



IEA Global Sustainable Technology Roadmap for Iron & Steel

Energy Use in Selected Industries in Brazil: Overview and Opportunities

American Steel Experts' Dialogue
Session 1: "State-of-play of the iron & steel industry
from an energy perspective" "

São Paulo, August 22th 2018

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Energy and Economic Department

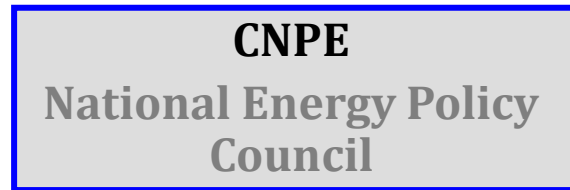
SUMMARY

- *About EPE*
- *Brazilian Industry in the Energy Sector: Status and Prospects*
- *Meeting the energy demand growth*
- *Next steps*
- *Final Remarks*

ABOUT EPE

Institutional Structure of Brazilian Energy Sector

High Level Policy Guidelines and Major Government Decisions



Policy Design and Energy Planning



EPE is a Brazilian state-owned company responsible for studies in order to support governmental policies for the energy sector, in charge of MME.

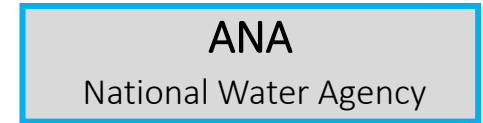
Planning



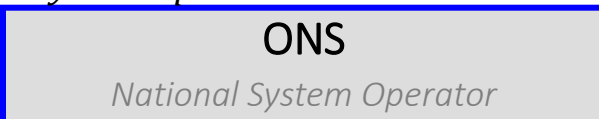
Supply Monitoring



Regulation and Supervising



System Operation



Commercialization

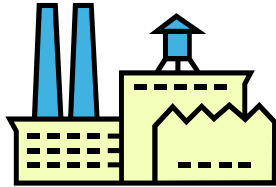


BRAZILIAN INDUSTRY IN THE ENERGY SECTOR: *Status and Prospects*

Energy Consumption in Brazil -2017

Industry

33,3%



Transportation

32,5%



Household

9,6%



Energy Supply
(Self consumption)

10,0%



2017 260,0 Mtoe

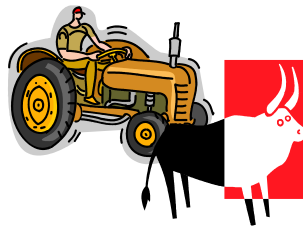
2016 255,5 Mtoe



1,7%

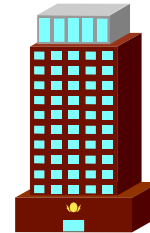
Agriculture

4,0%



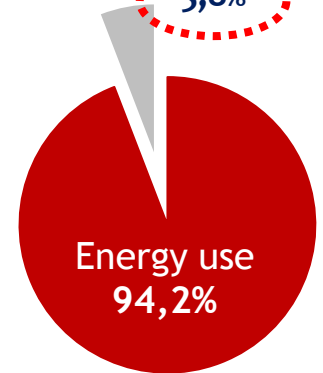
Commercial

4,8%



Non energy use

5,8%



Industrial and transportation demand accounts for about 60% of all energy consumption in Brazil (all sources: electricity and fuels)

