



ENERGY EFFICIENT TECHNOLOGIES AND ENABLING POLICIES: EXAMPLES FROM INDIAN INDUSTRY SECTOR

Girish Sethi
Director and Senior Fellow
TERI, New Delhi

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a low carbon Asia

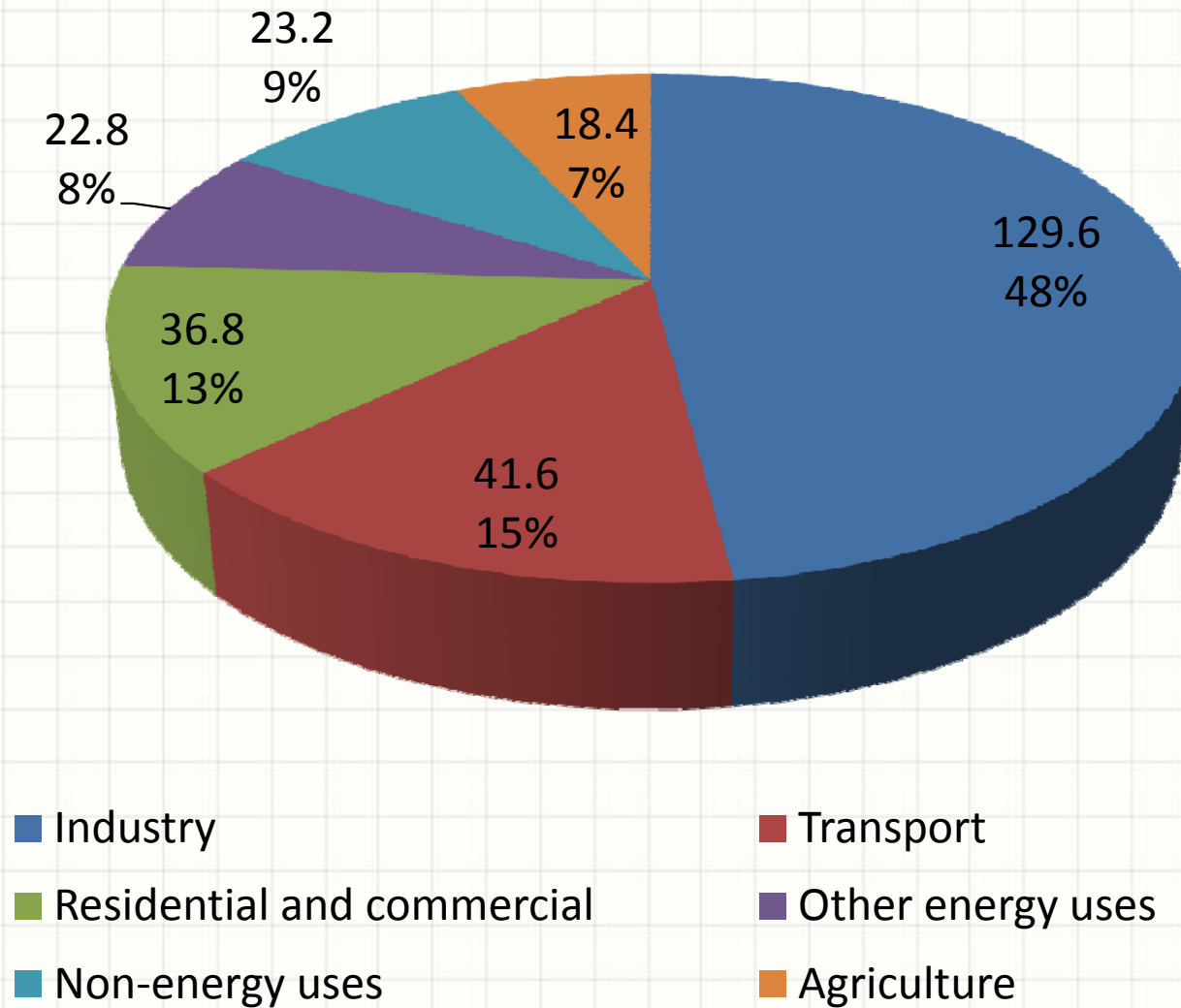
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Introduction

- Global energy demand will grow by 55% between 2005-30
- 74% of the growth will be on account of increase in demand in developing countries
- Meeting the growing energy demand through conventional means would not be environmentally sustainable
- Effective strategies are needed for promoting Energy Efficient (EE)/Renewable Energy (RE) technologies for sustainable growth
- Broad focus areas for developing countries:
 - Technology Deployment
 - Capacity building
 - Enabling Policy Environment
 - Financing



