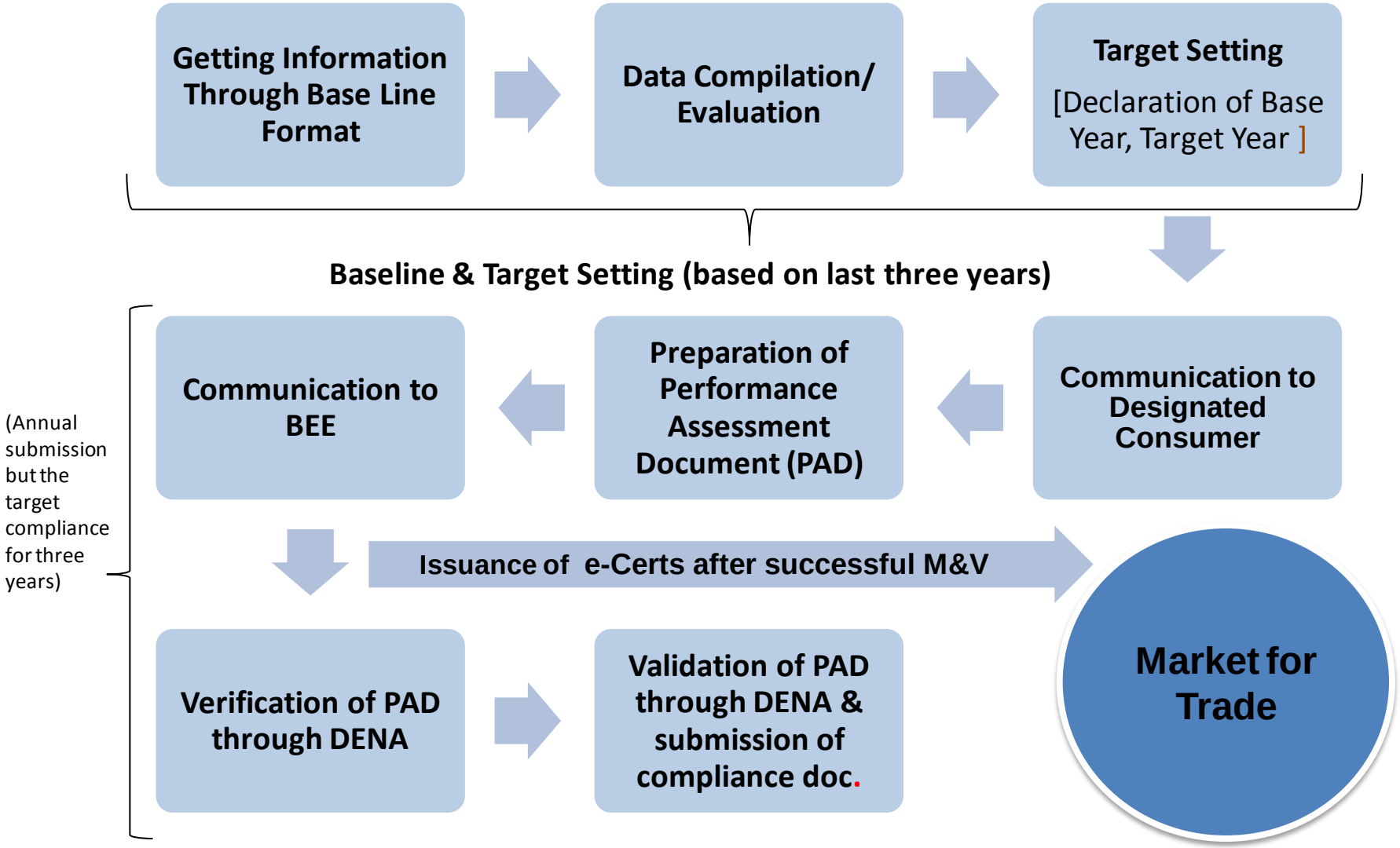
PAT - METHODOLOGY



Perform, Achieve & Trade (PAT) Mechanism



PAT Activity Flow Sheet



Designated Consumers (DCs) as notified under Indian Energy Conservation Act and covered under PAT Scheme

Industry Sector	Annual Energy Consumption Norm to be DC (toe)	No. of Identified DCs
Aluminum	7500	10
Cement	30000	85
Chlor-Alkali	12000	22
Fertilizer	30000	29
Pulp & Paper	30000	31
Thermal Power	30000	144
Iron & Steel	30000	67
Textiles	3000	90

PAT Scheme : Scope

- Covers 478 designated consumers in 8 sectors
- All DCs consume about 165 million toe energy
- Targets would be given to all DCs to achieve the same within a time frame

  -Achievement > Target ⟹ E-Scerts

  -Achievement < Target ⟹ Purchase E-Scerts / Penalty

- The Energy Savings Certificates (ESCerts) so issued will be tradable on special trading platforms to be created in the two power exchanges (Indian Energy Exchange and Power Exchange India).
- National Target = 6.686 million toe at the end of 1st PAT Cycle (by 2014-15)