Source: Brazilian Energy Balance, 2018

Energy Consumption in Brazilian Industry -2017

2017 86,5 Mtoe

2016 84,3 Mtoe



2,6%

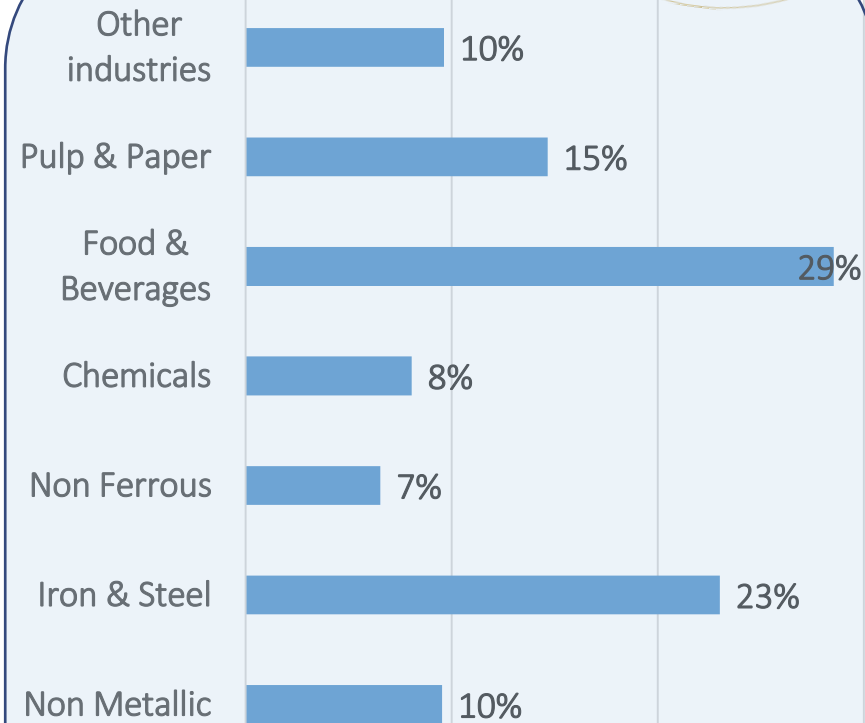
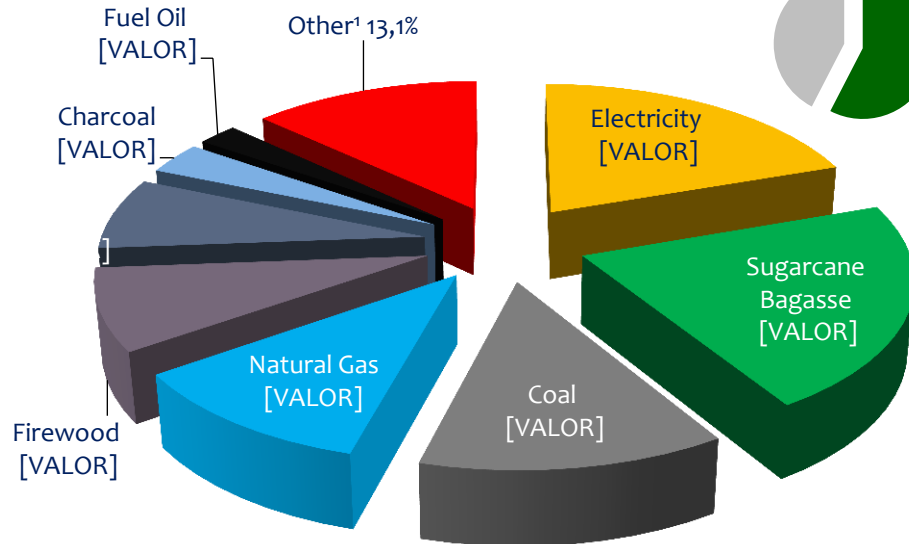
Coal +8,4% (Steel production)

Sugarcane bagasse 5,7% (Sugar production)

Black Liquor +3,6% (Pulp&paper production)

Charcoal -4,1% (Steel production)

Renewable
58%



¹ Iron & Steel (18 %), Mining & Pelotizing (3%) and Ferro-alloys (2%)

