

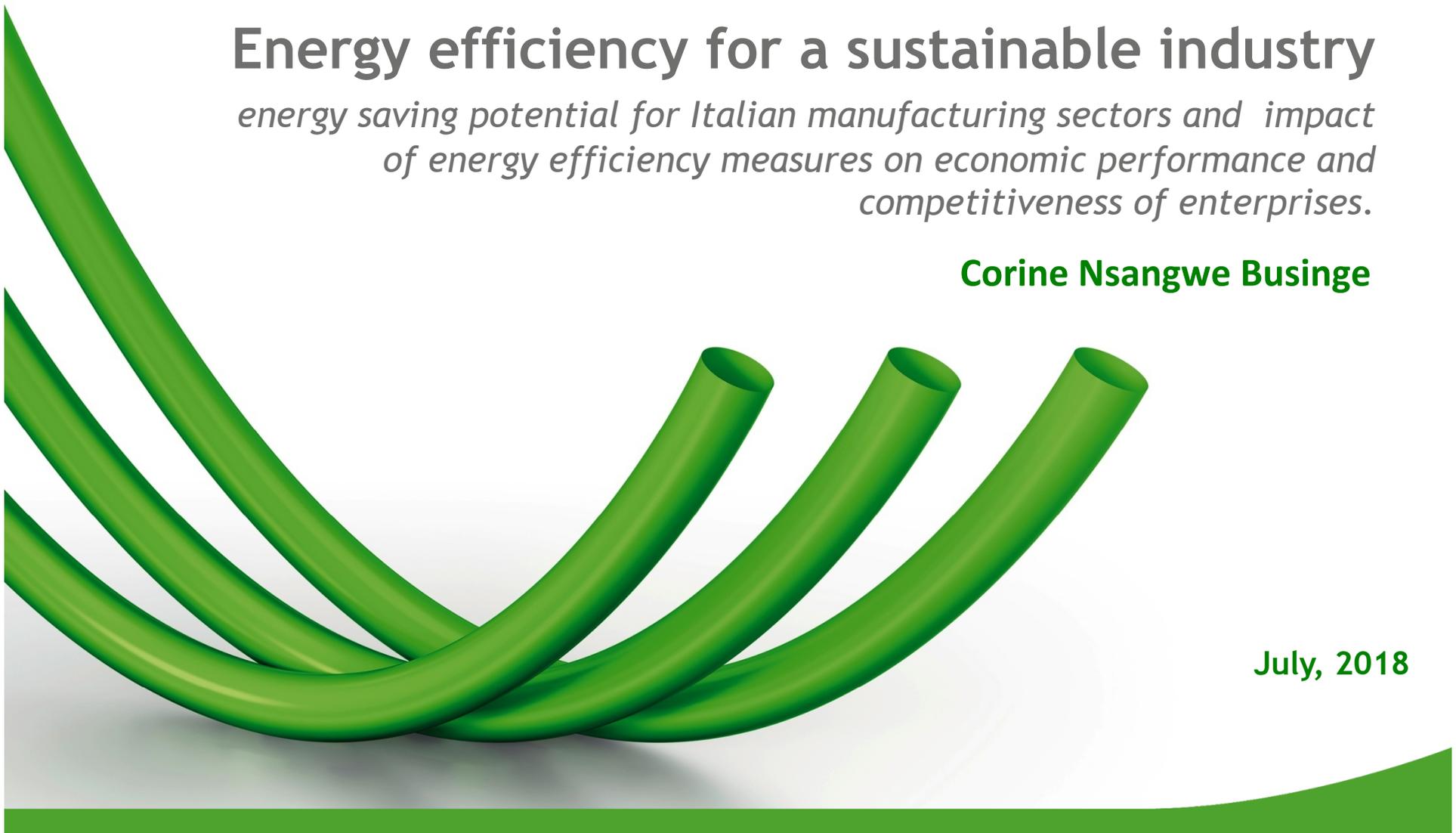


# Energy efficiency for a sustainable industry

*energy saving potential for Italian manufacturing sectors and impact of energy efficiency measures on economic performance and competitiveness of enterprises.*

**Corine Nsangwe Businge**

July, 2018



## About RSE

---

### Ricerca sul Sistema Energetico – RSE S.p.A.

A joint stock company 100% holded by the public operator GSE SpA and therefore by the Italian Economic Development Ministry.