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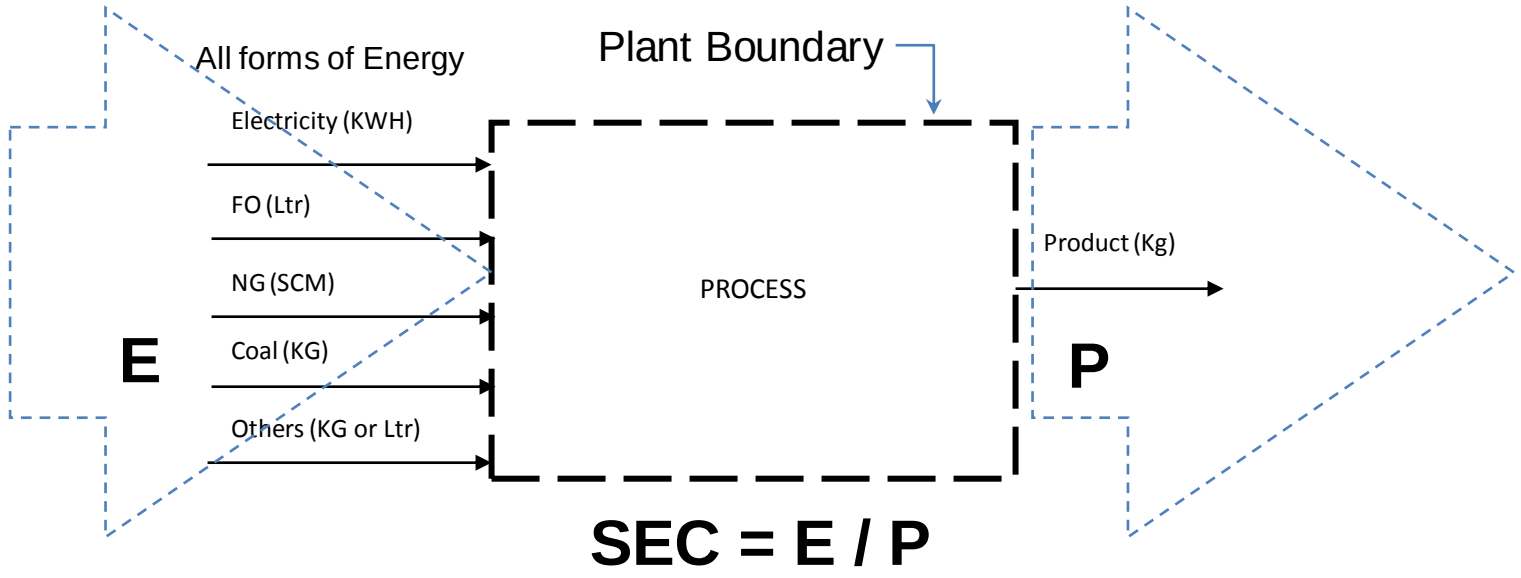
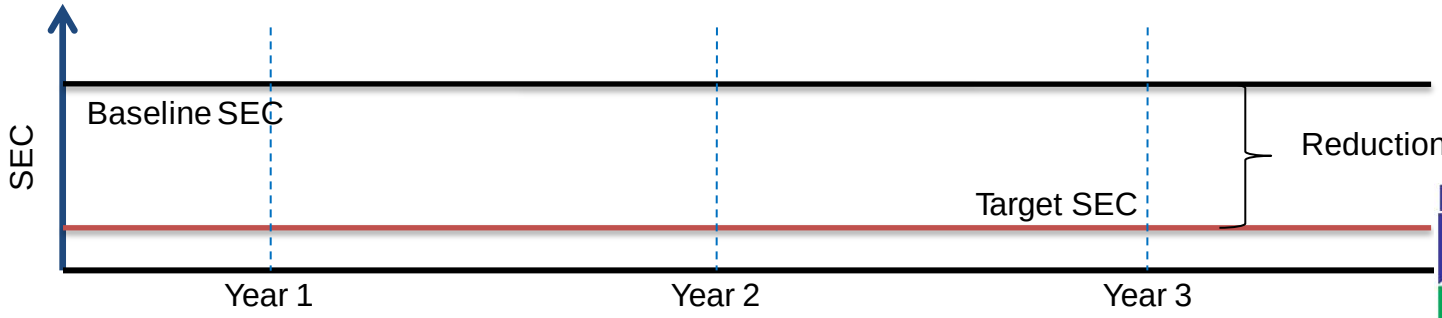
Specific Energy Consumption

As the SEC is calculated on a Gate-to-Gate concept, the definition of plant boundary plays an important role.





Target Setting
and
Energy Savings

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Target Setting Approach

- Industry Focused
- M&V Compliant
- Pro-rata Approach
- Percentage SEC reduction
- Independent Targets
- Differential Targets
- SEC Captures Plant variation
- Relative SEC Index Based Targets

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Approach for Estimation of Potential Savings

- Macro Analysis was carried out for 8 nos of Sectors under EC Act 2001
- Effort was to develop a simplified approach to estimate the energy saving potential across the designated sectors as a whole & for 478 designated consumers identified by BEE
- All the eight designated sectors were reviewed for base year data collection
- sector specific analysis was carried out to study the specific energy consumption, production growth rates etc.
- Production details and specific energy consumption (SEC) details for each designated sector was collected for the base year
- Specific energy consumption in 'tonnes of oil equivalent' (toe) per unit of production is estimated for each sector based on total electrical and thermal specific energy consumption of that sector
- Total energy consumption by each designated sector in toe is estimated as product of 'Total Production' and specific energy consumption of that sector in 'toe / unit production'