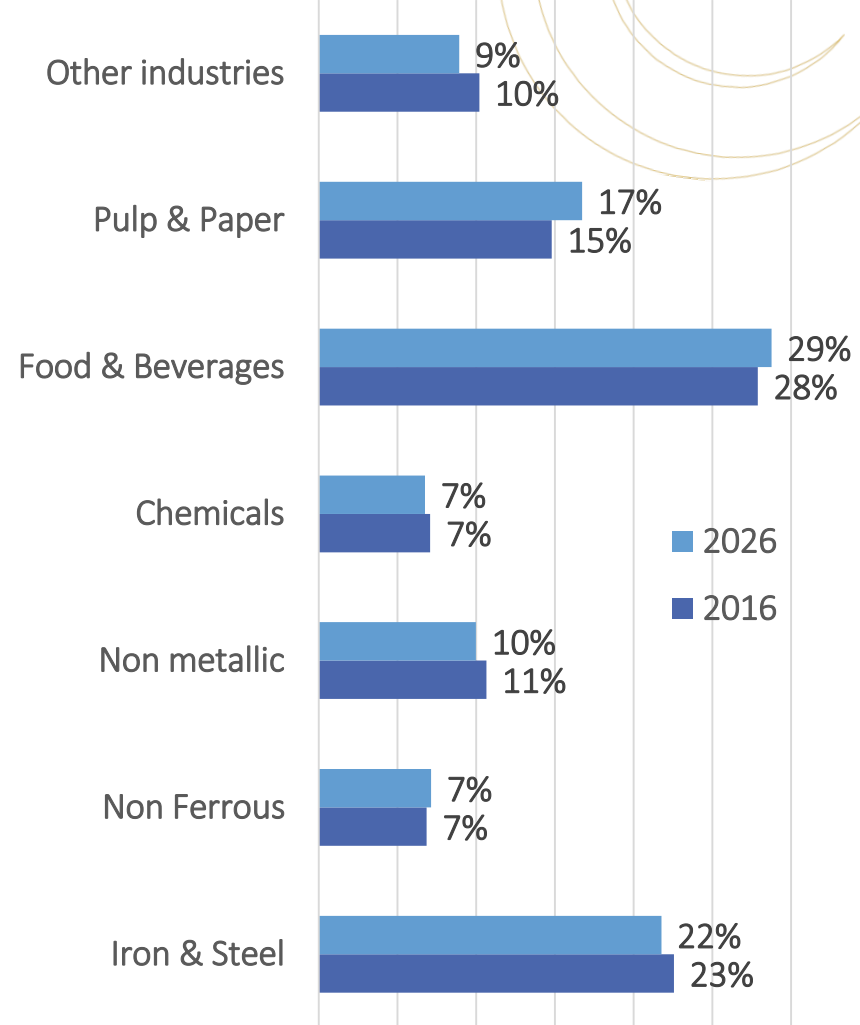
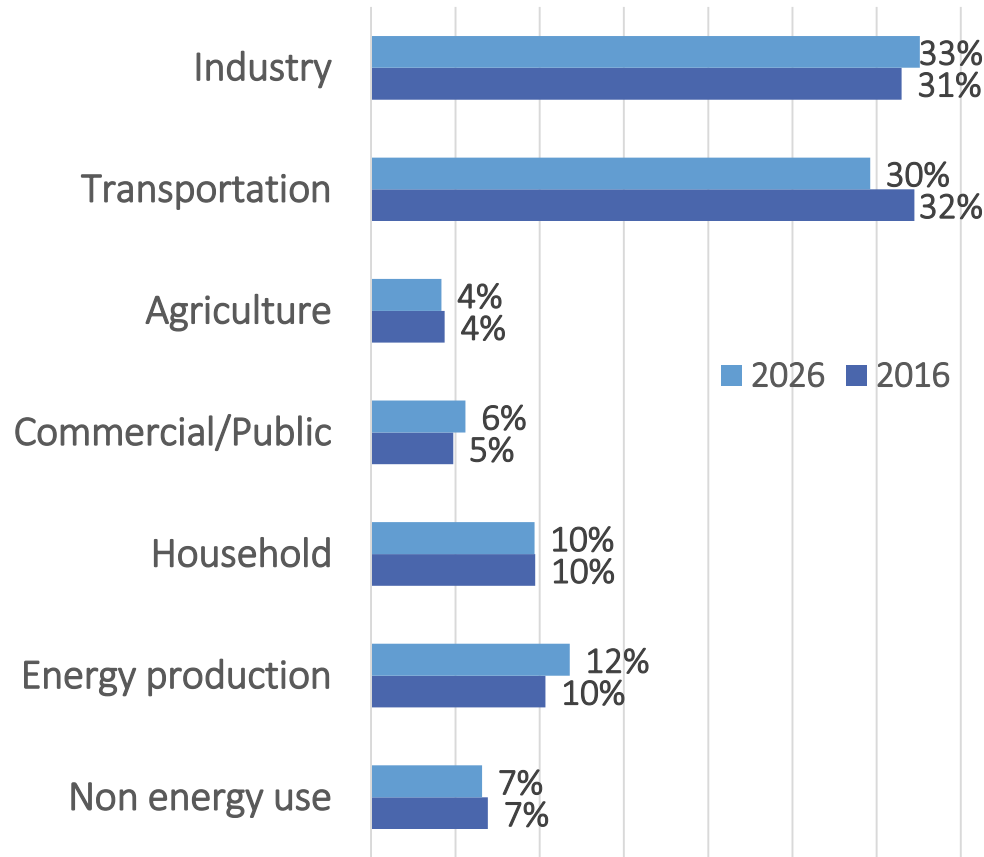
² Cement (5%) and Keramics (5%)

Source: Brazilian Energy Balance, 2018

¹ Includes: diesel oil, LPG, nafta, querosene, coke gas, refinery gas, petroleum coke, as well as other renewables and non renewables.