<http://www.rse-web.it>

### OUR MISSION

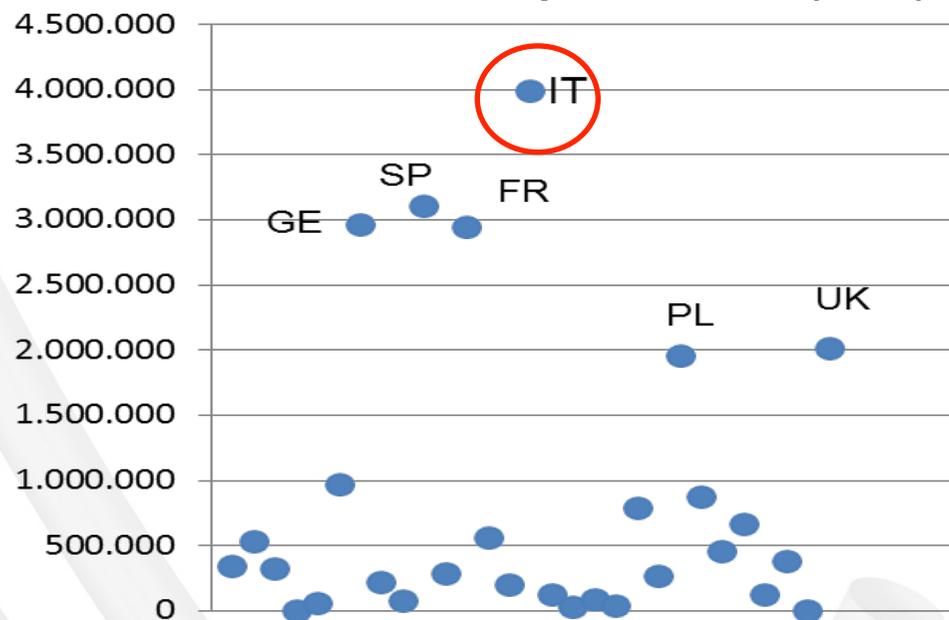
***“We put energy in our Research”***

Our mission is to carry out publicly funded national and international programs in the fields of electrical power, energy and the environment. RSE is financed by the Italian Electricity System Research Fund of the Italian Economic Development Ministry, and by the EU Commission within EU Horizon 2020 Projects.



## Energy Efficiency & Italian Industry: facts and figures

Number of enterprises EU 28 (2013)



The Italian industry counts for over **4 million enterprises**, almost **20% of EU 28** manufacturing sector.

**95% SME**, number of employees < 250



**21%** of national final energy consumption



**30-50%** incidence of the energy bill on production costs

➤ High electricity price due to fuel mix and taxes

# Energy Efficiency & Italian Industry: main barriers

## Economic barriers

- ❑ < 30% of energy efficiency projects are actually implemented (high PBT, financial risk)

## Internal competition for capital: *EE is minor issue compared to core business*

- ❑ < 15% of investments in industrial processes are driven by EE

## Regulatory barriers

- ❑ The **legislation** on energy efficiency is **constantly evolving**

## Informational barriers:

*lack of knowledge and awareness about EE*

- ❑ < 18% of enterprises have an **Energy Manager**
- ❑ **Only 30%** of enterprises know **ESCos**



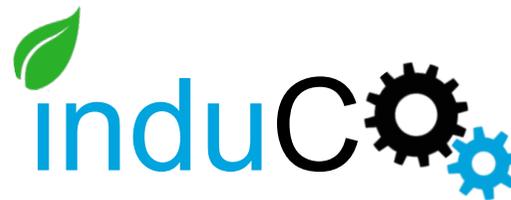
# Energy Efficiency and Italian Industry



*Which is the untapped energy saving potential achievable by industrial sectors?*