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Approach Towards Target Setting

- Establishment of Baseline :
  - As per reported data of 3 years (2007-08 to 2009-10)
  - Normalization Factors
  - Average of last 3 years value

- Targets to be statistically calculated based on relative SEC approach after grouping the DCs suitably

- The target reviewed by an expert committee before notification

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Estimation of Energy Savings

- Base:
  - Baseline Year : 2009-10
  - Baseline Production (P_{base}) : Avg. of 2007-8, 2008-9 & 2009-10
  - Baseline SEC (SEC_{base}) : Avg. of 2007-8, 2008-9 & 2009-10
  - Target SEC (SEC_{target}) : SEC as estimated in 2014-15
  - Target : % reduction from SEC_{base}

- Estimation of Energy Saving (TOE) :

$$P_{base} (SEC_{base} - SEC_{target})$$

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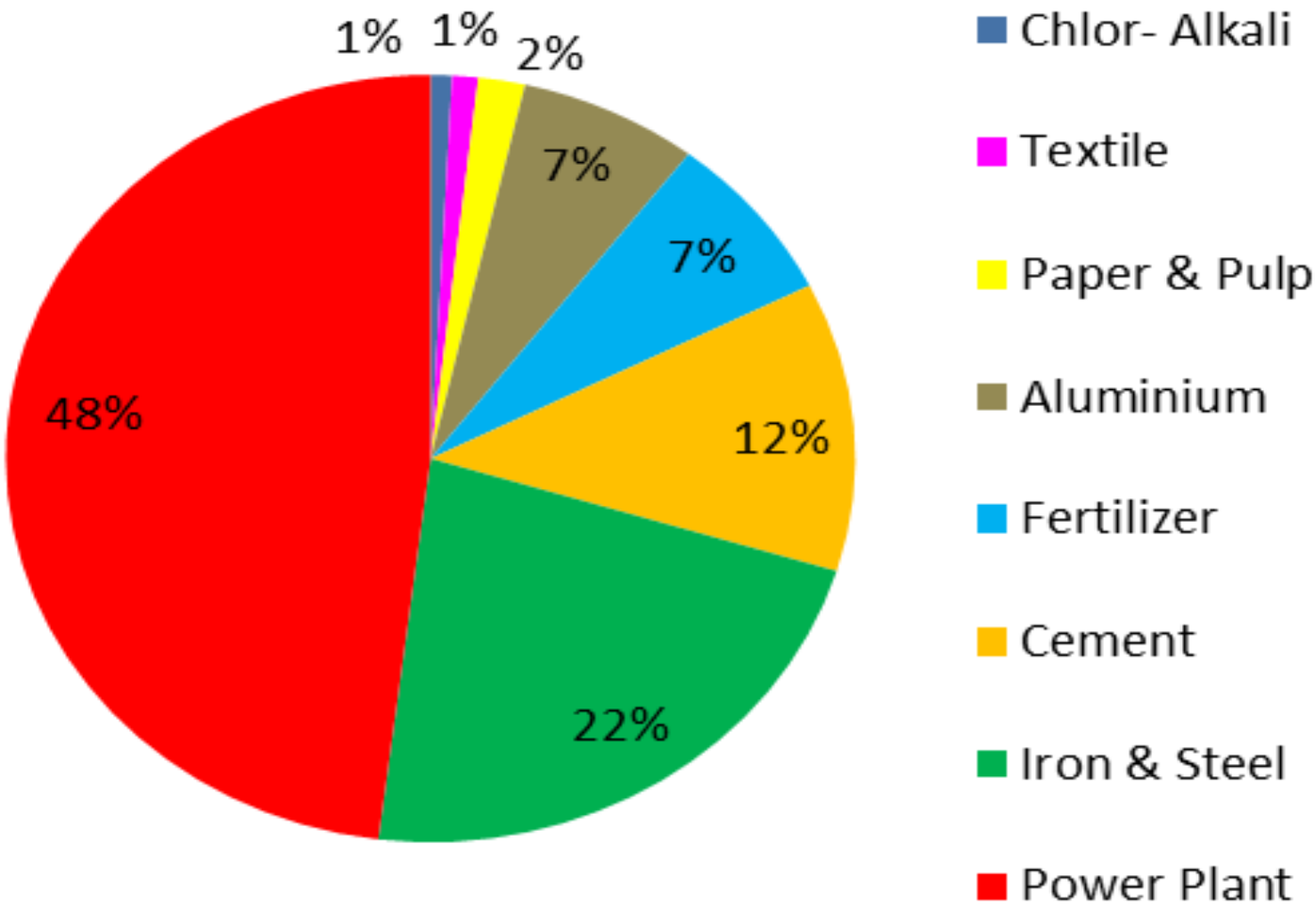
National Target of Energy Saving among all Sectors

S.NO.	Sector	No. of Identified DCs	Annual Energy Consumption (Million toe)	Share Consumption (%)	Apportioned Energy Reduction For PAT Cycle-1 (Million toe)
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	Fertilizer	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

National Energy Saving Targets under PAT (%) (2012-15)



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Energy Saving Certificate- Market Design

