



*Evaluation and monitoring of Energy Efficiency in  
New Member Countries and EU-25*

*“EEE-NMC »*

*Final workshop*

*Bucharest, May 24 2007*

**Energy efficiency trends in EU New Member  
Countries (NMC's) and in the EU 25**

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May 2007**



This presentation does not reflect the views of the European Commission



## Content

### ➤ Energy intensities

- ✓ Primary and final energy intensity trends
- ✓ Energy intensity trends in industry: impact of structural changes
- ✓ Comparison of energy intensities

### ➤ Energy efficiency

- ✓ Benchmarking of energy efficiency performance in industry
- ✓ Energy efficiency trends: ODEX
- ✓ Energy efficiency trends for households
- ✓ Energy efficiency trends in transport

All indicators are based on national statistics, as collected by national teams  
Coverage: EU-10 (Cyprus, Czech Rep, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia), Bulgaria, EU-15 and EU-25 (Romania for some indicators),

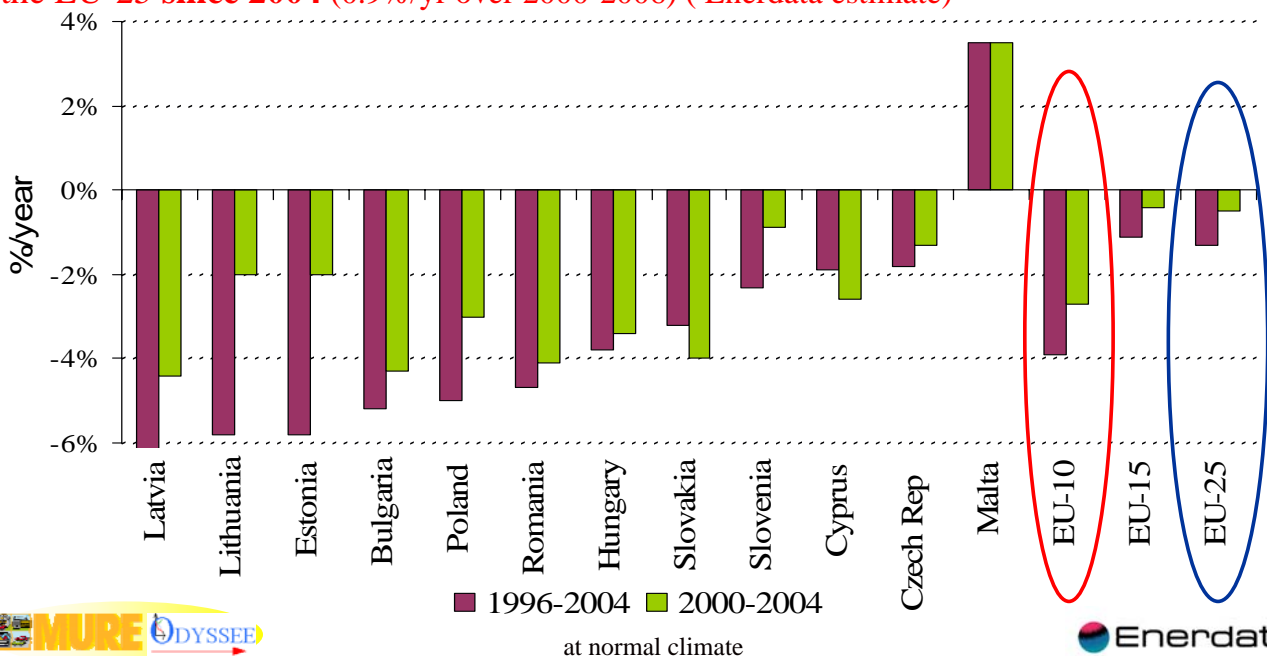


## ➤ Energy and economic developments: energy intensities

### Primary energy intensity trends

Energy intensities relate energy consumption to GDP ( toe/€at 2000 prices) → **indicator of energy productivity** (energy efficiency from an economic view point).

Rapid reduction over 1996-2004, with a slow down in most countries **since 2000**, especially in Baltic countries, Poland, Slovenia and EU as a whole; more rapid reduction in the EU-25 **since 2004** (0.9%/yr over 2000-2006) ( Enerdata estimate)

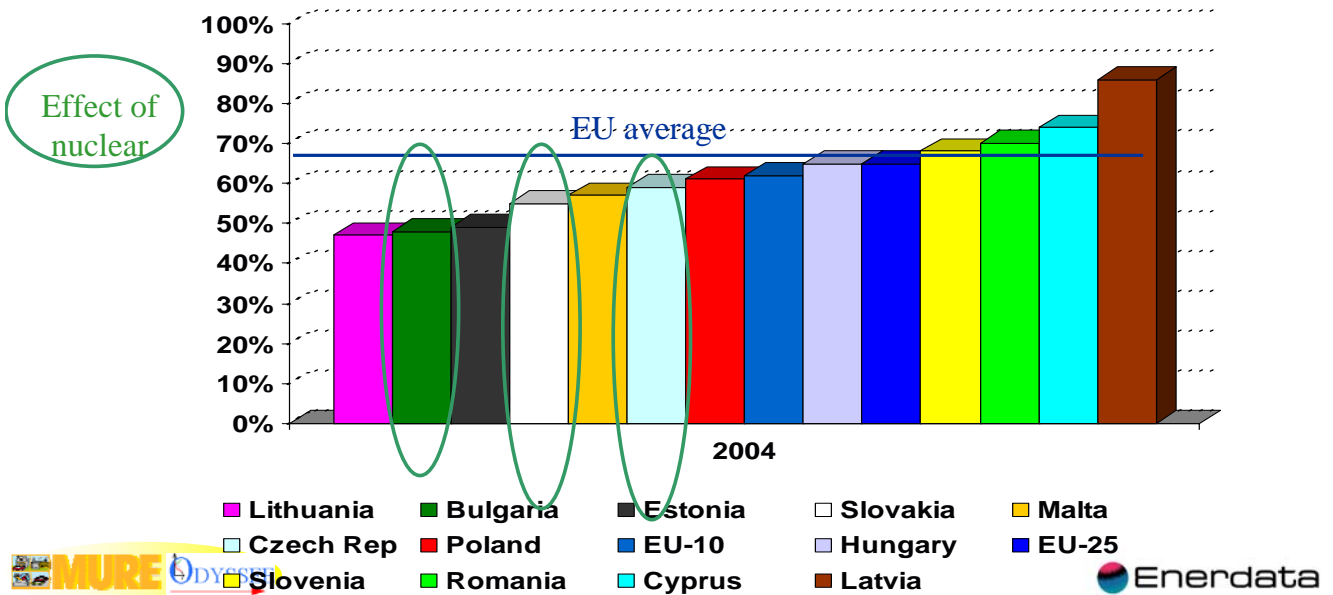


# Primary versus final energy intensity

**Different level/trends** in primary and final energy intensity linked to **3 main factors**:

- Level/change in the efficiency of energy transformations (e.g. % of nuclear)
- Level/change in electricity trade
- Share/growth of electricity consumption (high share/ growth → higher transformation losses when electricity is produced from thermal)