*Can energy efficiency improve the economic competitiveness of companies?*



**Industry**

**energy Consumption**

**Optimization**

**Overview**

Current state of Italian Industry:

**Analysis**

EEM implemented in Italian industry in the last 10 years

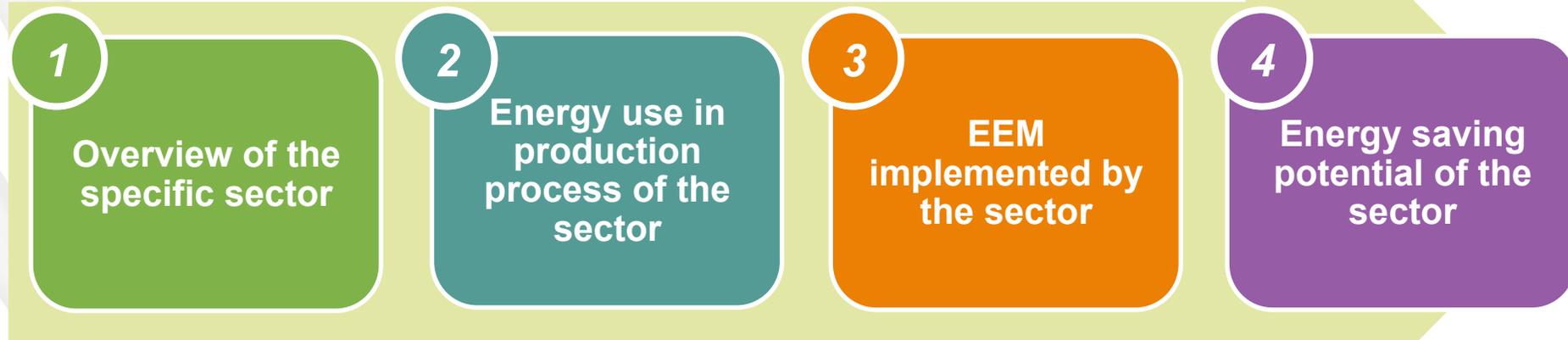
**Review**

- Energy saving potential
- Impact of energy efficiency

# The methodology: energy saving potential



*Which is the untapped energy saving potential achievable by industrial sectors?*



- *size and number of companies*
- *number of employees*
- *economic performance*
- *geographic distribution*

- *production processes*
- *energy consumption*
- *technologies*

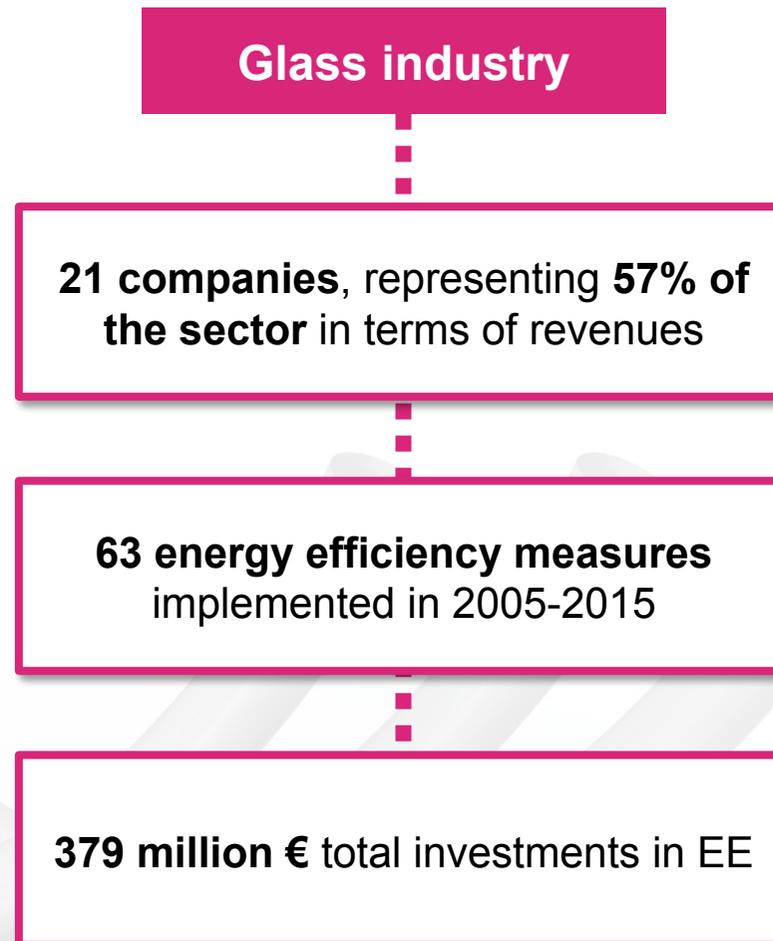
- *Database of over **2500 EEM** implemented in Italian industry in the last 10 years under the **White Certificate Scheme***