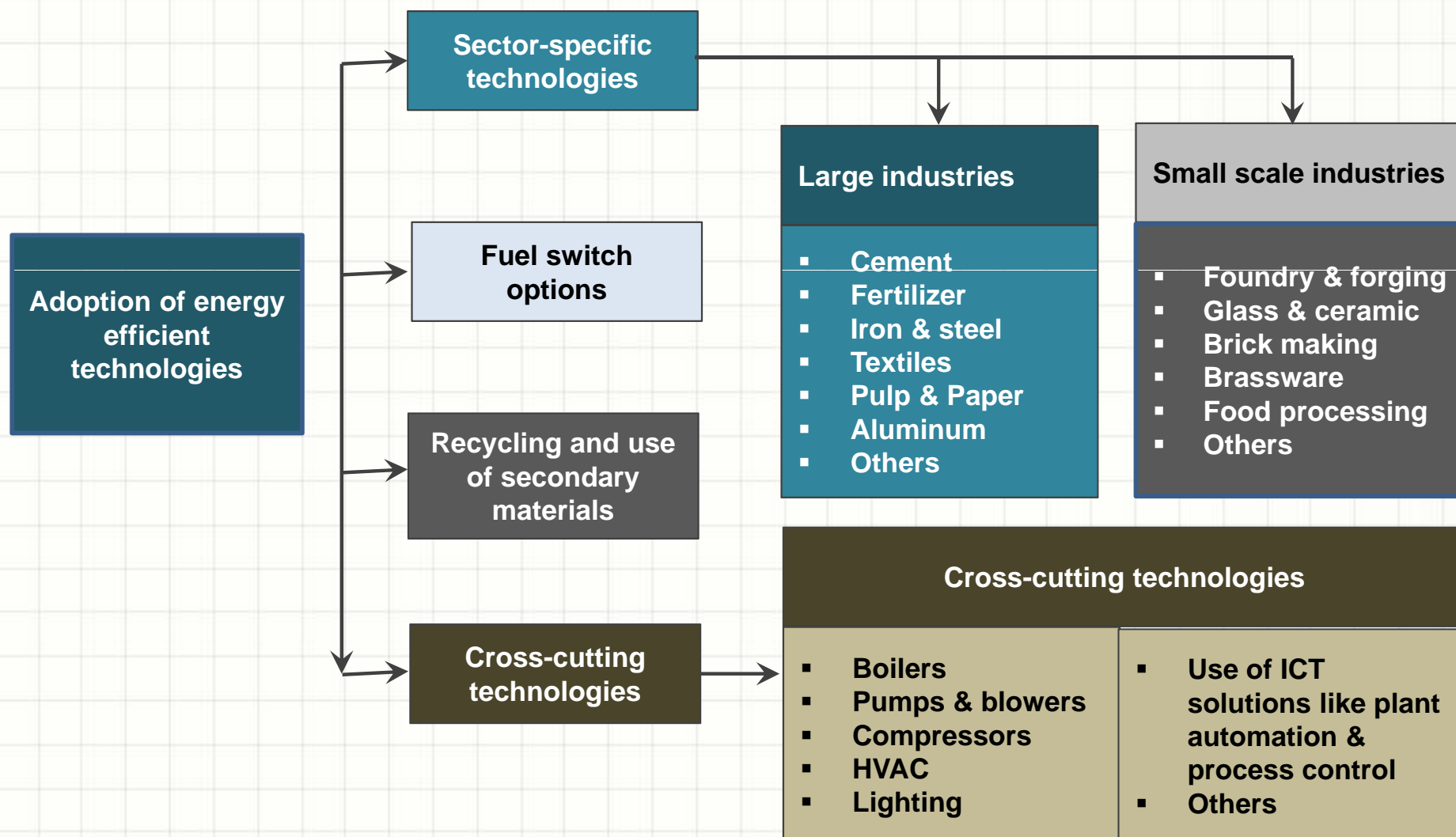
Sector-wise energy consumption in India



Electrical Energy Consumption and Conservation Potential

Sector	Consumption (Billion KWh)	Saving Potential (Billion KWh)	% Savings
Agriculture Pumping	92.33	27.79	30.09
Commercial Buildings/ Establishments with connected load > 500 KW	9.92	1.98	19.95
Municipalities	12.45	2.88	23.13
Domestic	120.92	24.16	19.98
Industry (Including SMEs)	265.38	18.57	6.99
Total	501.00	75.36	15.04