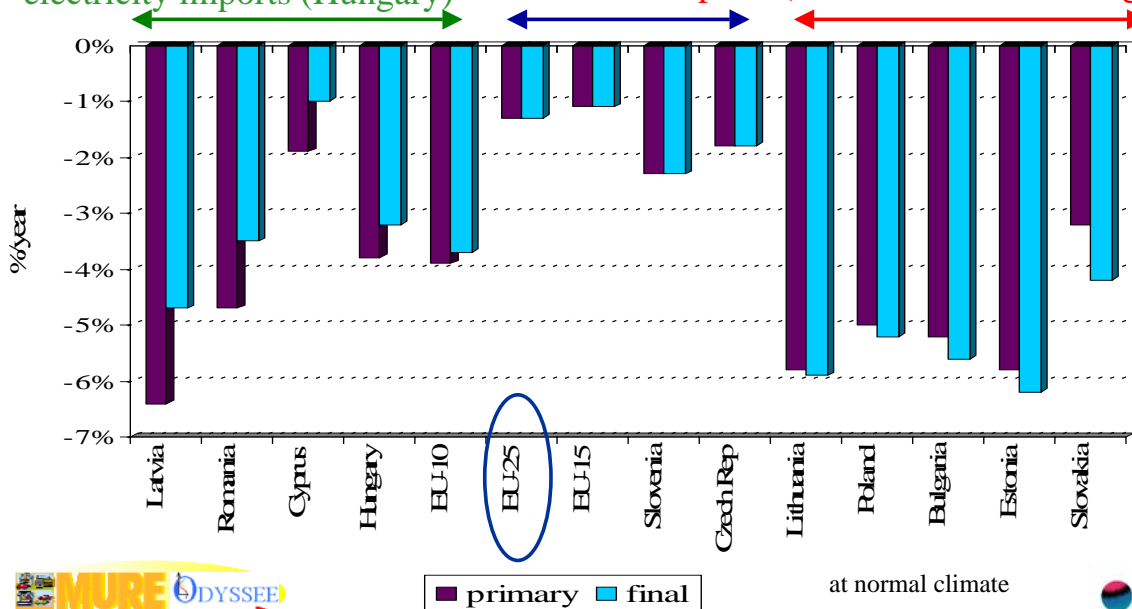
Ratio final to primary energy consumption



## Primary and final energy intensities trends in NMC'S and EU-25 (1996-2004)

Primary intensity decreases faster → higher efficiency of power generation in Cyprus, Latvia, EU-10 Hungary (gas combined cycle), Romania, and lower electricity imports (Hungary)

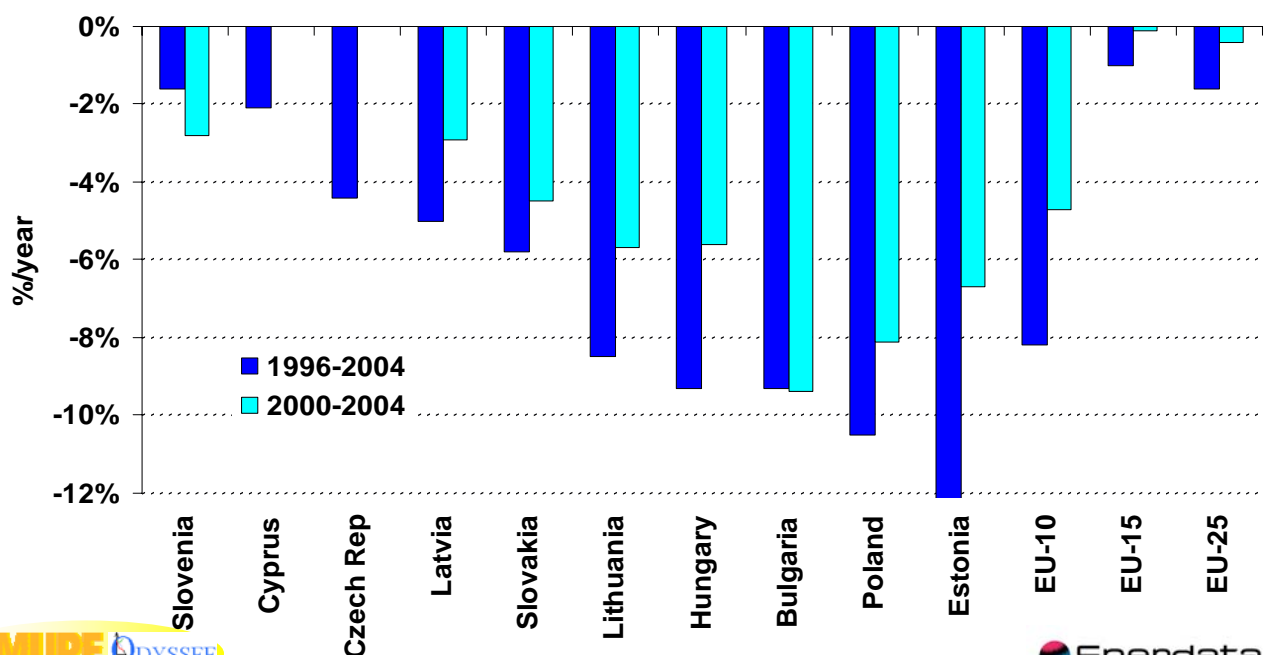
Primary intensity decreases slower → high electricity consumption growth (Estonia, Lithuania); higher share of nuclear (Slovakia, Bulgaria), increased electricity exports (Poland, Slovakia, Bulgaria)