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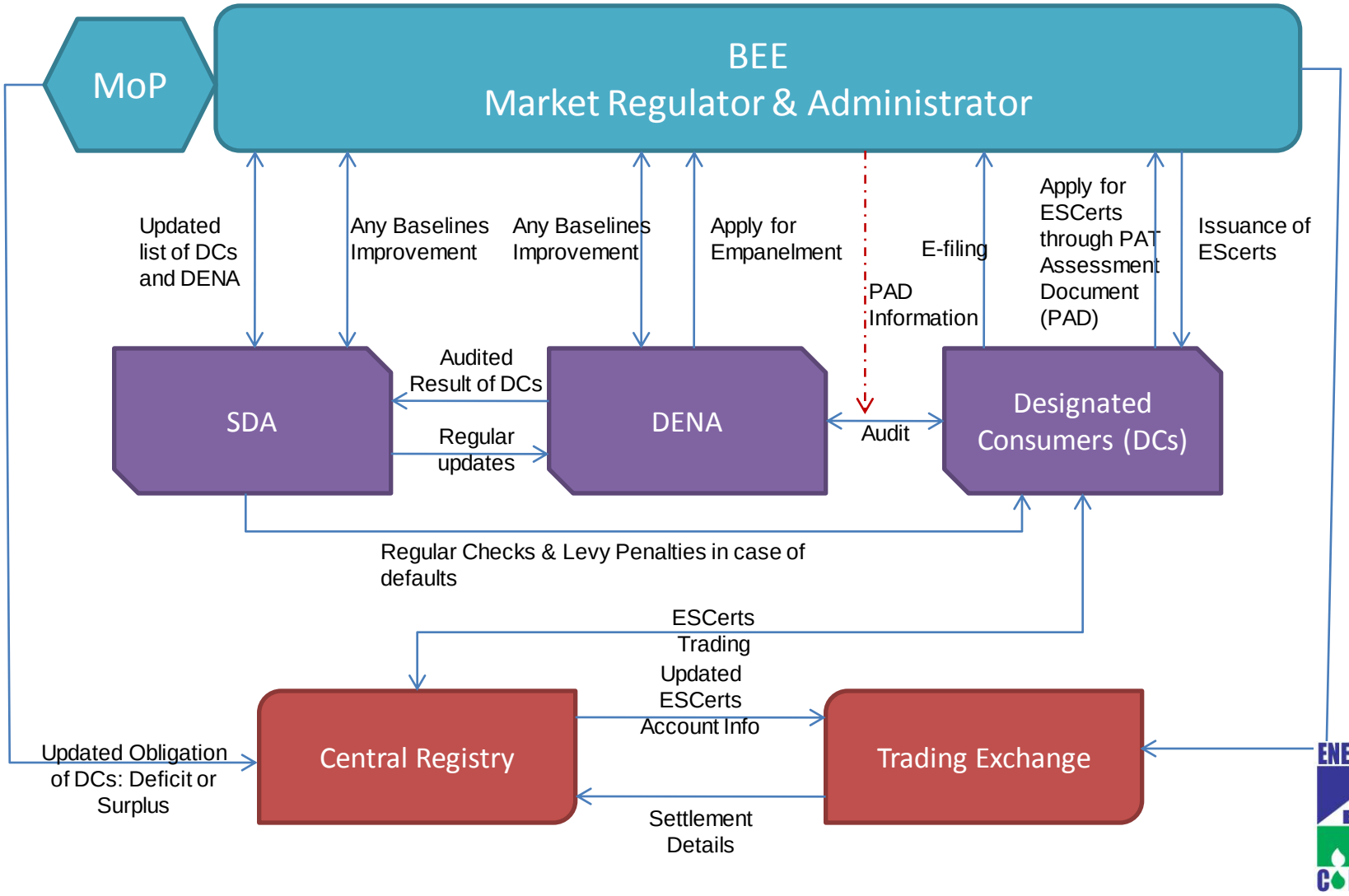
Institutional Design

Schematic



Market Design

- Designated Consumers are obligated to improve energy efficiency
- Energy Efficiency Targets are %-age reduction in SEC expressed in Absolute Savings terms
  - Various plants in an industry clustered on the basis of different parameters like technology etc
  - Each DC will get an energy efficiency improvement percentage target
  - The target would be converted into absolute energy saving target (in mToE terms) on the basis of plant capacity
  - The absolute energy saving target (obligations) would be applicable for a compliance period of three years
- Designated consumer can meet target by
  - Undertaking energy efficiency measures themselves
  - Buy ESCerts from someone else

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Market Design

- Compliance and Reporting
  - Total compliance period of 3 years (march 2015)
  - Designated Consumers would undertake energy efficiency measures and submit annual reports
  - If submitted annual reports show over-achievement, ESCerts to be issued for level of over-achievement
  - Provision of annual reporting along with penalties in case of non- compliance
  - After period of 3 years, a complete gate-to-gate measurement to be undertaken for verifying SEC and plant capacity for each DC
  - BEE would appoint Designated Energy Auditors (DENAs) for M&V
    - DENAs would be organizations, which meet minimum capability norms
    - DENAs would be accredited and empanelled by BEE
- BEE will initiate compliance checks on dip-check basis on both DC and Accredited Energy Auditor
- In case of non-compliance State Designated Agencies to levy penalties on DC