Energy Consumption in Brazil - Perspectives

% in total energy consumption



Source: Ten year Expansion Plan 2026

MEETING THE ENERGY DEMAND GROWTH

Meeting Energy Consumption: Approaches and Choices

- Minimum CAPEX and OPEX



- Reduction of uncertainties supply

- Reduction and avoiding environmental impacts



Renewable



- ✓ Hydro
- ✓ Biomass
- ✓ Wind
- ✓ Solar

Non renewable



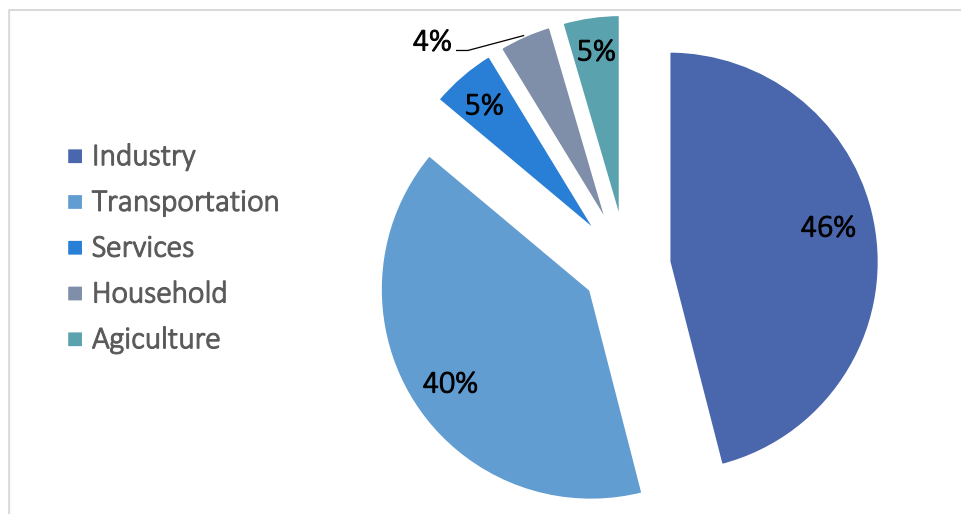
- ✓ Nuclear
- ✓ Coal
- ✓ Natural Gas



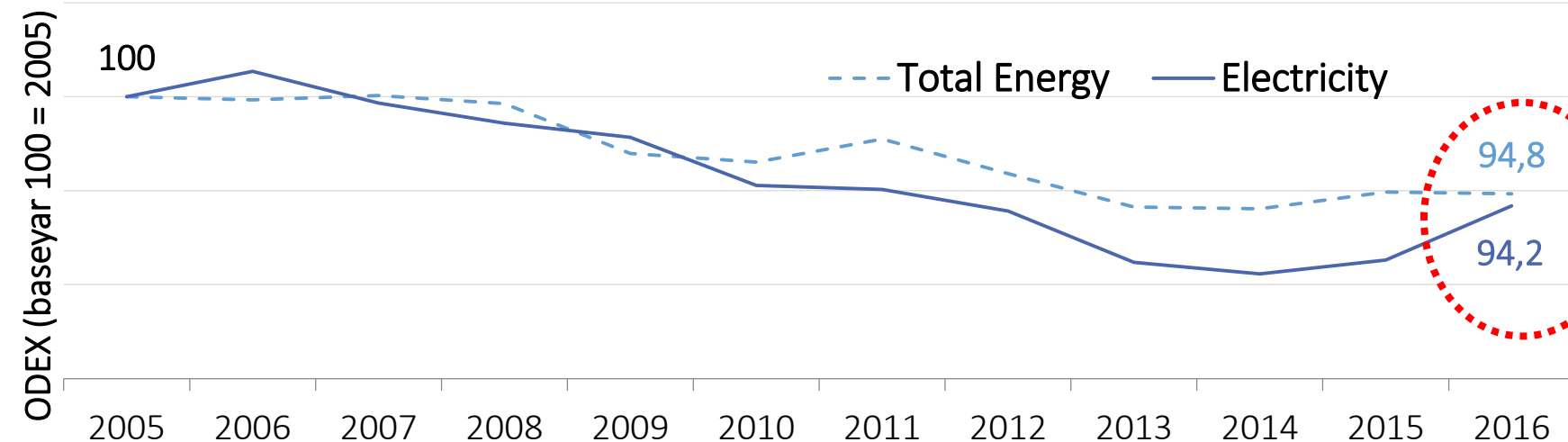
- ✓ Energy Efficiency
- ✓ Distributed Generation/Storage

Energy Efficiency: important option to meet demand

% the total energy efficiency by sector – 2026



% Energy efficiency in industrial sector (2026): 5%



Energy Efficiency: understanding how to better promote

National Survey on Energy Industrial Use

- *Improve data quality on energy use in industry*
- *Understand energy efficiency choices (amount, costs) and their role to meet energy demand in this sector*
- *Input for policies development to deploy untapped energy efficiency potential*
- *Update Useful Energy Balance (BEU)*
- *Focused on most energy intensive industries in Brazil*
- *Funding by World Bank Resources – META Project*
- *12-Month project*
- *Contracted via Competitive Procurement*
- *Consultancy: Applus-Qualitec*
- *Currently under development*