## ➤ Energy intensity trends in industry: role of structural changes

### Trends in industrial energy intensities in EU-25 countries (1995-2004)

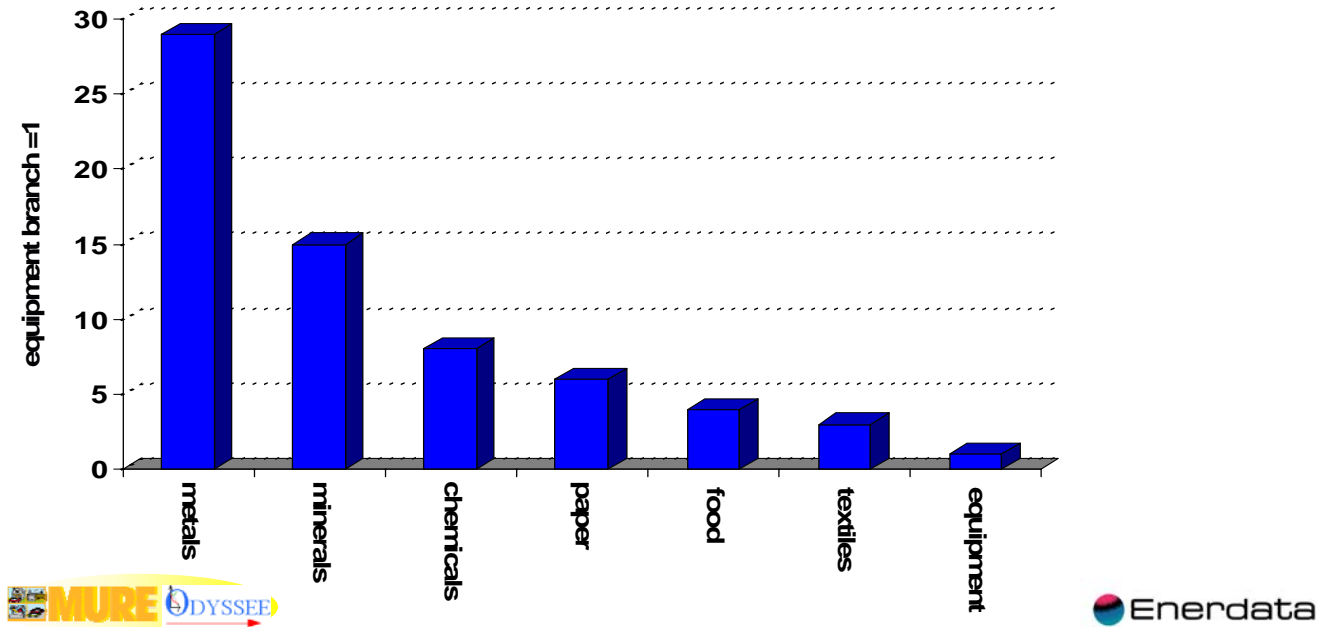
Very rapid decrease of the energy intensities of manufacturing (energy consumption per unit of value added) in most countries ; 5 countries above – 8%/year ; EU-10 average around – 8%/year; Bulgaria, Poland and Estonia around or above 10%/yr. Slower reduction since 2000 in most countries. Much slower reduction for the EU as a whole



# Relative levels of energy intensities by branch in the EU-25 (equipment=1).

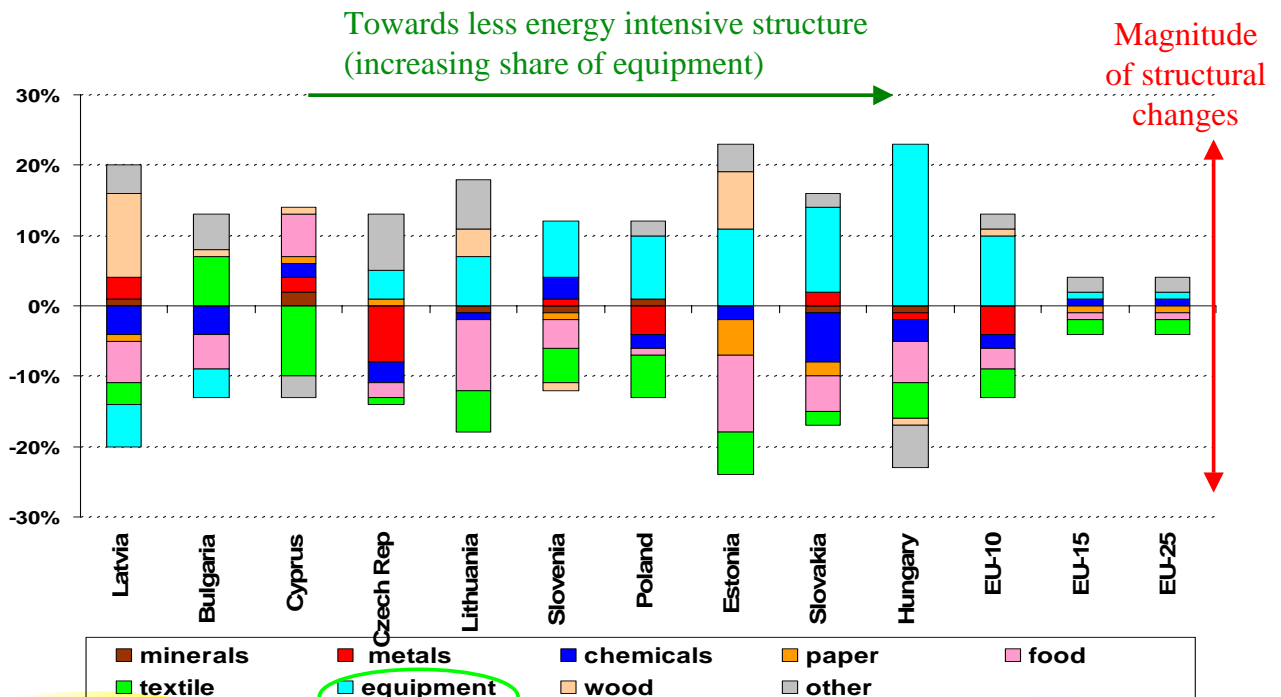
Primary metals and non metallic minerals require 29 and 15 times more energy to produce one unit of value added than the production of equipment industries