Energy conservation options in industries – Broad categorization



Energy Technology and Policy initiatives in India : a few examples

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- Research, Development, Demonstration and Deployment (RDD&D)
 - Adoption of existing technologies to suit the specific requirements of developing countries
 - [TERI initiatives in SME sector](#)
 - New energy efficient technologies
 - [BEE – Super Energy Efficient Equipment Program](#)
- Dissemination of existing EETs and Best Operating Practices (BOPs)
 - Large variations in the energy consumption levels across industries in the same sub-sector
 - Need for capacity building and focused policy initiatives
 - [PAT scheme of Government of India](#)
 - [AFD-TERI study in Small industries](#)

Small and Medium Enterprise (SME) sector in India

- 26 million registered units employing 69 million people
- Accounts for 45% of manufacturing output and 40% of India's total exports
- Many energy intensive sectors like foundry and forgings, glass and ceramics, textiles, food processing and so on
- Uses obsolete energy inefficient technologies
- Good scope to save energy by developing and demonstrating cleaner technological options



Application of low carbon technologies in SME sector - a joint TERI/IGES research project

1) Overall Goal:

- a) Promotion of low carbon technologies in India

2) Cooperation Framework:

- a) Japan - "Science and Technology Research Partnership for Sustainable Development" promoted by JICA and JST;
- b) India - Ministry of Environment and Forests, Govt of India

3) Target sectors:

- a) Small and Medium Enterprises

4) Focus:

- a) Energy efficient technologies

5) Time period:

- a) 4 years (2010 -14)

6) Implementation partners:

- a) India: TERI and selected SMEs
- b) Japan: IGES, Kyoto Univ and selected Japanese companies

7) Identified technologies:

- a) Small sized Gas and Electric Heat Pumps for process heating and cooling applications

Unique RDD&D initiative among Indian SMEs: TERI-SDC Partnership

- Initiated in 1994 by Swiss Agency for Development and Cooperation (SDC) in collaboration with Indian research institute (TERI)
- Identified energy inefficient operations in four SME sub-sectors: foundry sector (cupola melting furnace), glass sector (pot furnace), brick sector (vertical shaft brick kilns) and biomass applications (gasifier)
- TERI in collaboration with international experts worked towards development and demonstration energy efficient technologies in each of the four sector
- Diffusion of the demonstrated technology was possible due to accumulation of technological capacity within TERI and Indian partners
- TERI and Indian partners provide training and hand-holding support of local service providers as well as SME operators during technology replications

Supporting partners in technology development



Sponsor



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Embassy of Switzerland in India