National Survey on Energy Industrial Use: Segments

ALUMINUM

- *Bauxite*
- *Alumina*
- *Primary and Secondary Aluminum*

PULP AND PAPER

- *Pulp*
- *Paper*
- *Recycled Paper*

IRON AND STEEL

- *Pelletizing/sintering*
- *Pig Iron*
- *Steel (coal and charcoal routes)*

CERAMIC

- *White ceramics*
- *Structural ceramics*
- *Glass*

FOOD AND BEVERAGES

- *Sugar*
- *Floor, Pasta and Bakery*
- *Oil & Fats*
- *Meat*
- *Milk/Dairy*
- *Beverages and Juices*

CHEMICALS

- *Petrochemical*
- *Gas and Chemical*
- *Alcohol-chemical*
- *Fertilizers*
- *Soda-Chlorine*

National Survey on Energy Industrial Use: Overview

Scope

- *Surveys in Brazilian industrial plants (face-to-face)*
- *Energy consumption by technology and process by segment*
- *Identifying energy potential and costs for Brazilian Industry*

Requests

- *Industry collaboration in order to allow data access*
- *Expert team on energy use analysis from consultancy side*
- *EPE team in order to provide and guide for adjustments*

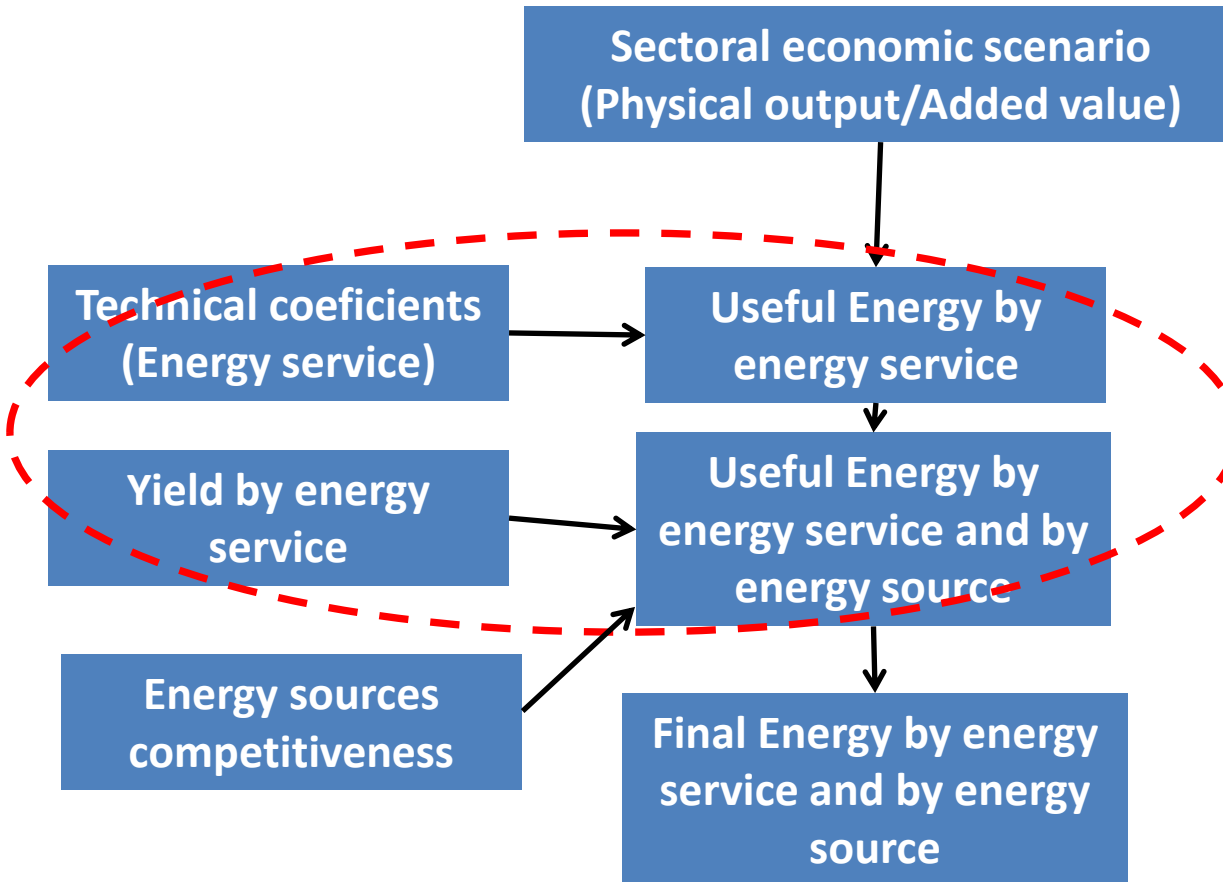
Products

- *Database about specific industrial segments: energy use*
- *Specific reports for each study*
- *Internal technical workshops to present results (capacity building)*