A reduction in the share of “energy intensive branches”(e.g. metals, non metallic and chemicals) in the industrial activity with an increase in the importance of equipment will result in a reduction of the average energy intensity of manufacturing



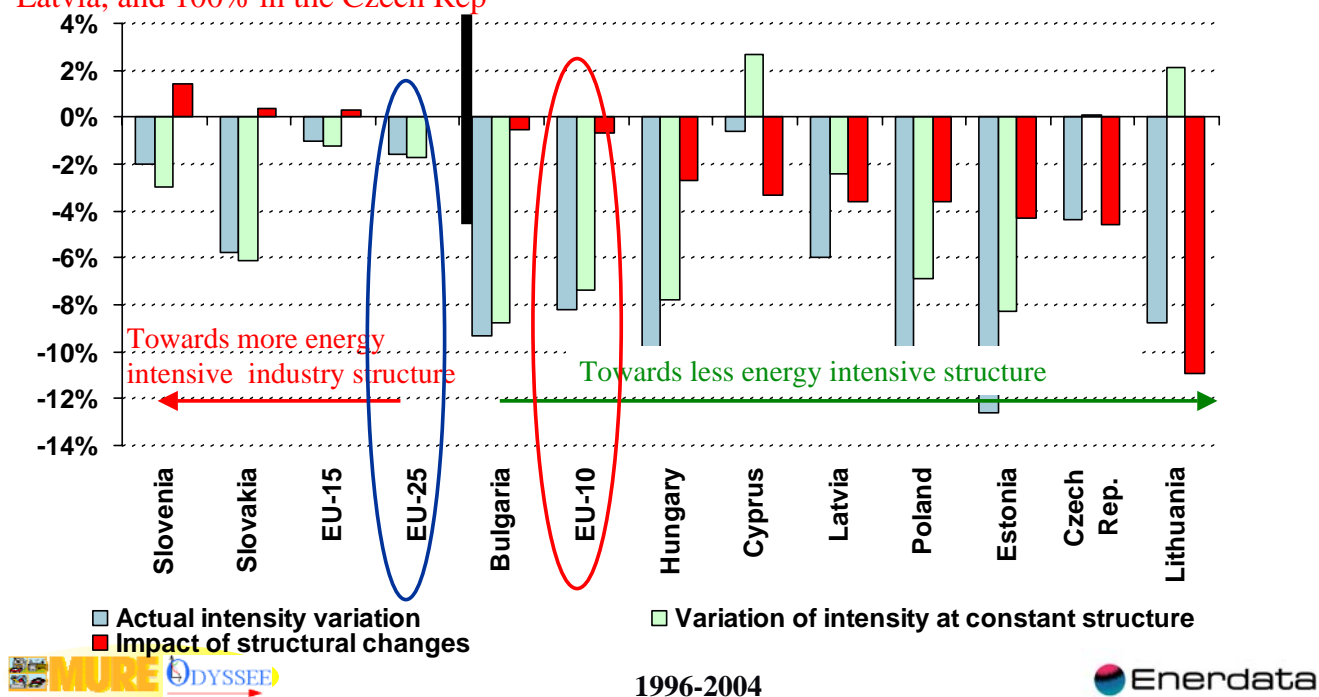
# Structural changes in manufacturing in NMC's and EU-25

Variation in the share of each branch in total value added (1996-2004)



# Impact of structural changes in manufacturing on the energy intensity variation

Structural changes contribute to decrease the manufacturing energy intensity in most countries: especially in Hungary, Cyprus, Latvia, Poland, Estonia & Czech Rep (between -3 and -5%/yr): they explain 25% of the overall reduction in Hungary, 35% in Estonia and Poland, 60% in Latvia, and 100% in the Czech Rep



## Comparison of energy intensities

# Cross country- comparisons of energy intensities : what adjustments ?

- Direct comparison of energy intensities, as usually done, is misleading, as it does not account for countries specificities
- Comparison can be improved with some adjustments for differences in :
  - ✓ General price levels, **with purchasing power parities (PPP)**: converting national currencies in € at PPP, increases the GDP (or value added) by a factor 1.5 for Slovenia, 2 for Poland or 3 for Bulgaria or Romania and decrease the intensities by the same factor
  - ✓ Climate → **adjustment of the part of consumption linked to heating** to the same climate structure on the basis of degree-days (**EU-25 average degree-days**)
  - ✓ Industrial and economic activities → **adjustment to the same value added structure (EU-25 average)**
  - ✓ Primary fuel mix → **adjustment to the EU-25 average ratio primary/ final consumption**