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Market Design

- ESCerts are issued
  - When energy efficiency improvements surpass targets
  - With 1 toe = 1 ESCert
  - Banking of ESCerts allowed during each cycle
    - 1st cycle ESCerts to 2nd cycle
    - 2nd cycle ESCerts to 3rd cycle

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Advanced ESCerts

- Baseline, SEC(b) = 10 toe/t
- Target, SEC (t) = 7 toe/t
- Achieved after year 1, SEC (a) = 8.5 toe/t
- Production = 10000 tons

- **AFTER YEAR 1**
- ESCerts =[(SEC(b) – (SEC (b)– SEC (t))/3) – SEC(a)] x 80% x prod

  = ((10 – (10-7)/3) – 8.5)) x 0.8 x 10000

  = (9-8.5) x 8000 = 4000 ESCerts

Revised Target = SEC(t) – (ESCerts/Prod)

= 7 – (4000/10000) = 6.6 toe/t

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Fuel Composition Mix in PAT Sector Industries

Fuel	Million toe	%
Coal	142.3	85.36
Oil	4.33	2.60
Gas	17.14	10.28
Imported Electricity (Not from CPP)	2.94	1.76

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Price of One ESCert (FY-2011 Price)

Fuel	Rs.	Calorific Value	Rs/toe	%	Rs . per toe (2011)
Coal	4001/ton	4457	8976.9	85.36	7662.67
Gas	3710/1000 scm	8500	4365	10.28	448.69
Oil	41734/ton	10000	41734	2.6	1085.08
Electricity	4.678/kWh	860	54395	1.76	957.36
Price of 1 tonne of oil equivalent					**Rs 10154**

Target, Compliance, ESCerts & Penalty- Example

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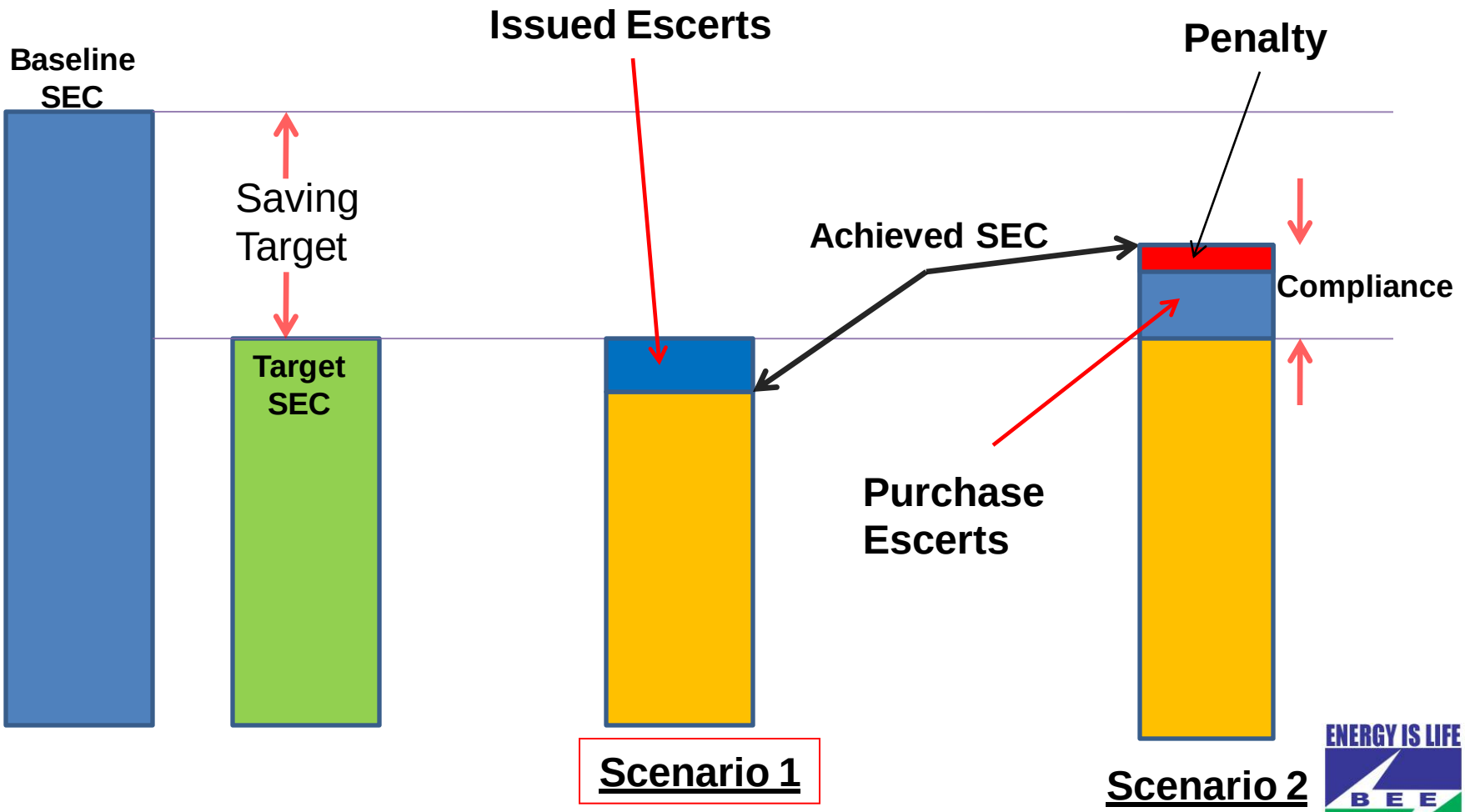
Concept of Target, Compliance, ESCerts & Penalty