- *Replicability of EEMs*
- *Internal competition of EEMs*

Industrial sectors analysed:  
**Iron&Steel, Food&Beverage, Paper, Glass, Chemistry, Ceramic, Cement**

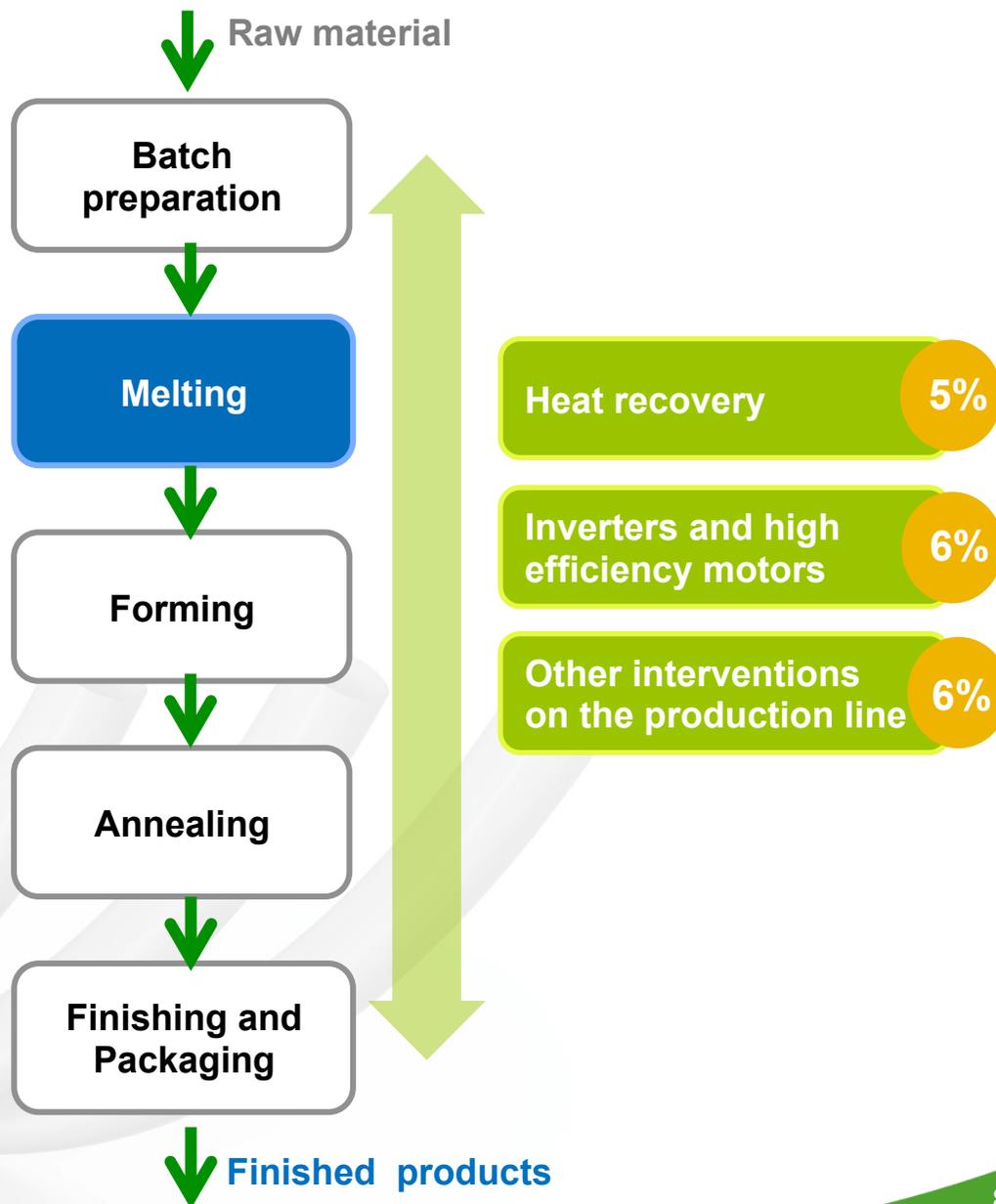
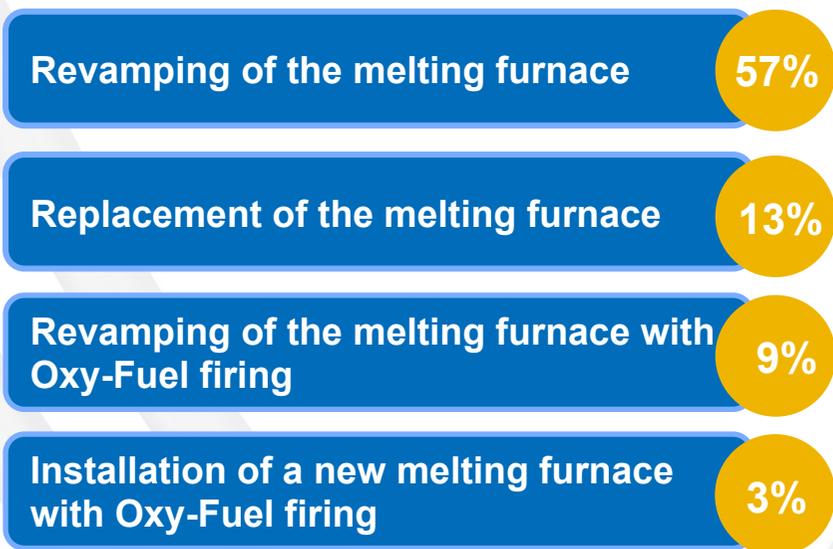
## Energy saving potential in industry: the Glass sector