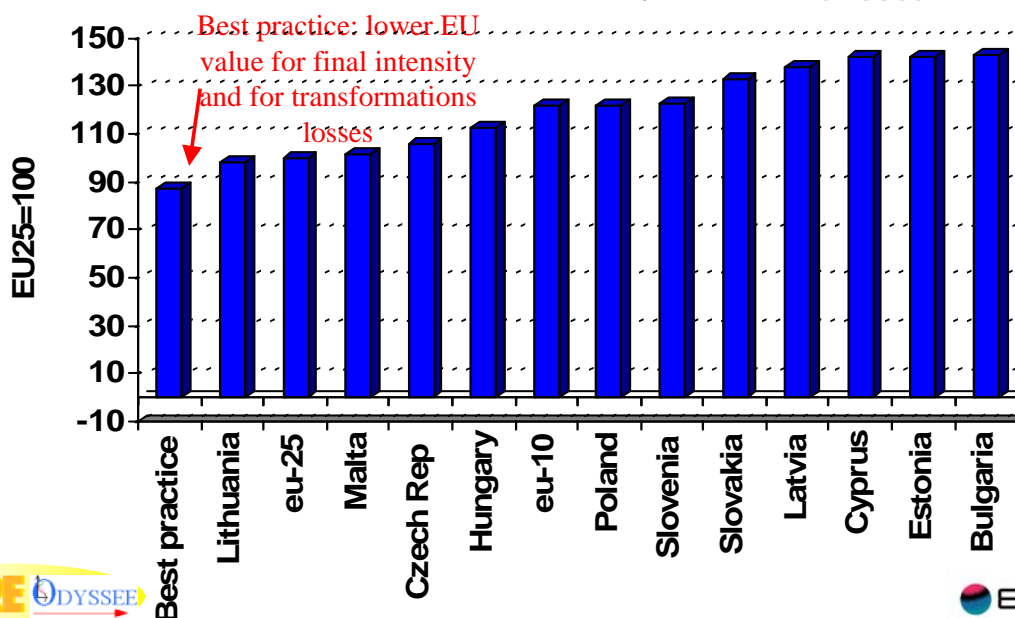
at normal climate



## Primary energy intensities: all adjustments

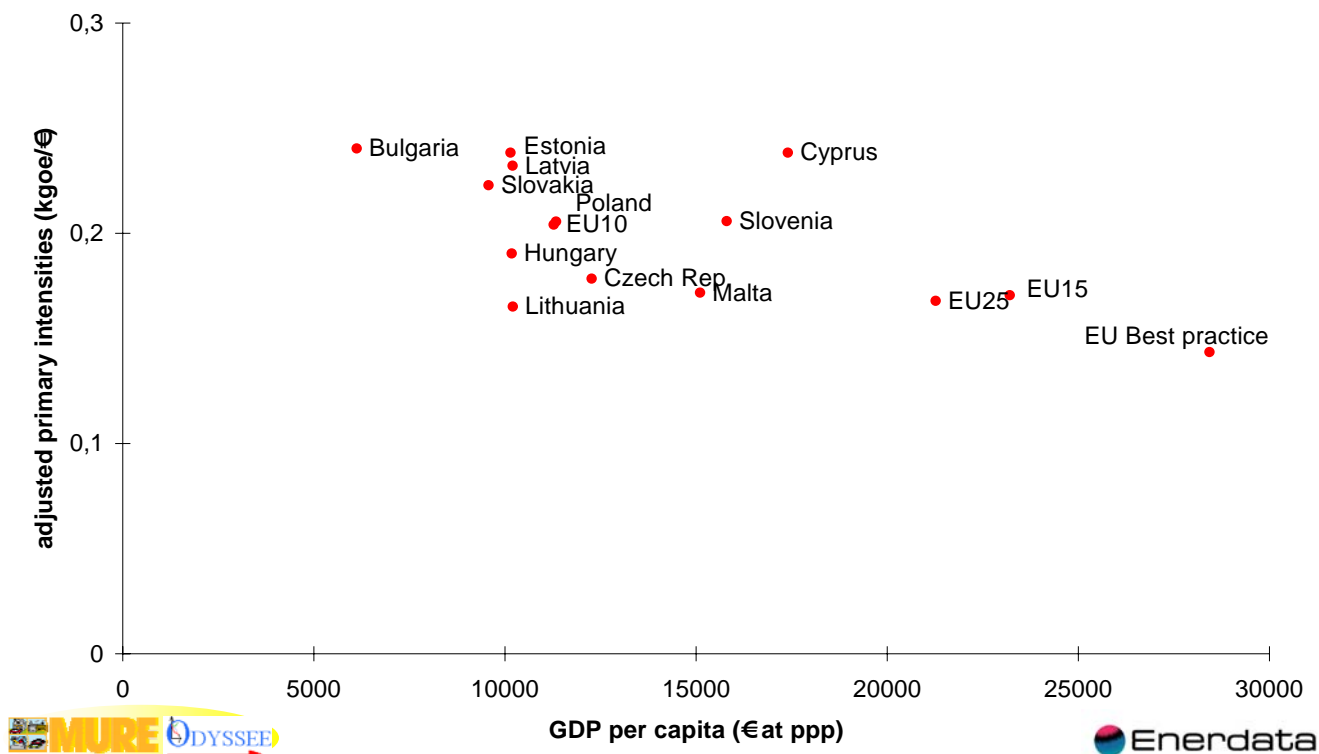
After all adjustments, primary intensities are for most NMC about 30% higher than the EU average (40% for Bulgaria, Latvia and Estonia).

Primary energy intensities adjusted to EU average primary fuel mix ,climate, economic and industry structures (at ppp)



# Primary energy intensities with all adjustments as a function of GDP per capita

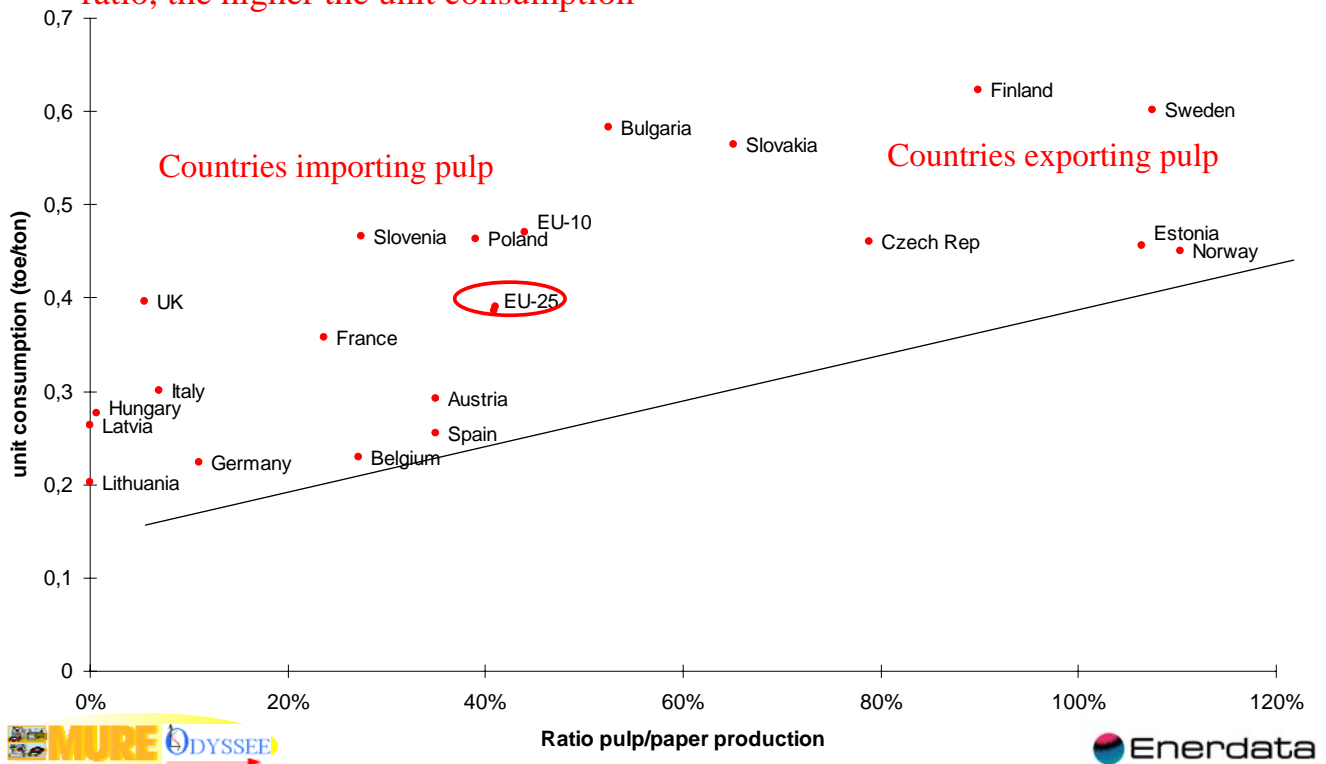
Primary energy intensities adjusted to EU average primary fuel mix, climate, economic and industry structures (at ppp) (2004)