National Survey on Energy Industrial Use: Usage

Updating of technical parameters for energy consumption in industry

INDUSTRIAL ENERGY DEMAND FORECASTING: GENERAL OVERVIEW



✓ Industrial segments:

- ✓ Iron & Steel
- ✓ Food & Beverages
- ✓ Non Ferrous
- ✓ Mining/pelotizing
- ✓ Cement
- ✓ Ceramic
- ✓ Chemical
- ✓ Pulp & paper
- ✓ Textile
- ✓ Other

✓ Energy Services:

- ✓ Direct heating
- ✓ Steam
- ✓ Mechanical power
- ✓ Lightning
- ✓ Cooling
- ✓ Eletrochemical
- ✓ Other uses

National Survey on Energy Industrial Use: Usage

Updating of technical parameters for energy consumption in industry

| ENERGY SOURCE | ALLOCATION COEFFICIENTS BY ENERGY SERVICE | | | | | | | |
|-----------------------|---|-------|----------------|---------|-----------|-----------------|-------|-------|
| | Mechanical Power | Steam | Direct heating | Cooling | Lightning | Electrochemical | Other | Total |
| Natural Gas | 0,00 | 1,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| Coal | 0,00 | 1,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| Firewood | 0,00 | 0,00 | 1,00 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| Sugar cane bagasee | 0,00 | 1,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| Other primary sources | 0,00 | 1,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| Diesel Oil | 0,00 | 1,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| Fuel Oil | 0,00 | 1,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| Gasoline | 0,01 | 0,94 | 0,05 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| LPG | 1,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| Kerosene | 0,09 | 0,08 | 0,83 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| Coke gas | 0,00 | 1,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| Coke | 0,00 | 0,03 | 0,97 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| Electricity | 0,00 | 0,00 | 1,00 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| Charcoal | 0,95 | 0,03 | 0,00 | 0,01 | 0,02 | 0,00 | 0,00 | 1,00 |
| Other oil sources | 0,00 | 0,20 | 0,80 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |
| Tar | 1,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 1,00 |



- For each energy service identify in which amount some energy source is consumed

| ENERGY SOURCE | ENERGY EFFICIENCY COEFFICIENTS | | | | | | | BEST AVAILABLE ENERGY EFFICIENCY COEFFICIENTS | | | | | | |
|-----------------------|--------------------------------|-------|----------------|---------|-----------|-----------------|-------|---|-------|----------------|---------|-----------|-----------------|-------|
| | Mechanical Power | Steam | Direct heating | Cooling | Lightning | Electrochemical | Other | Mechanical Power | Steam | Direct heating | Cooling | Lightning | Electrochemical | Other |
| Natural Gas | 0,48 | 0,88 | 0,52 | | | | | 0,59 | 0,90 | 0,55 | | | | |
| Coal | | 0,77 | 0,32 | | | | | | 0,82 | 0,35 | | | | |
| Firewood | | | | | | | | | | | | | | |
| Sugar cane bagasee | | 0,77 | 0,32 | | | | | | 0,82 | 0,35 | | | | |
| Other primary sources | | 0,77 | 0,32 | | | | | | 0,82 | 0,35 | | | | |
| Diesel Oil | | 0,77 | 0,32 | | | | | | 0,82 | 0,35 | | | | |
| Fuel Oil | 0,48 | 0,88 | 0,52 | | | | | 0,56 | 0,90 | 0,55 | | | | |
| Gasoline | 0,48 | 0,88 | 0,52 | | | | | 0,56 | 0,90 | 0,55 | | | | |
| LPG | 0,28 | | | | | | | 0,30 | | | | | | |
| Kerosene | 0,28 | 0,88 | 0,52 | | 0,00 | | | 0,29 | 0,90 | 0,55 | | 0,00 | | |
| Coke gas | 0,28 | 0,88 | 0,52 | | 0,00 | | | 0,30 | 0,90 | 0,55 | | 0,00 | | |
| Coke | 0,48 | 0,88 | 0,52 | | | | | 0,59 | 0,90 | 0,55 | | | | |
| Electricity | | | | | | | | | | | | | | |
| Charcoal | 0,90 | 0,97 | 0,55 | 0,60 | 0,25 | | 1,00 | 0,94 | 0,98 | 0,55 | 0,70 | 0,29 | | 1,00 |
| Other oil sources | | 0,77 | 0,32 | | | | | | 0,82 | 0,35 | | | | |
| Tar | 0,34 | | | | | | | 0,35 | | | | | | |