### Statistical analysis of companies that have implemented EEMs



# Energy saving potential in industry: the Glass sector

## 63 energy efficiency measures



## Energy saving potential in industry: the Glass sector

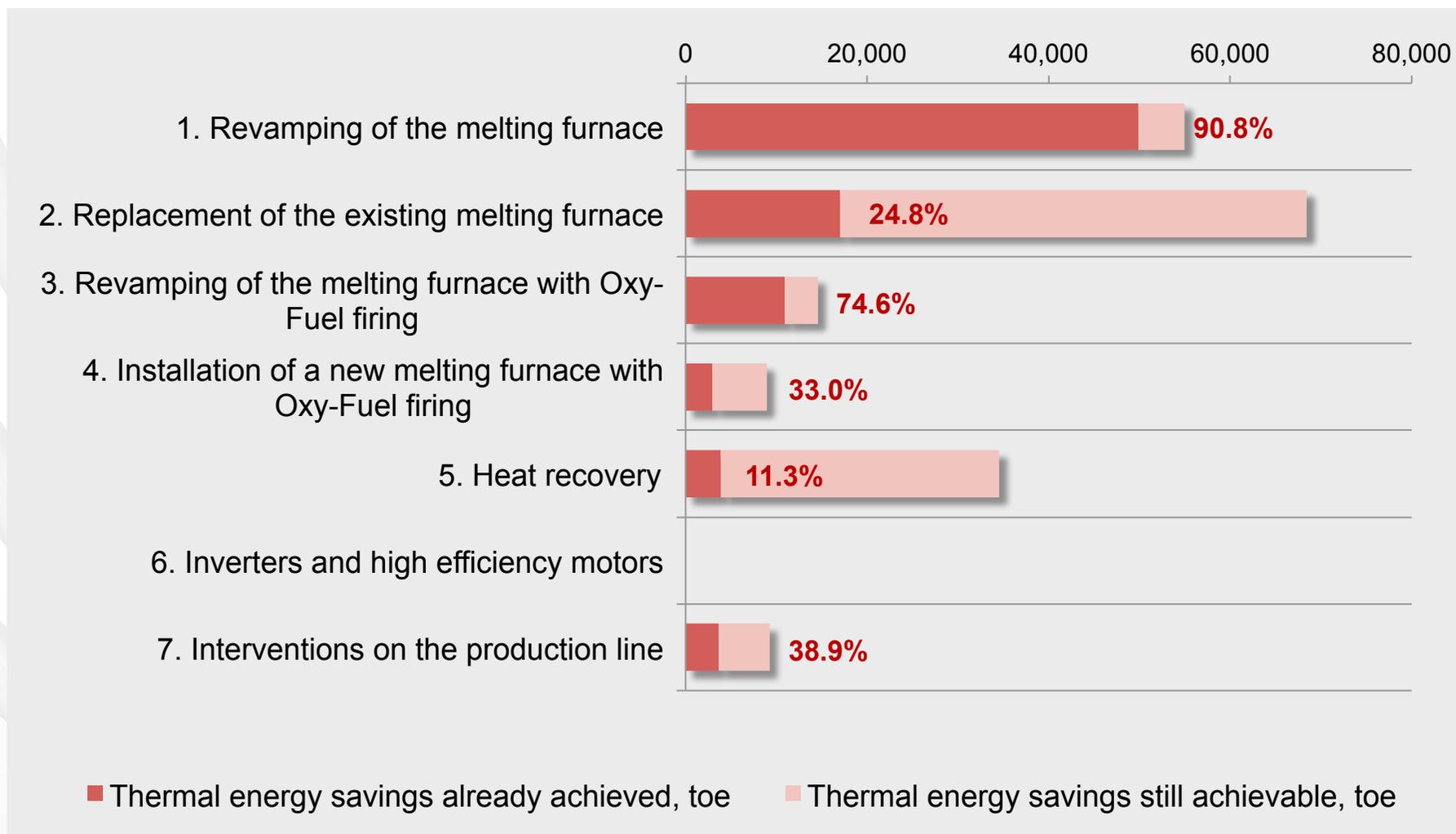
Energy savings generated by EEMs implemented in the glass industry

*Energy Saving Index = Energy savings (toe/yr) / Energy consumption of the plant (toe/yr) \* 100*

Energy efficiency measures		Electricity Saving Index	Thermal Saving Index
1	Revamping of the melting furnace	8,2%	6,7%
2	Replacement of the existing melting furnace	2,8%	8,3%
3	Revamping of the melting furnace with Oxy-Fuel firing	0,7%	1,8%
4	Installation of a new melting furnace with Oxy-Fuel firing	1,3%	1,1%
5	Heat recovery	-	4,2%
6	Inverters and high efficiency motors	2,9%	-
7	Interventions on the production line	4,5%	1,1%