➤ **Benchmarking of energy performance in industry**

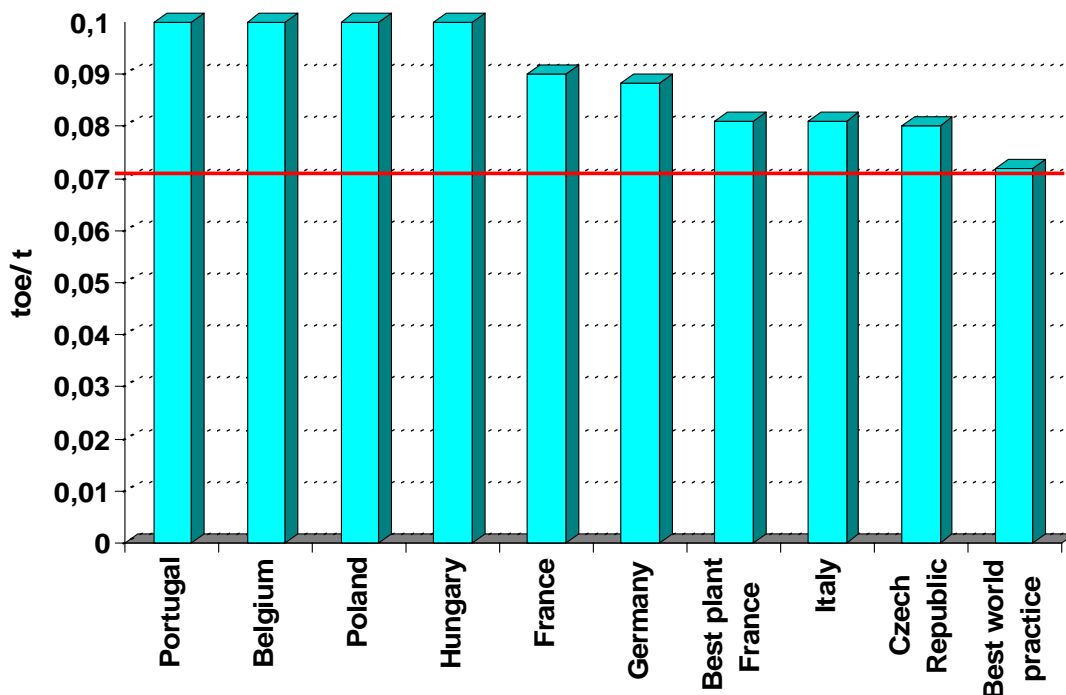
# Unit consumption per ton of paper

The energy performance of the paper industry is linked to the share of pulp produced in the country in relation to the paper production: the higher this ratio, the higher the unit consumption



