



Creating Innovative Solutions
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Benchmarking and mapping Energy consumption in Indian MSMEs

Study by AFD-ADEME-BEE-TERI

SAMEEEKSHA meeting (April 03, 2012)

Objective



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The objective of the study is to initiate the construction of 'overall picture' of energy consumption in MSME sector and benchmark specific energy consumption (SEC) for different MSMEs sub-sectors.

- Collection of data on energy consumption from energy audit reports & statistical data based on 4th census;
- Construction of energy consumption balance sheet & energy saving potential with BAT and BOP;
- Drivers and barriers for energy efficiency improvements in MSMEs.

Deliverables

Main expected deliverables:

1. Identifying and structuring MSME related statistical data;
2. Benchmarking SECs at cluster/product/process level;
3. Setting up a tentative energy consumption balance sheet;
4. Identifying best available technologies and best practices and improving current BAT list;
5. Estimating the energy saving potential of the Indian MSME sector;
6. Assessment of energy audit impact;
7. Highlighting the challenges to energy efficiency and compiling existing initiatives.

Proposed methodology



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Data

Cluster manuals/ energy audit reports (BEE, TERI, others)

MSME census data (total sub-sector production)

Energy supply side data (CEA, Ministry of petrol & gas)

Process

SEC average calculation and benchmarking (cluster/sub-sector level)

Total energy consumption projection at national level (SEC average*total sub-sector production)

Energy balance sheet for demand side data (calculated value) and supply side data



Identification and data collection



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S No	Source	Resources	Quantity/ Remarks
1	BEE	• Cluster manuals	27 (20 sub-sectors)
2	BEE	• Energy audit reports	1062 (25 clusters)
3	APITCO	• Energy audit reports	5
4	SIDBI	• JICA Energy saving equipment list	
5	UNIDO	• Diagnostic report	
6	JICA	• Energy audit reports & case study	Follow-up on-going
7	TERI-SDC	• Cluster data (glass), Foundry (All India)	
8	TERI-UNDP/GEF	• Brick (all India)	
9	TERI-UNIDO/GEF	• Cluster reports	12 (4 overlap with BEE)
10	TERI-SIDBI	• Energy audit reports	60 (2 clusters)
11	TERI-ANERT	• Energy audit reports	5 clusters
12	TERI-Tobacco Board	• All India data	

Methodology



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1. [Basic sheet](#)
2. [Cluster level analysis](#)
3. [Overall energy consumption](#)
4. [Energy audit reports](#)

The screenshot displays a series of overlapping Excel spreadsheets used for energy analysis. The visible sheets include:

- CLUSTER LEVEL - Brass Jamnagar Production**: Shows total production of 213072 tpa.
- CLUSTER LEVEL - Tea Jorhat Production**: Shows total production of 80000 tpa.
- CLUSTER LEVEL - Surat Production**: Shows total production of 171 tpa.
- SEC - Overall**: Shows overall energy consumption and CO₂ emissions.
- Basics**: Contains conversion factors (1 kcal = 4.184 kJ, 1 kWh = 3.6 MJ, 1 GJ = 1000 MJ, 1 PJ = 1000 GJ) and fuel data.
- Energy consumption**: Shows energy consumption for various products.
- CO₂ emissions**: Shows CO₂ emissions for various products.

The main spreadsheet, **EnergyConsumptionMSME.xlsx**, is a Microsoft Excel file with the following structure:

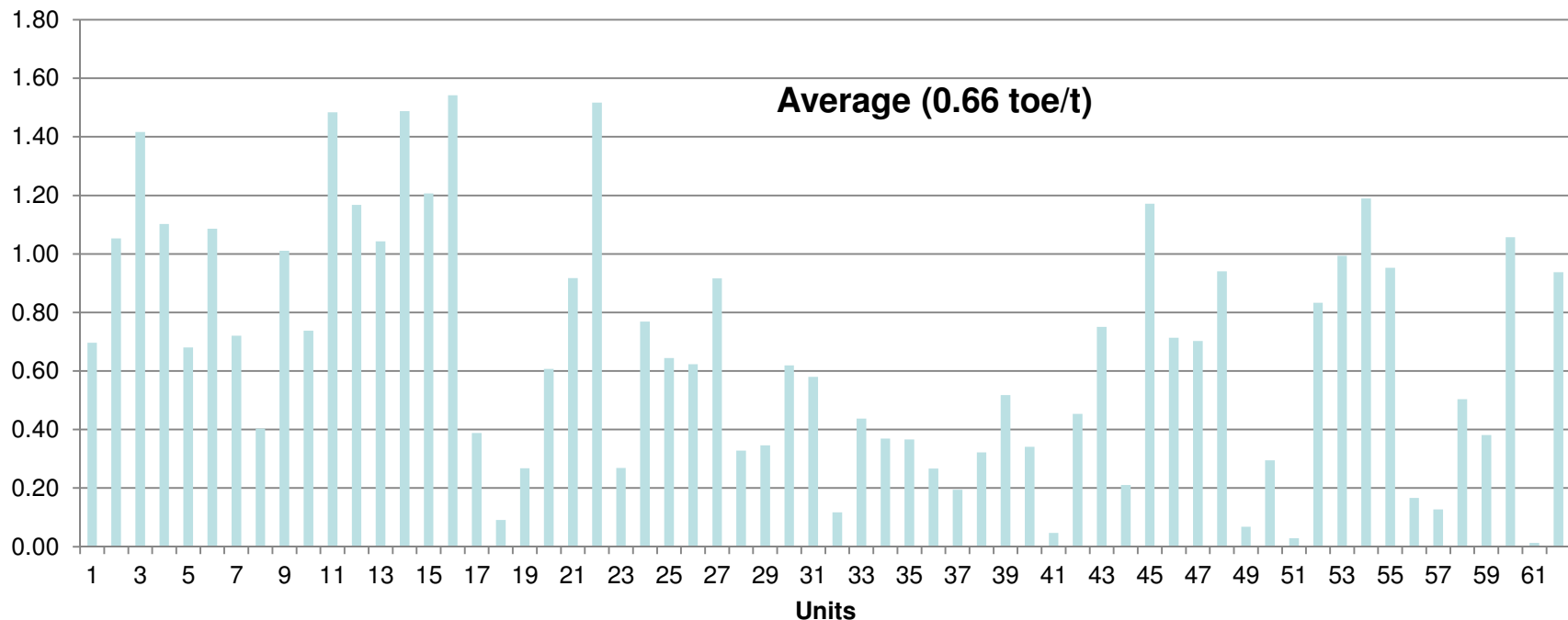
S No	NSIC code	Sub-sector	Cluster	Products	State	Year of study	Unit (production)	Production	Break-up toe	Thermal toe	Electrical million kWh	Total energy consumption
1		Brass	Bhubaneswar	Plates, Other products and Handicrafts		June 2010			418	0.02		171
1A				Plates					420			
1B				Other products					423			
1C				Handicrafts					418			
2		Brass	Jamnagar		Gujarat				253	154		
2A				Foundry					19907			
2B				Extrusion					13219			
2C				Machining					3901			
2D				Electroplating					715			
6		Foundry	Indore	Components for automobile	Madhya Pradesh	2010 Feb						

Unit level SECs – Heterogeneous products



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SEC (TOE/T) - Dyes and Chemicals (Ahmedabad cluster)