Glass – Pot furnace

Conventional coal fired
Pot Furnace

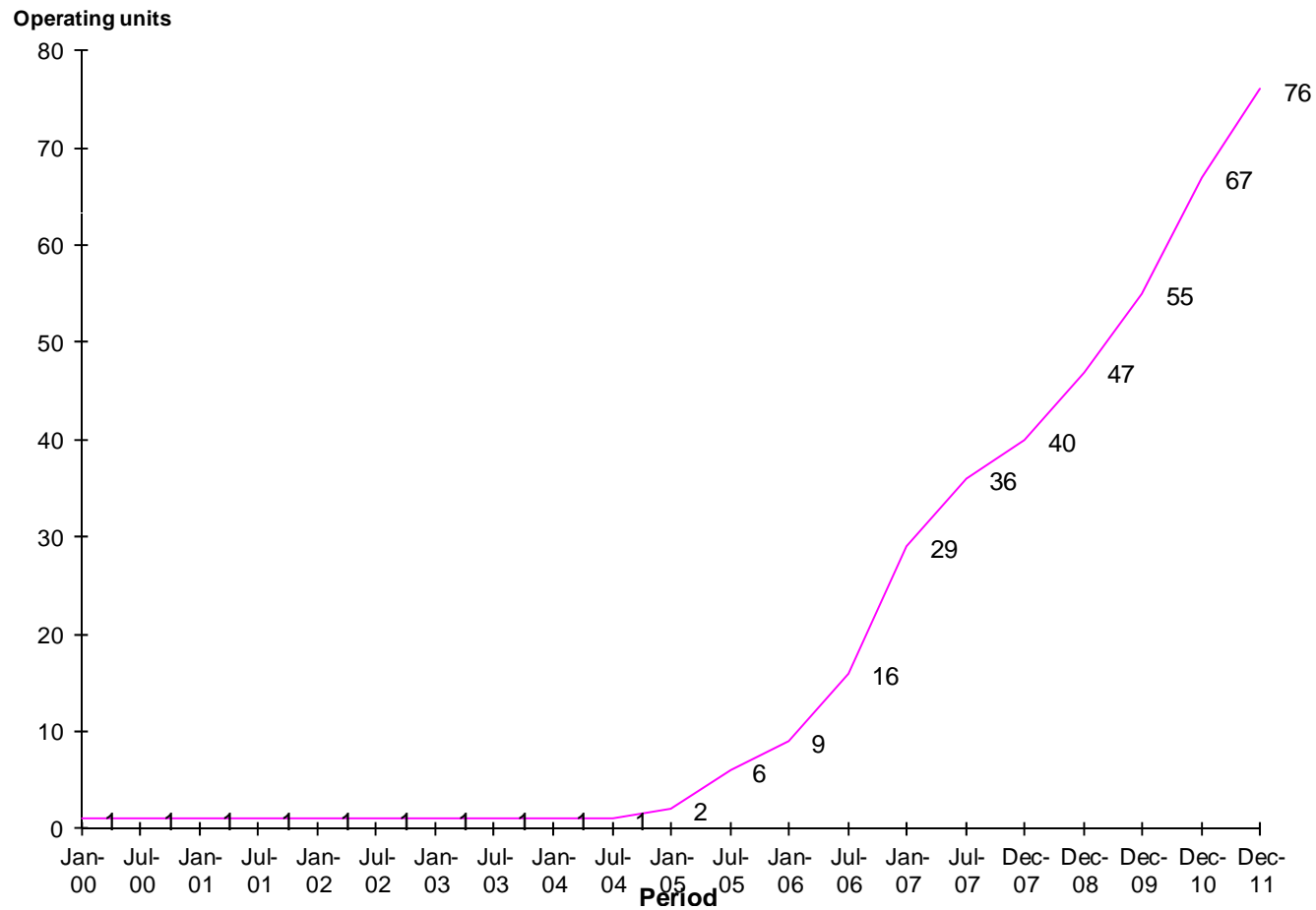


Recuperative natural gas fired
Pot furnace



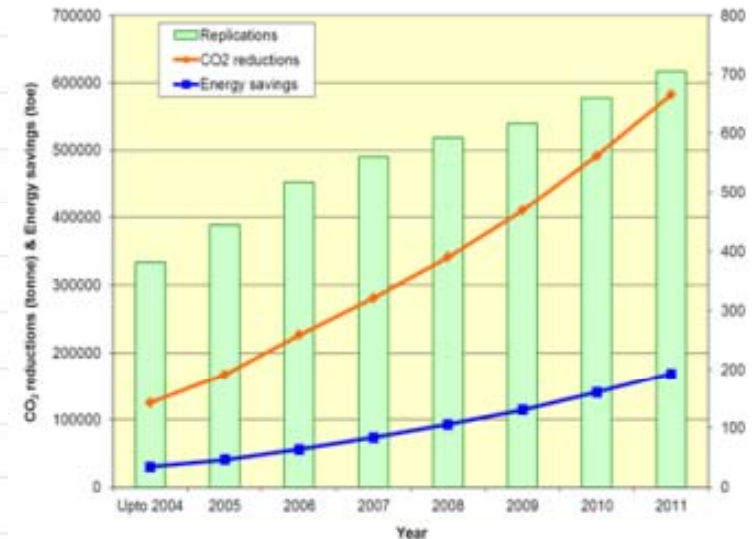
Energy savings: 25-50%

Technology diffusion curve for demonstrated pot furnace in glass industry



Impact of the RDD&D initiative

- 95 energy efficient cupola furnaces and 76 pot furnaces replicated in foundry and glass sectors. Energy saved in the two sectors about 102,000 tonnes of oil equivalent (365,000 tonnes of CO₂)
- Diffusion of the technologies was made possible by constant modifications to the demonstrated technologies e.g. lowering of cost and adapting to local requirements
- Many more self-replicated versions of these furnaces by local service providers whose energy savings have not been quantified



BEE- SEEP : Example - Ceiling fans

- 40 million ceiling fans produced per year in India
 - Standard fans consume 75 W, air delivery 220 m³/min (1200 mm sweep)
 - Energy efficient (EE) fans consume 50 W but are having lower air delivery
 - Super energy efficient (SEE) fans would consume 35 W with air delivery of standard fans
- Need programs to focus on RDD&D to develop such equipment /technologies
 - BEE planning to launch Super Energy efficient program (SEEP) initially for ceiling fans
 - Other examples : Room ACs, pump sets, industry specific process technologies etc.