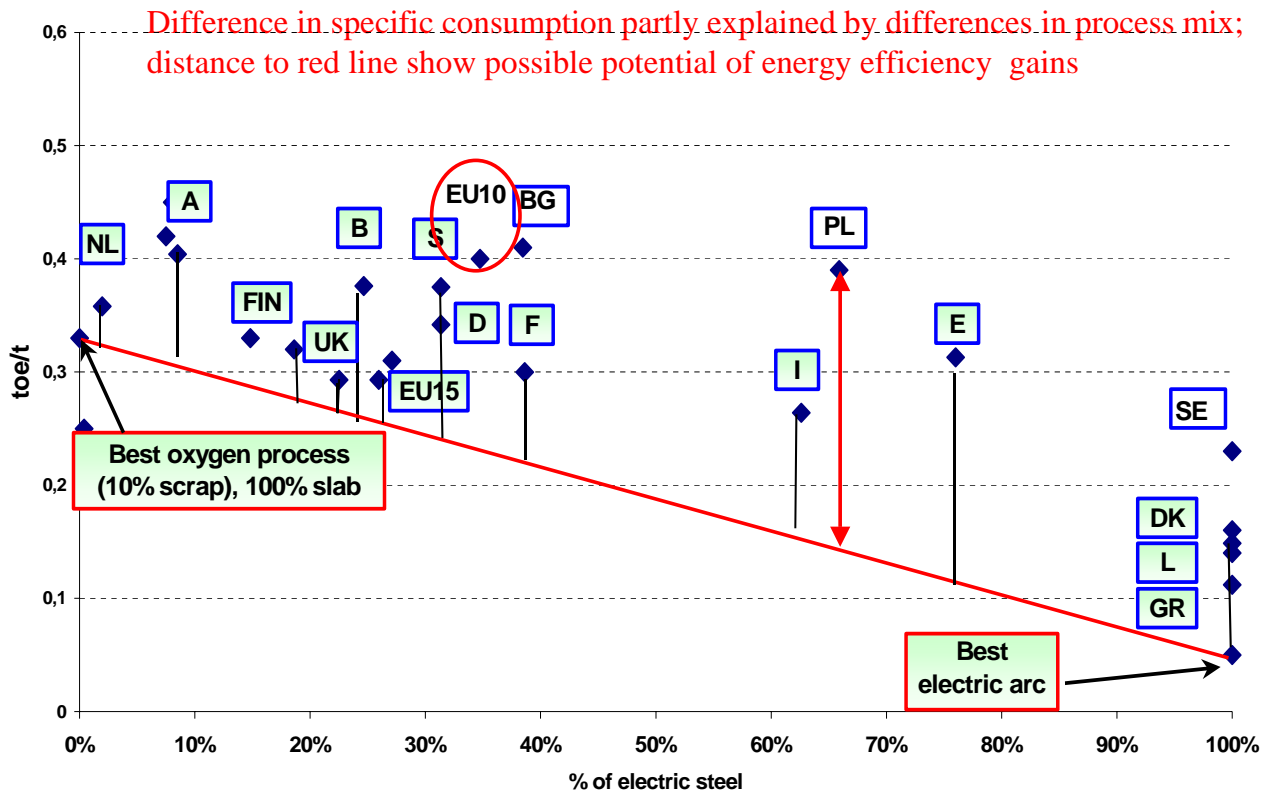
# Unit consumption per ton of clinker

For cement, the energy performance depends on the share of clinker produced in the country (the energy intensive component of cement) in relation to the cement production



0,116

# Consumption per tonne of crude steel



## ➤ Energy efficiency trends: ODEX

# How energy efficiency progress and energy savings are measured within ODYSSEE?

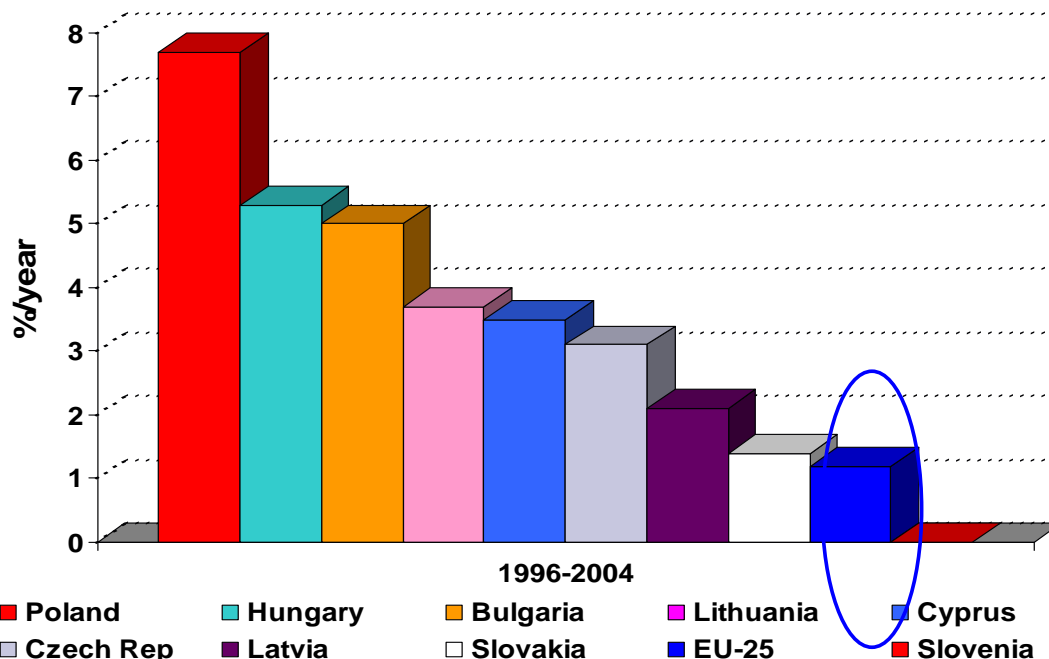
- Progress in energy efficiency and/or energy savings for final consumers are measured within ODYSSEE through indicators that are as much as possible **cleaned from all factors** that have nothing to do with energy efficiency (e.g. increase in equipment ownership, structural changes in industry)
- Energy efficiency trends are measured at the level of the main end-use sectors (industry, transport, households) as follows:
  - **By aggregation of unit consumption indices** by sub-sector (or end-use, sub-sector, mode of transport) in one index for the sector on the basis of the current weight of each sub-sector in the sector's energy consumption;
  - Unit consumption by sub-sector are expressed in **different physical units** so as to be as close as possible to energy efficiency evaluation : toe/ton , toe/ m<sup>2</sup>, kWh/appliance, litre/100km, toe/tkm...
- Energy efficiency trends are then evaluated at the level of the whole economy → **ODEX** ("ODYSSEE energy efficiency index")



## Comparison of energy efficiency trends in industry

Energy efficiency improved unevenly across the countries

Annual progress in energy efficiency as measured from ODEX

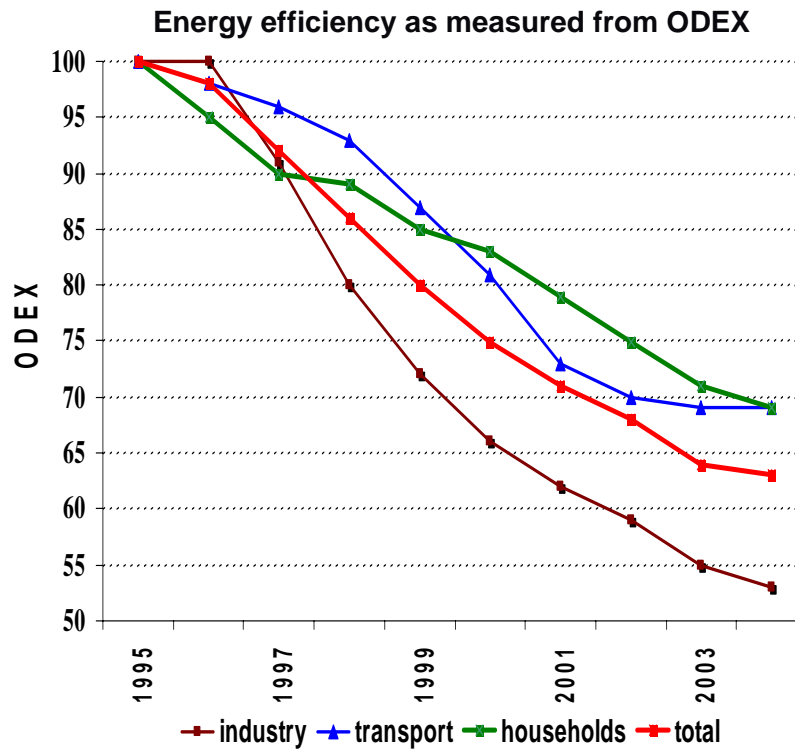


ODEX calculated on the basis of 11 branches in industry

1998-2004 for Latvia, Lithuania, Czech Rep, Slovakia and Slovenia



# Energy efficiency progress: case of Poland



ODEX= 63 in 2004

→ 37% energy efficiency improvement between 1995 and 2004 (5%/year);