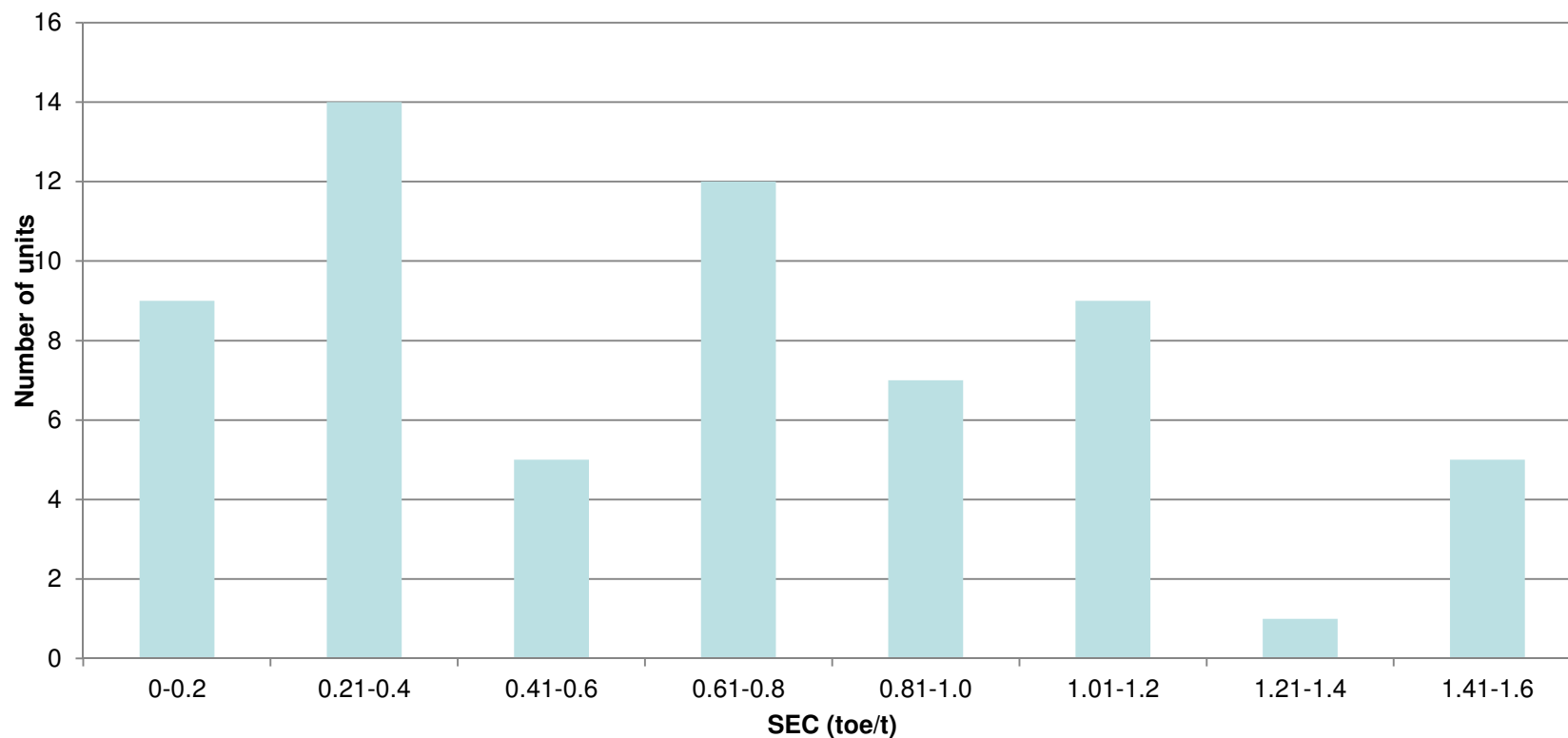
- Difficulties in correlation of SECs due to variations in product types, process followed, raw material and capacities;
- SEC benchmarking thus seems to be difficult across heterogeneous products - more than 30 product types from about 65 analysed chemical units.

Unit level SECs – Heterogeneous products



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**Distribution of SEC (TOE/T) - Dyes and chemicals
(Ahmedabad cluster)**