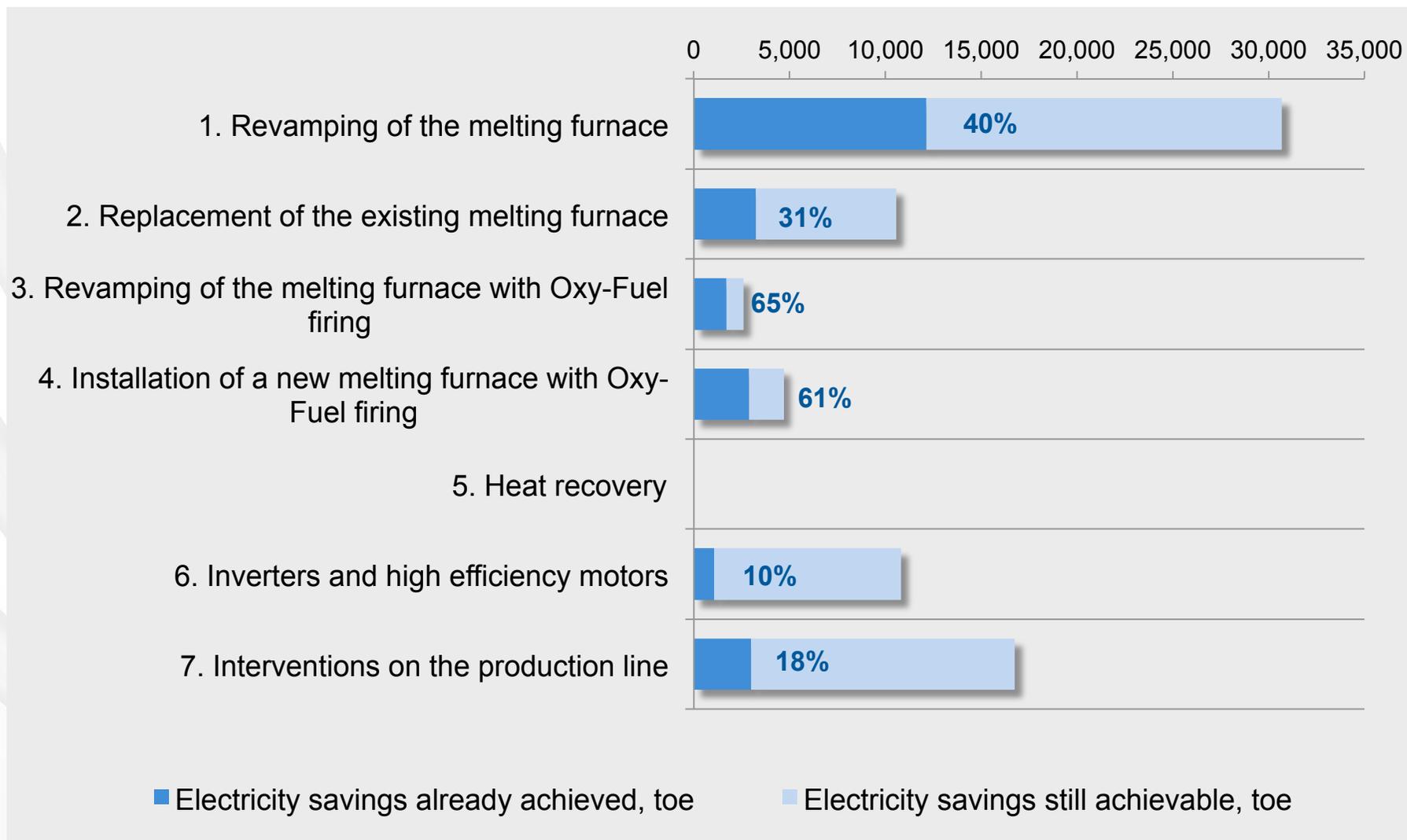
## Energy saving potential in industry: the Glass sector

### Thermal energy saving potentials for the glass sector



## Energy saving potential in industry: the Glass sector

### Electricity energy saving potentials for the glass sector



# Industry & Competitiveness



## Can energy efficiency improve the economic competitiveness of companies?



Econometric model of the statistical association between expenditure in EEMs and business competitiveness on the sample of companies in the glass sector.

**Economic performance**  $\downarrow_{i,t} = \alpha + \beta \downarrow_0$  **financing**  $\downarrow_{i,t} + \beta \downarrow_1$  **energy efficiency**  $\downarrow_{i,t} + \beta \downarrow_2$   
 $\downarrow_{i,t} + \beta \downarrow_3$  **dimensions**  $\downarrow_{i,t} + \varepsilon \downarrow_{i,t}$

- *financing* = debt/equity ratio
- *energy efficiency* = investment in EEMs (€)
- *R&D* = investment in R&D activities (€)
- *dimensions* = size of the companies (number of employees);
- *i* = company analysed
- *t* = time (years)
- **economic performance** = dependent variables explained by the model
  - ❑ four profitability indexes (*ROE, ROA, ROS, ROI*);
  - ❑ two labour productivity indexes (*Turnover per employee, Revenue per employee*);
  - ❑ one measure of the added value created by the companies (*Value of production*)