- For each energy service identify energy efficiency average potential

INPUTS FOR:

- Improvement of energy demand method
- Competitiveness of energy sources studies (e.g. oil vs natural gas)
- Energy efficiency potential and subsidies to promote designing policies

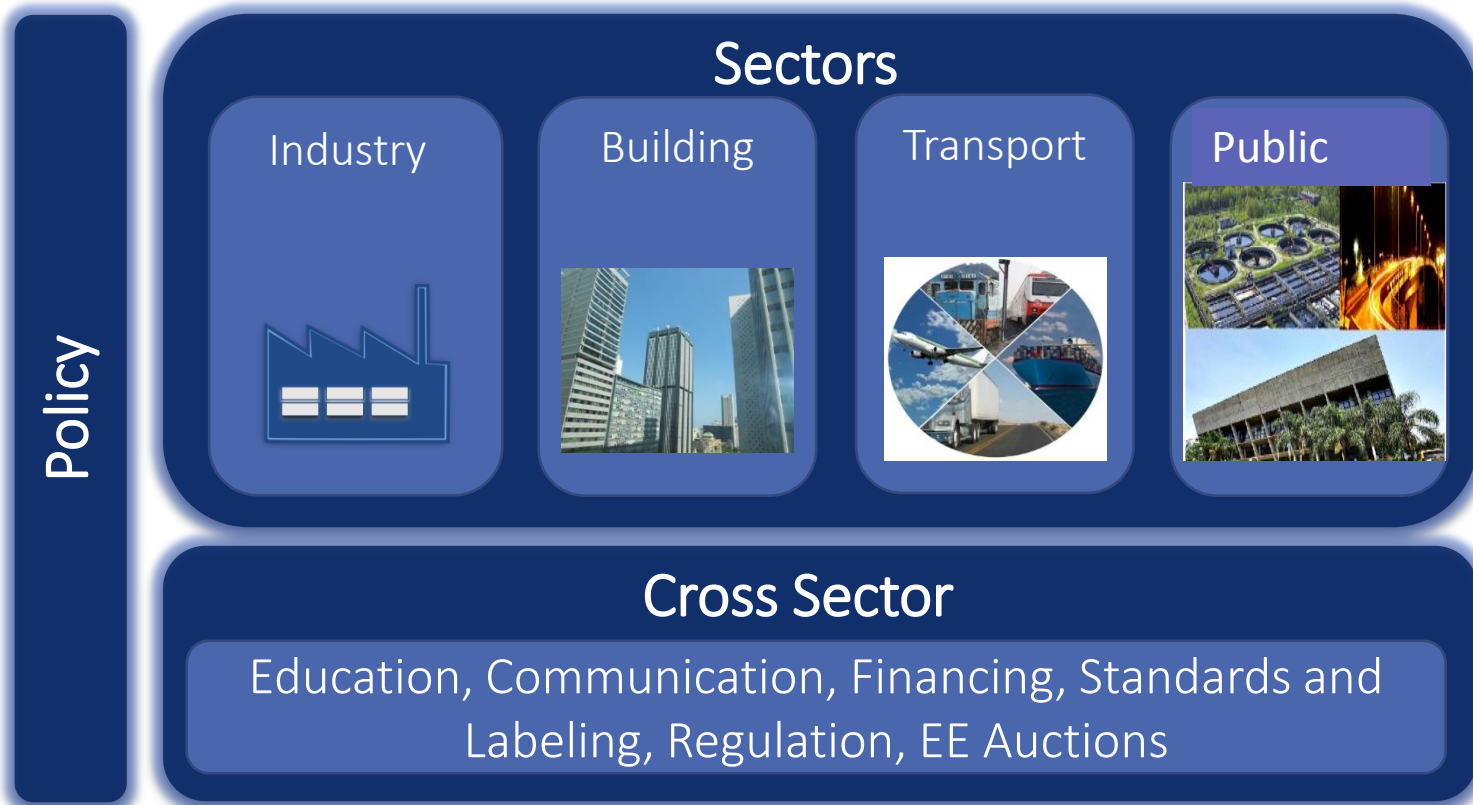
NEXT STEPS

Next Steps

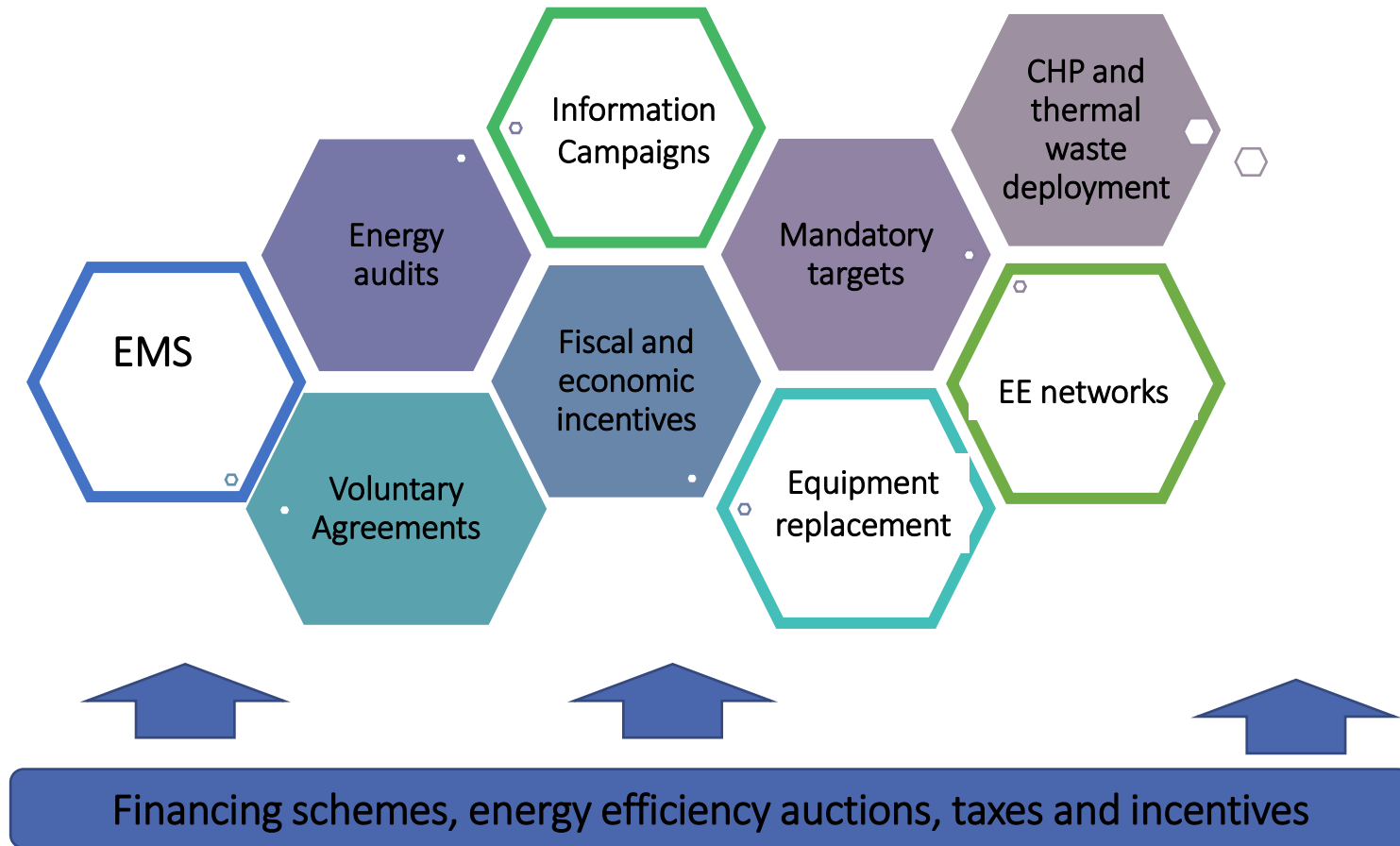


- ✓ *Data gathering are under development by consultancy and fine tune consistency analysis is required*
- ✓ *Development status to be presented in 29th August in MME*
- ✓ *Products from this Project will be available:*
 - ✓ *Reports for each industrial segment: available at EPE website*
 - ✓ *Updating of Useful Energy Balance (BEU) for Brazilian Industry: to be developed*
 - ✓ *Technical Note about energy use in Brazilian industry consumption and energy efficiency deployment: to be developed*

Untapped Energy Efficiency Potential: How accelerate deployment?



Untapped Energy Efficiency Potential: How accelerate deployment?



FINAL REMARKS

Final Remarks: Lessons Learnt



- ✓ *Data availability: critical issue and access strategies are needed*
- ✓ *Communication Strategy with industry stakeholders is fundamental: helps to establish confidence*
- ✓ *Conduct a previous survey with industrial consumers in order to identify critical issues to overcome*
- ✓ *Continuous adaptation capacity required*

THANK YOU FOR YOUR ATTENTION!

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