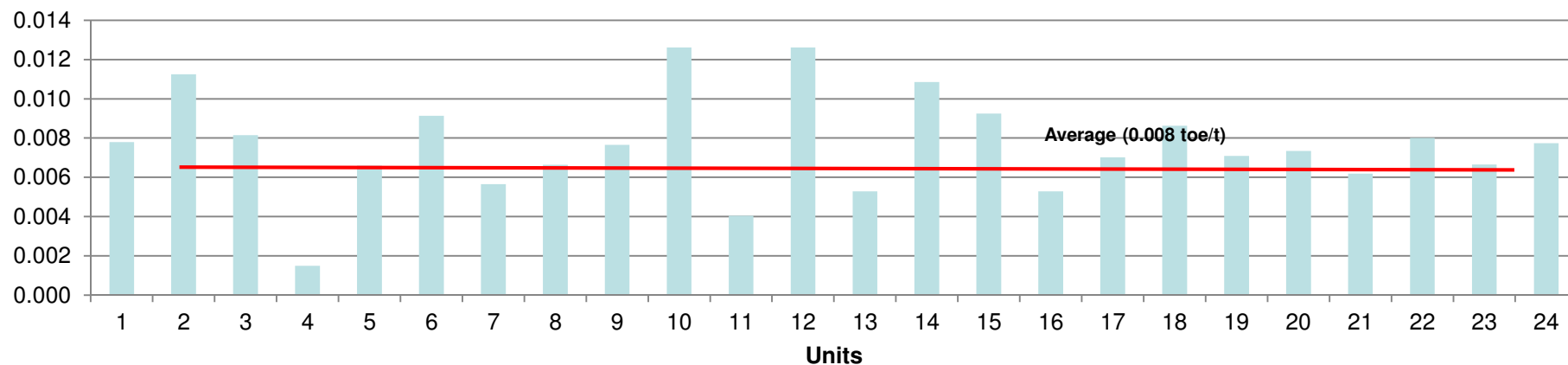


Unit level SECs – Homogeneous products

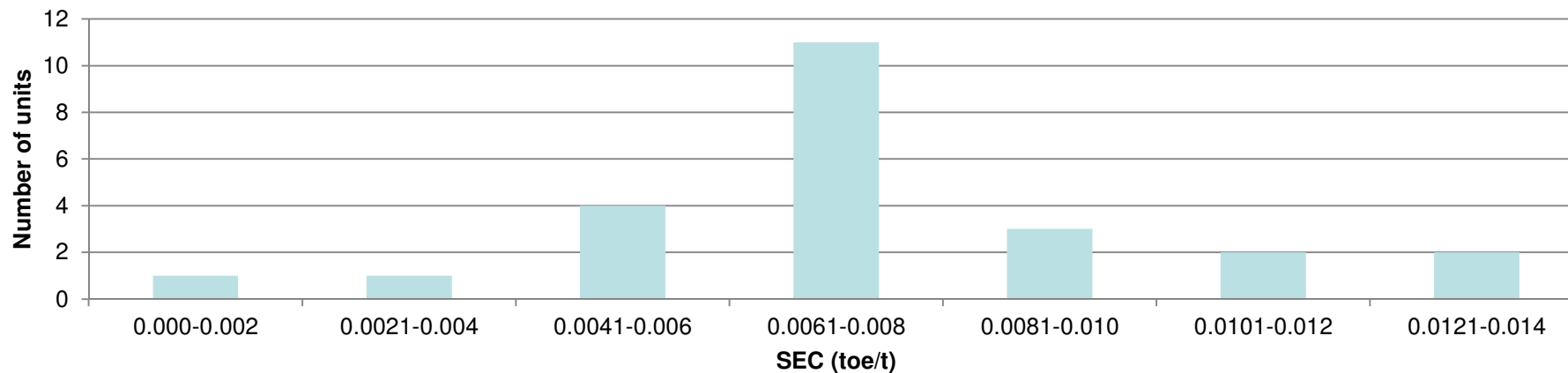


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SEC (TOE/T) - Icemaking (Bhimavaram cluster)



Distribution of SEC (TOE/T) - Ice making (Bhimavaram cluster)