Example

- Specific Energy Consumption (SEC) in Baseline year: 10 TOE/unit of production
- Baseline Production: 10000 units
- Target: 4% reduction in SEC
- SEC in the target year: 9.6 TOE/unit production
- For ESCerts or Penalty:

– Reduction requirement: 4000 TOE

– Scenario 1 (Achieved SEC = 9.4): +2000 TOE(ESCerts)

– Scenario 2 (Achieved SEC = 9.8): -2000 TOE (Penalty)

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Penalty for non-compliance

- Quantum of non compliance is deficiency in meeting target at the end of the cycle
- Penalty is the energy cost of quantum of non compliance
- Quantum of non compliance is provided in verification report and penalty is adjudicated by the state electricity regulatory commission
- Converted energy cost is Rs 10,154 per toe (2011-12) shall be periodically updated

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Monitoring , Reporting and Verification

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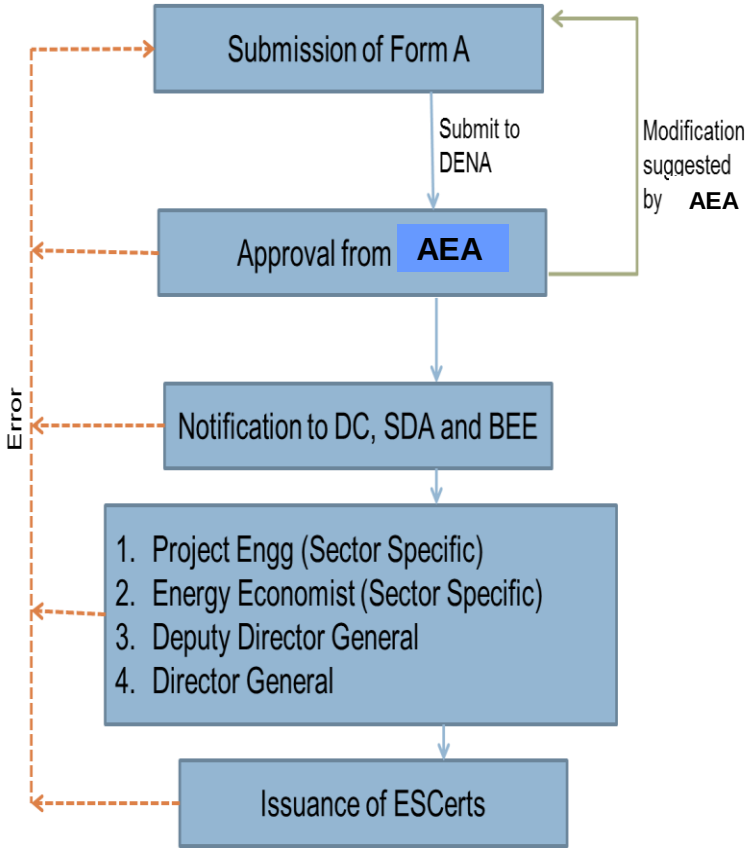
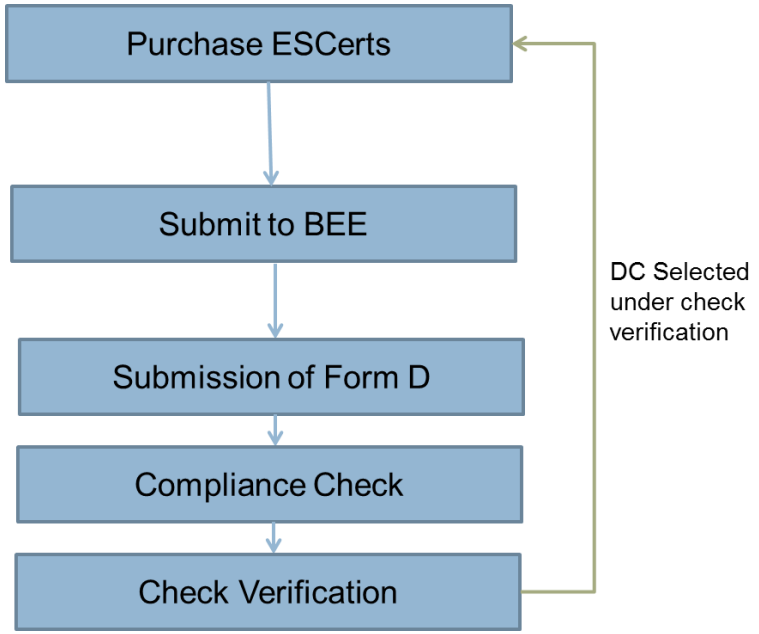
Monitoring & Verification Process

Issuance of ESCerts



Compliance Mechanism



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Desirable Attributes for M&V Framework

- Consistency and reliability
- Reasonable accuracy
- Flexibility
- Low cost of implementation for both scheme participant and administering authority

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Monitoring & Verification

- Designated consumers monitor and record their energy purchases and product sales
- Data to be provided to SDAs and BEE
- Data will be verified by accredited energy auditor for verification & check verification
- Check verification on sample basis

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Recommendation for issue of energy savings certificates

- The Bureau on satisfying itself about the correctness of verification report, and check-verification report, wherever sought by it, send its recommendation to the Central Government, based on the claim raised by the designated consumer in Form ‘A’, within ten working days from the last date of submission of said Form ‘A’ by the concerned state designated agency, for issuance of energy savings certificates.