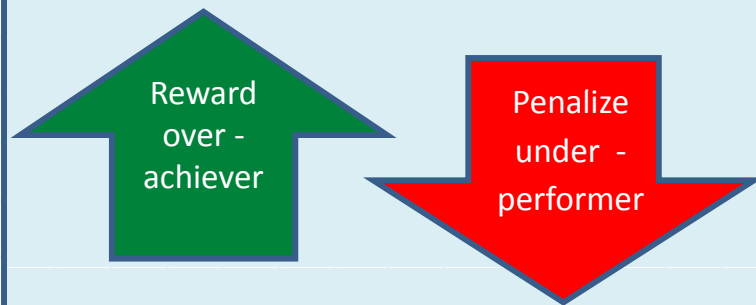
Key features: PAT

- Focuses on 478 large consumers of commercial energy (7 industry sub-sectors and thermal power plants)
- Large variation in SEC observed within each sub-sector
- Key goal of the PAT scheme is to mandate specific energy efficiency improvements.
- These units consume about 165 million tons of oil equivalent (mtoe) energy
- Unit specific energy reduction targets mandated based on their baseline energy consumption
- By the end of the first PAT cycle (2012-15), the energy savings of 6.686 mtoe is envisaged.

Perform Achieve and Trade (PAT) Mechanism

: Overall structure

Market Based Mechanism



- Administrator
 - Set target and compliance period
- Designated Consumers
 - 8 sectors (~478 units) Power, Steel, Cement, Fertilizer, Pulp & Paper, Textile, Aluminium, Chlor-alkali
- Auditing Agencies
 - Independent
 - Monitor, verify and certify
- Market Place
 - Transaction of energy efficiency instrument



Set Targets

- Setting targets on the basis of current specific energy consumption
- Set compliance period
- May take into account Location, Vintage, Technology, raw materials, product mix etc.



Monitoring & verification of targets by Designated Energy Auditors

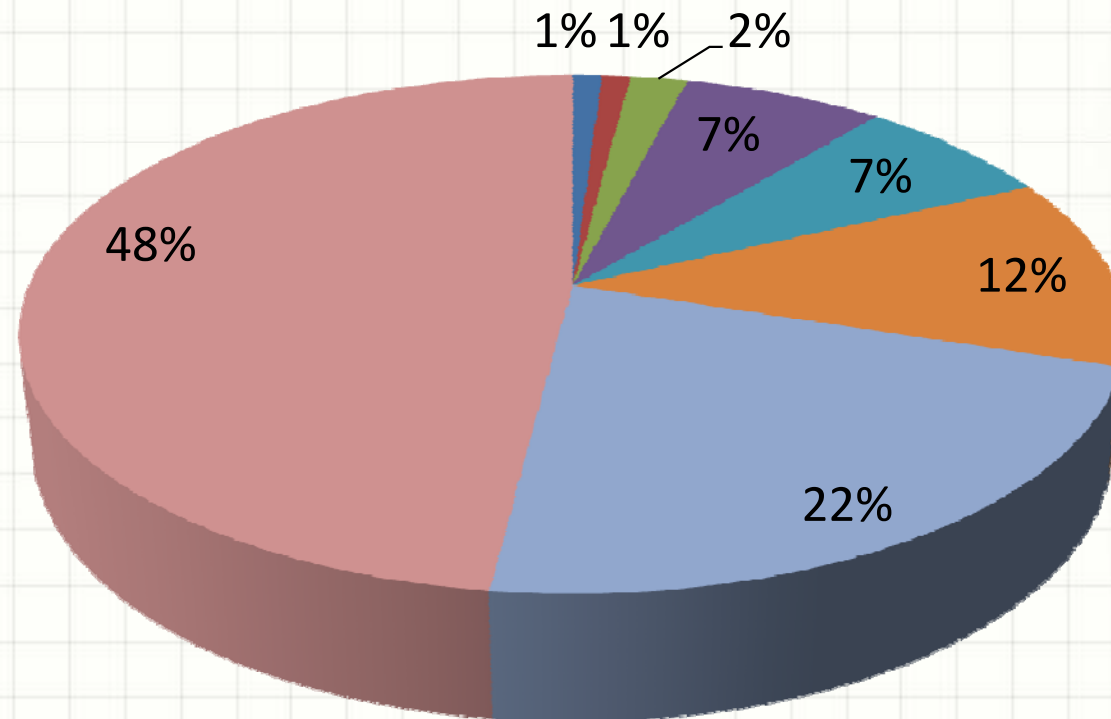
- Check if designated consumer has achieved targets
- Underachievement: Obligations to buy ESCerts or pay penalty
- Overachievement: Issuance of ESCerts for banking for later use or trade