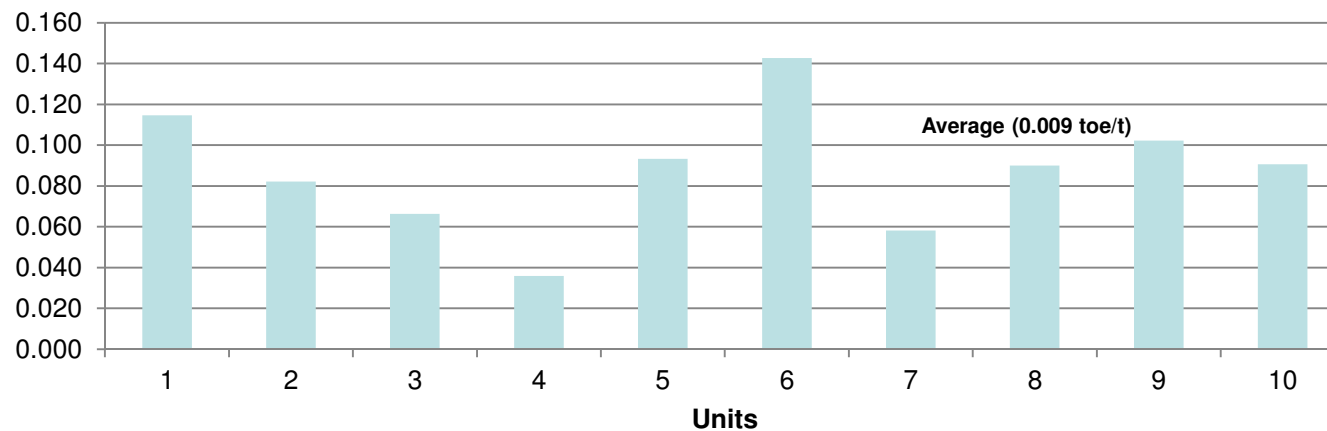


Unit level SECs – Homogeneous products

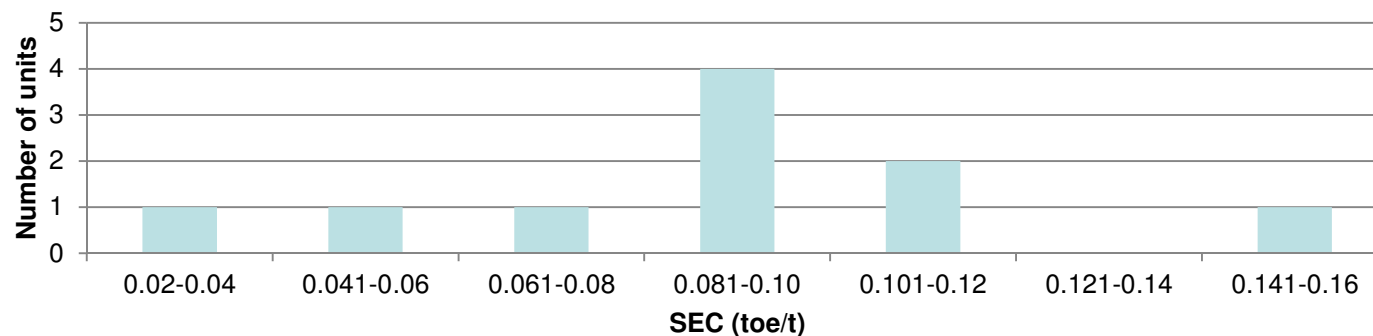


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SEC (TOE/T) - Rice mills (Vellore cluster)



Distribution of SEC (TOE/T) - Rice mills (Vellore cluster)

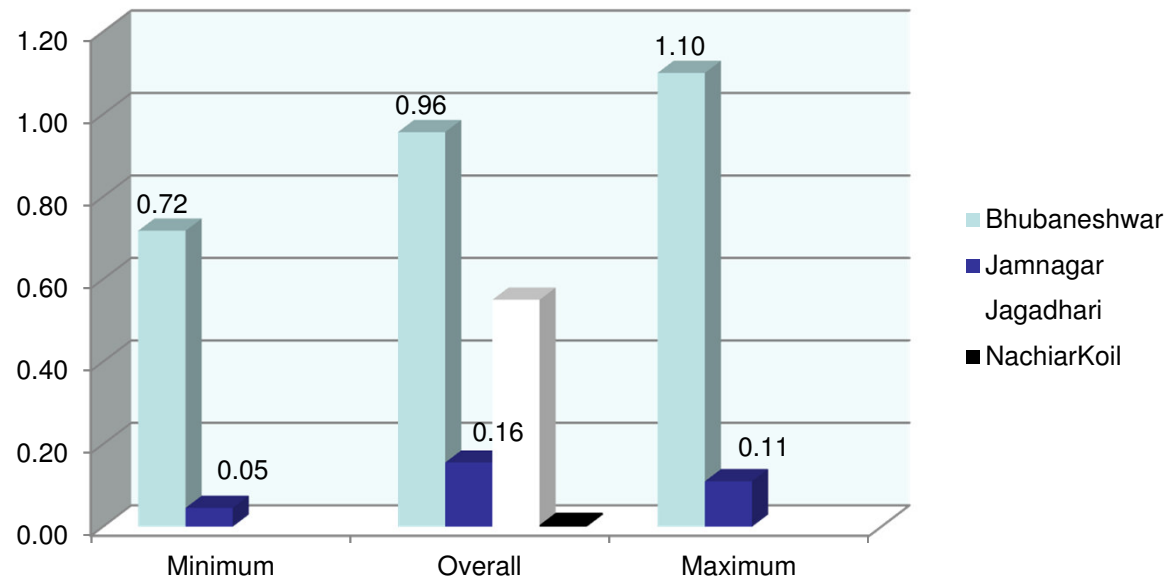


SEC comparison – intra clusters



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SEC (TOE/T) - BRASS



Product/process-wise variations in SEC observed amongst the 4 brass clusters:

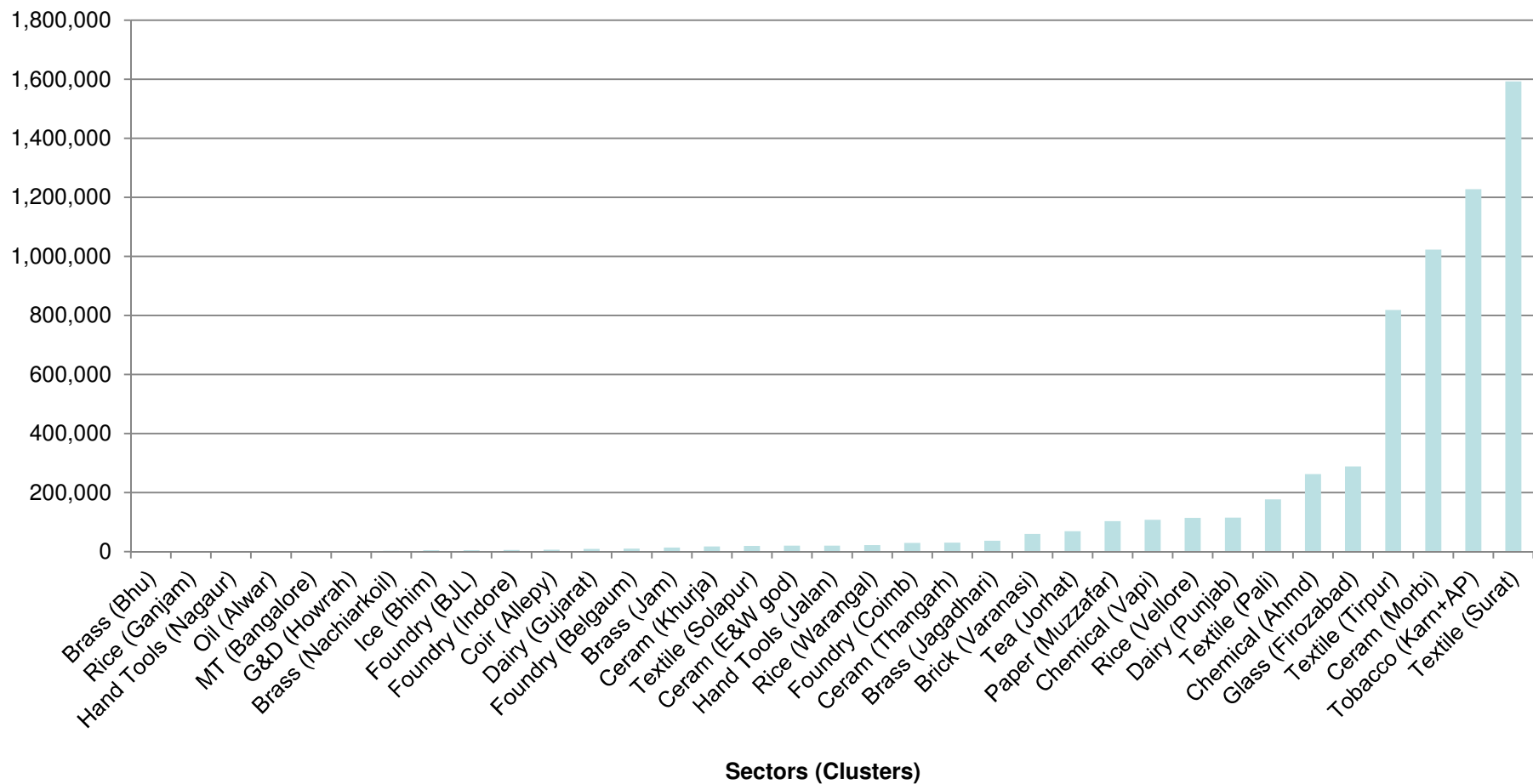
- ☐ Bhubaneswar – Thali, handicrafts and others
- ☐ Jamnagar – Extrusion, electroplating, foundry, machining
- ☐ Jagadhari – Brass utensils, sheets, coils, strips and Aluminium utensils
- ☐ Nachiar Koil – Brass lamps