Reporting

- On line reporting of Energy Consumption of previous year during first three months of every financial year
- Report in terms of Form A, B,C,D
- Energy Conservation steps implementation Action Plan reporting in every PAT Cycle

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Compliance Scheme

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Securing participation and ensuring compliance

- Mandatory trading schemes have been effective in securing industry participation through legal means and Powers to enforce penalties for non-compliance.
- Ongoing stakeholder engagement is critical in understanding the underlying issues relating to non-compliance and to ensure that the requirements are clearly conveyed to participating firms
- Effective communication with the industry will also inform regular reviews and ensure that the targets set are both ambitious and realistic.

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Important Time lines

	Mandatory		Voluntary	
Submission of Form 1	Once in a year	30th June	NA	NA
Submission of Form A (Performance Assessment Document)	Once in 3 years	30th June 2015	Before Compliance year	30th June
Submission of Form B (Verification by AEA)	Once in 3 years	30th June 2015	Before Compliance year	30th June
Issuance of ESCerts	Once in a year	Aug 2015	Before Compliance year	Aug
Submission of Form D (Performance Compliance Document)	Once in 3 years	30th Nov 2015	NA	NA

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Normalization Factors

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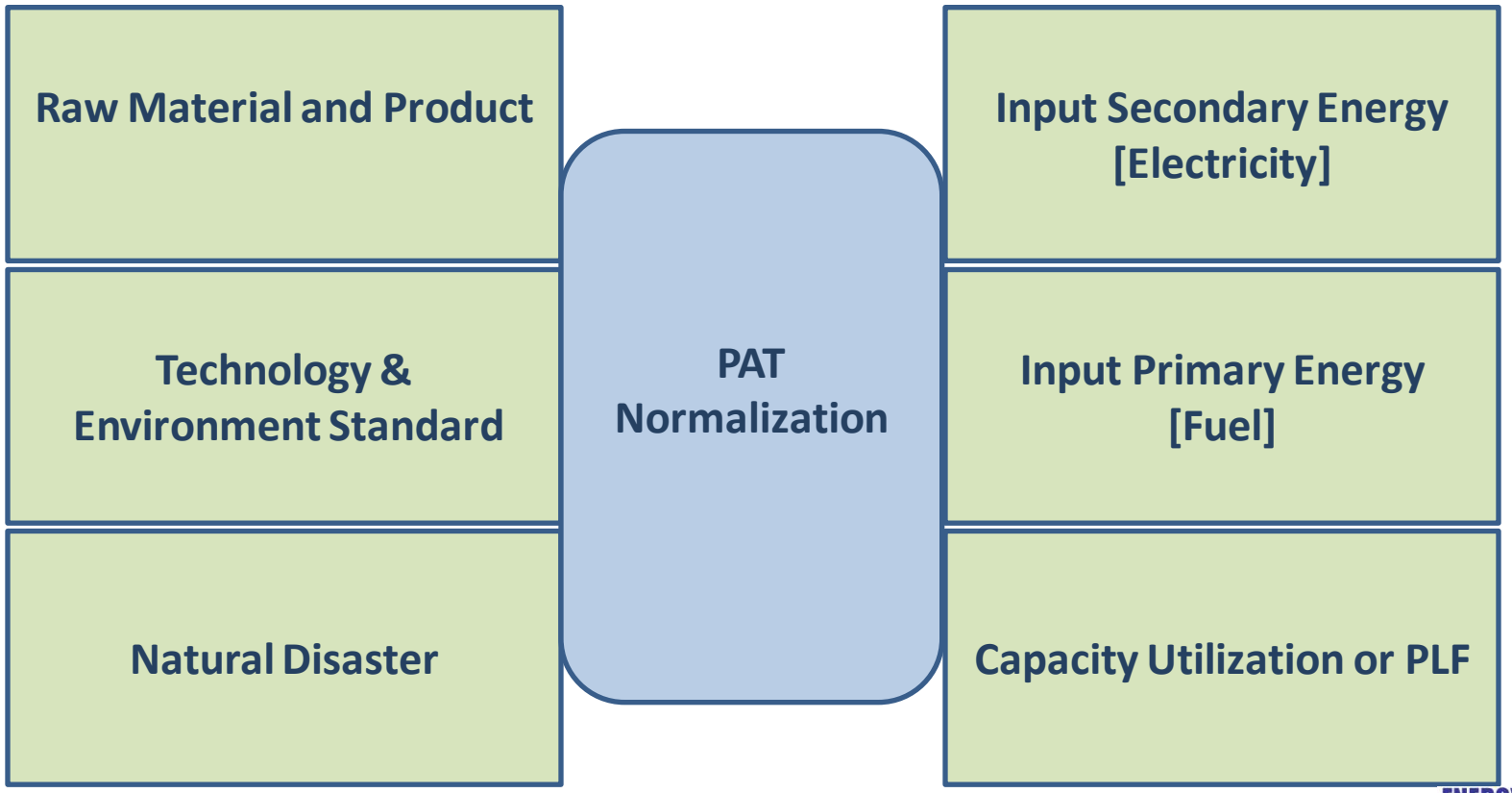
Normalization Area