Trading of ESCerts

- Participation by Designated consumers on platform provided by Power Exchanges
- Symmetrical flow of information

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



- Chlor-Alkali
- Textile
- Paper and pulp
- Aluminium
- Fertilizer
- Cement
- Iron and steel
- Power plant

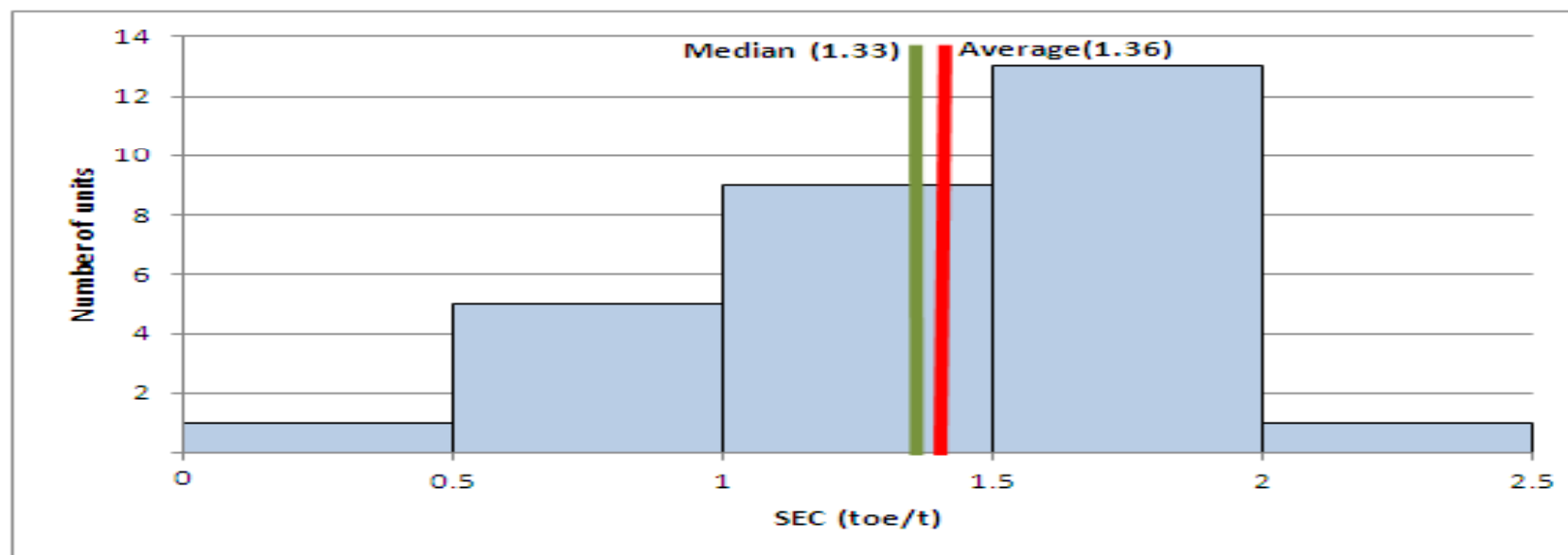


AFD-BEE-ADEME-TERI study



- Energy data of 36 SME clusters was analyzed
- Large variation in specific energy consumption (SEC) was observed
- Average and median SECs show significant scope to save energy through targeted dissemination programs.

Brass industry cluster in Eastern India



Conclusions

- Opportunities for energy efficiency exist in all industry sectors
- Need to develop sector specific technology implementation models with close involvement of various stakeholders
- Other related challenges to be addressed include finance, capacity building and an enabling institutional mechanism
- Large opportunities for international collaborative Research Partnerships (North-South and South – South)



THANK YOU FOR YOUR ATTENTION

Email girishs@teri.res.in

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