Total energy consumption-cluster level



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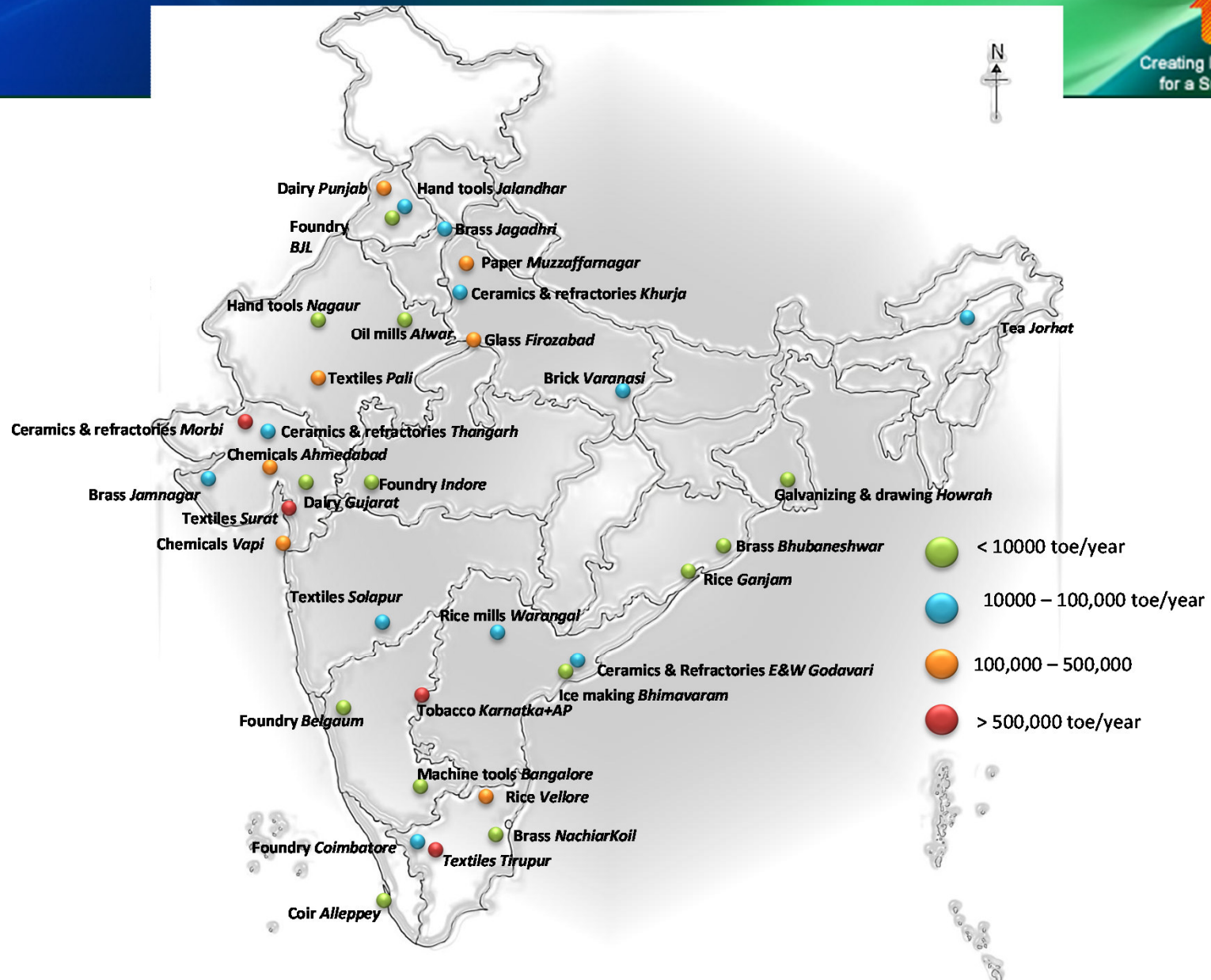
- Total energy consumption of 38 clusters : 6.2 Mtoe