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Normalization Factors

- **Capacity Utilization and PLF**
  Fluctuation due to Scheduling
- Effect due to Market Demand
- Non-availability of fuel or Raw Material
- **Raw Material & Product**
- Quality of Raw Material
- Output Product Change
- Production Semi-finished Product
- Input Semi-finished Product

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Environmental Standards and Natural Disaster

- Change in Standards
- Change in Government policy
- Natural disaster
- Rioting or social unrest

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Current Status

Perform, Achieve and Trade (PAT)

- PAT was launched on 30th March 2012 with the notification of targets, along with the associated rules and schedules, on operationalization of PAT scheme.
- Notification along with the rules has been sent to each designated consumer under the PAT scheme
- The PAT program was formally inaugurated by Hon'ble Minister of Power on 4th July, 2012 in a function organized at New Delhi.
- PAT cycle-1 (2012-13 to 2014-15) is currently under the implementation phase.
- 53 nos. of PAT consultation workshop were organized all over the country before launching of the scheme. Additionally, 22 number of workshops have been successfully organized between June to December, 2012 all over the country to disseminate the rules and methodology of the PAT scheme.
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Energy Efficiency Financing Platform(EEFP)

- MoU has been signed by BEE with M/s. PTC India Ltd, M/s. SIDBI, HSBC Bank, Tata Capital and IFCI Ltd to promote financing for Energy Efficiency projects.
- Three workshops were organized in association with financial institutions in June, 2012 and October, 2012 to stimulate financing for Designated Consumers of Maharashtra and Gujarat.

Summary

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Summary

- **Multi- cycle process –first cycle till 2014-15**

- **Target setting**
  - based on gate to gate specific energy consumption (SEC)
  - each designated consumer has to reduce SEC in target year (2014-15) as compare to baseline year (2009-10)
  - percentage reduction is based on efficiency in baseline year; efficient units in a sector have a lower percentage reduction target as compare to less efficient units

- **Monitoring and Verification**
  - designated consumers monitor and record their energy purchases and product sales
  - data to be provided to SDAs and BEE
  - data will be verified by accredited energy auditor for verification & check verification
  - check verification on sample basis

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Summary

- **Incentivization and trading of excess savings**
  - Energy Saving Certificates issued for savings in excess of target; early issuance (after one year) is possible
  - Certificates can be traded with other designated consumers who can utilize them to show compliance
  - Certificates can be banked for one more cycle
  - Trading platform on the two power exchanges (IEX & PXIL)

- **Penalty for Non-Compliance**
  - Quantum of non compliance is deficiency in meeting target at the end of the cycle
  - Penalty is the energy cost of quantum of non compliance
  - Quantum of non compliance is provided in verification report and penalty is adjudicated by the state electricity regulatory commission
  - Converted energy cost is Rs 10,154 per toe (2011-12) shall be periodically updated

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Next Steps

- Resolution of issues : Sectoral committee will address issue related to methodology and targets

- Normalization process : Formulae for normalizing performance in target year with respect to changes in
  - Capacity utilization
  - Relation of grid to captive power
  - Raw material quality
  - Product mix

- Coverage for next cycle : Identification of sectors and units to be included in next cycle and targets for next cycle

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CONCLUSION-PAT Scheme

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Energy Saving Potential

- Introduction of Perform, Achieve and Trade Scheme for Energy Intensive Industries improves energy efficiency and facilitates cost effectiveness by certifying energy saving that could be traded due to its market based mechanism.
- The 478 designated consumer plants offer an energy saving potential of 6,686,000 ton of oil equivalent/year(6.686 million toe/year) at the end of first phase of PAT Cycle (2012- 2015).

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Faster adoption of Low Carbon Technologies

- PAT is one of the most promising initiatives to achieve the goal by implementing Best Available Practices and Technologies in the identified sectors through economical viable projects.
- Broader implementation of sectoral crediting mechanisms could ensure that low-carbon technologies are also used more widely, which in turn would encourage Indian industries to invest in these technologies.

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Benefits

- The direct benefit for the participating industries in this period is reductions in input costs related to energy of approximately Rs 68000 million.
- Needless to add, this will significantly enhance global competitiveness of industry while simultaneously reducing India's CO2 emissions by 24 million tons per year in 2014-15.

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Innovative Model

- The PAT scheme is a unique and innovative programme with no precedence anywhere else in the world.
- PAT would become a valuable model for other countries to adopt for their own energy efficiency programmes with a business perspective.
- The PAT scheme has the makings of becoming a benchmark for design and implementation of policies and measures.
- It also highlights an innovative approach of introducing market-based instruments within a regulatory framework to encourage compliance.
- Successful implementation of the scheme could serve as a model for addressing upcoming challenges in a transparent and economically efficient manner.

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Thank You!