## Industry & Competitiveness: the Glass sector

<i>Economic characteristics (independent variables)</i>	Business performance measures (dependent variables)						
	Return On Equity	Return On Assets	Return On Sales	Return On Investment	Labour productivity <sup>§</sup>	Labour productivity <sup>£</sup>	Value of production
<b>Constant <math>\alpha</math></b>	8.44*** (2.78)	5.37*** (1.27)	6.80*** (1.55)	5.51*** (1.66)	235.15*** (13.29)	240806.7*** (13643.3)	20443.74* (10996.31)
<b>Financing (debt/equity)</b>	-0.55*** (1.11)	0.03 (0.04)	0.05 (0.04)	0.10¥ (0.05)	0.08* (0.33)	0.08** (340.95)	0.03* (232.96)
<b>Investment in energy efficiency</b>	0.13** (2e-07)	0.05 (9e-08)	0.06¥ (7e-08)	-0.01 (9e-08)	0.17** (2e-06)	0.17** (0.001)	0.11* (0.001)
<b>R&amp;D expenditure</b>	-0.18*** (142.07)	-0.40*** (79.46)	-0.43*** (107.28)	-0.27*** (114.45)	-0.37*** (610.46)	-0.37*** (624088.8)	-0.07*** (279397.4)
<b>Number of employees</b>	-0.11¥ (0.02)	-0.12* (0.01)	-0.10** (0.01)	-0.16*** (0.01)	-0.25*** (0.01)	-0.23*** (10.11)	0.87*** (1.22)

**Notes:**

\*= 90% significant parameter; \*\*= 95% significant parameter; \*\*\*= 99% significant parameter.

¥: non-significant parameter, but associated with a p-value between 0.2 and 0.1.

§: measured with the turnover/employees ratio.

£: measured with the revenues/employees ratio.

# Industry & Competitiveness: the Glass sector



*Which companies invest most in energy efficiency?*

Mean investment in EEMs (€/employee) Vs. sample mean investment

Glass sector companies

Return On Equity	1 <sup>st</sup> quartile	●
	2 <sup>nd</sup> quartile	●
	3 <sup>rd</sup> quartile	●
	4 <sup>th</sup> quartile	●
Productivity (Turnover per employee)	1 <sup>st</sup> quartile	●
	2 <sup>nd</sup> quartile	●
	3 <sup>rd</sup> quartile	●
	4 <sup>th</sup> quartile	●

- average investment of the quartile > average investment of the sample
- average investment of the quartile  $\cong$  average investment of the sample
- average investment of the quartile < average investment of the sample



## Conclusions

---

- Energy is a crucial input for the Italian industry. However **energy efficiency is having hard time taking off in this sector.**
- In order to promote the diffusion of energy efficiency and contribute to the removal of the barriers that hinder its development, **RSE has developed the project InduCo.**
- The project investigates the **untapped energy saving potential** of industrial sectors and the **impact of energy efficiency on the competitiveness** of enterprises. In this presentation results of the study were shown for the **glass sector.**
- In the glass sector some EEMs have been successfully implemented by a large number of companies, while **other technologies show a low penetration rate.** Such technologies emerge as most critical and therefore **deserve greater attention from policy-makers.**



## Conclusions

---

As regards **competitiveness**, the study provides interesting results:

- there is a **general positive impact** of the adoption of EEMs on business performance;
- however there is a **catching up process**, under which companies with a medium level of profitability and productivity are those that invest most in energy efficiency.

To boost energy efficiency in industry, **policy-makers should consider a broader range of business characteristics**, such as size, productivity, energy intensity, manufacturing sector, in order to most effectively tackle the resistances to the implementation of energy efficient technologies.

*Thanks for your attention*



**[corine.nsangwebusinge@rse-web.it](mailto:corine.nsangwebusinge@rse-web.it)**