Total energy consumption – regional representation



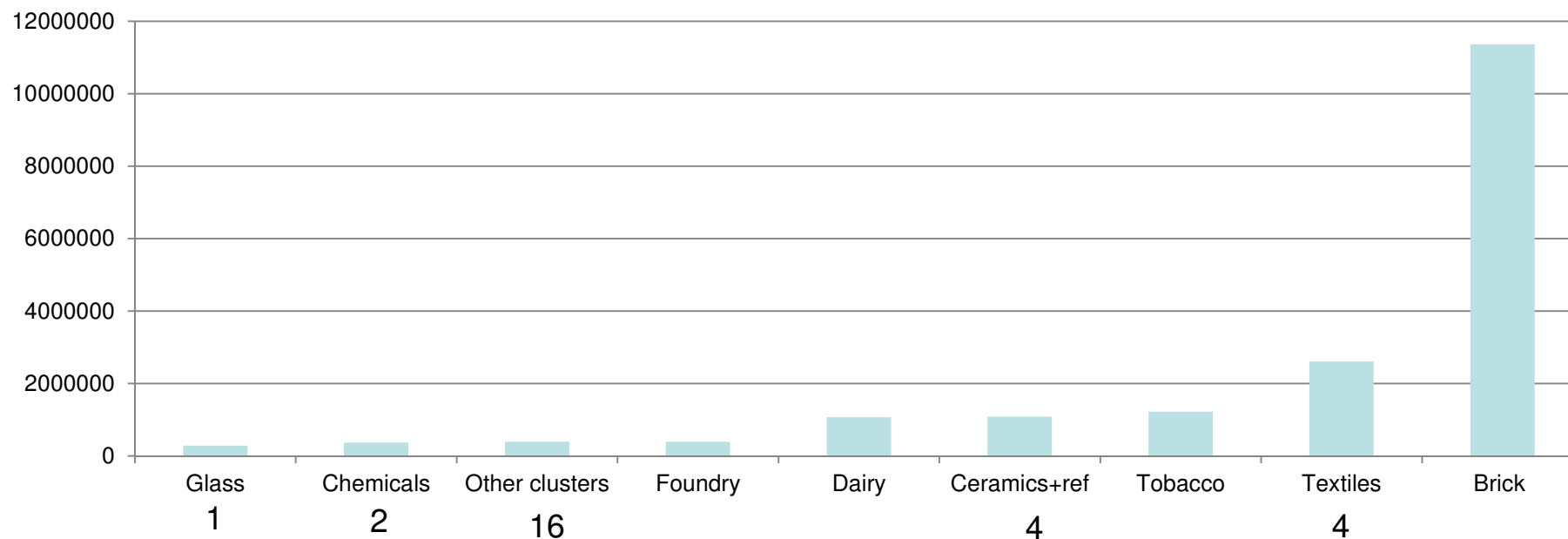
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Sub sector-wise energy consumption



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Total energy consumption : 18.8 Mtoe

Other related activities



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- Analysis of data from 4th All India Census of MSMEs (2006-07)
Lack of data related to actual production and energy consumption;
→ non-usable for extrapolation of energy consumption
- Review of supply side documents
Central Electricity Authority (CEA) : General Review 2011 does not provide break-up of electricity utilization in industry especially MSME sector
- Coal procurement is done in open market in a number of MSME sub-sectors e.g. brick, which is generally not accounted by the supply side
- The energy saving potential with adoption of Best Available Technologies (BAT) and Best Operating Practices (BOP) being prepared to assess the energy saving potential

Impact of energy audits



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- Survey carried out in two units in Bangalore machine tool cluster (Grow well CNC system, Sadbhava Fabricators) to assess the impact of energy audit studies at unit level;
- Observations
 - Do not keep record of production and electricity consumption at each machine
 - Undertake job-work; SEC calculation not appropriate
 - Energy accounts for 3-4% of total cost
 - Implemented measures:
 - Contract demand reduction, installation of capacitor banks, reduced lighting voltage
 - Savings not quantified
 - Implementation of EC measures not done
 - EE motor, star-delta starter, replacement of mercury to sodium vapour lamp (Financial)
 - Retrofitted conventional machine with CNC machine (not recommended in EA report)
 - DPR prepared; Loan availed from bank; Awaiting subsidy under TEQUP
- Impact on energy conservation marginal

Interim findings



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- Variations in reporting formats of different reports;
- M & V and Data collection have not been a core focus resulting in non-availability of reliable data;
- Direct production data from government sources are not readily available;
- Supply side does not provide sufficient detailed data to prepare a top down energy balance;
- SECs are function of a range of parameters such as technology, raw material, product type and capacity: Averaging SEC at cluster can be interesting but must be used with care, mainly to evaluate the trends in EE;
- At this stage of data availability, extrapolation of energy consumption to national level would be inaccurate;
- Improvement in data collection process is the need of the day.

Interim conclusions



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- Total energy consumption of 38 clusters : 6.2 Mtoe;
- Estimation by TERI: National level energy consumption of foundry, brick, tobacco and dairy sub-sectors works out to be 12.6 Mtoe;
- Estimation of overall energy consumption at national level is not feasible yet
 - Need for aggregation of energy data at cluster level to arrive at sub-sector level consumption levels;
- Benchmarking of SEC must be done for homogeneous products and processes;
- Cluster/ sub-sector specific studies will be required to arrive at energy consumption at national level
 - Involvement of field institutions of MoMSME and DICs for data collection;
- Data collection process for MSMEs must be institutionalized
 - Inclusion of formats under the forthcoming 5th Census data on MSMEs at different levels such as cluster, district and state levels and for Energy Audit standardized reports.



Thank you