Equivalent to 21 Mtoe savings since 1996 (890 PJ)

Larger gains in industry (50% or 6.8%/yr)

Regular progress for transport until 2001 and slow down since

Regular progress for households

ODEX is presently calculated on the basis of about 30 sub-sectors for EU-15 countries (up to 7 modes in transport, 9 end-uses for households, 11 branches in industry; less detailed for NMC's)



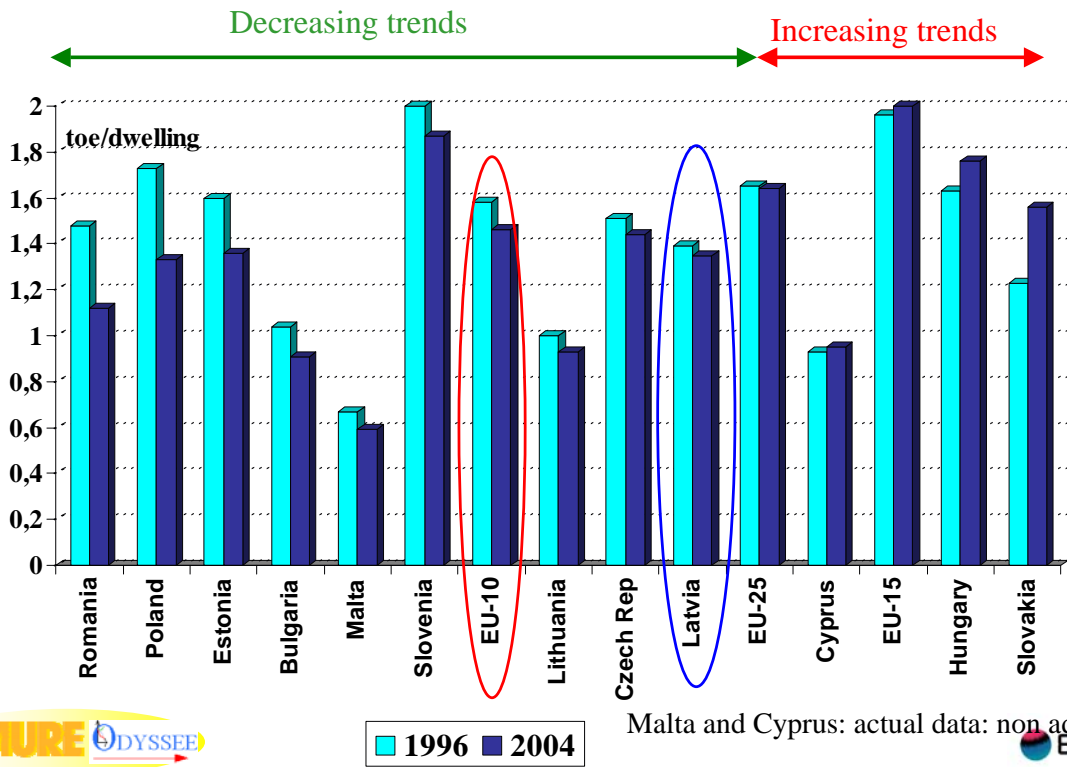
## ➤ Energy efficiency trends in households



# Average consumption per dwelling

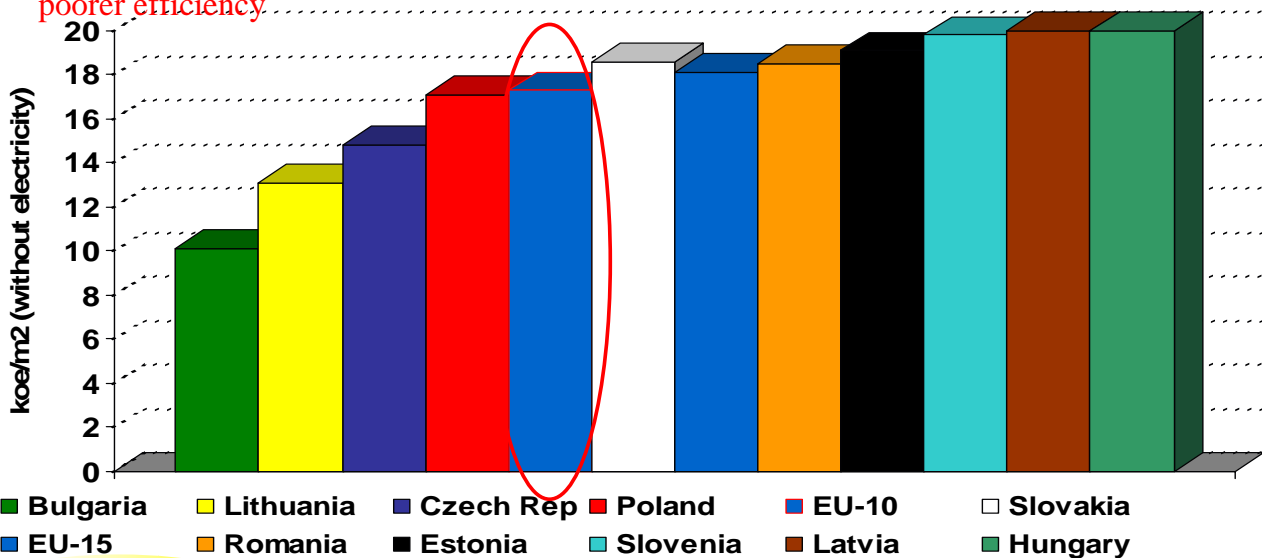
(scaled at EU-25 average climate)

Decreasing trends of the average energy consumption per dwelling in most NMC<sup>1</sup>; values in a range of 1 to 2 toe (outside Malta and Cyprus)

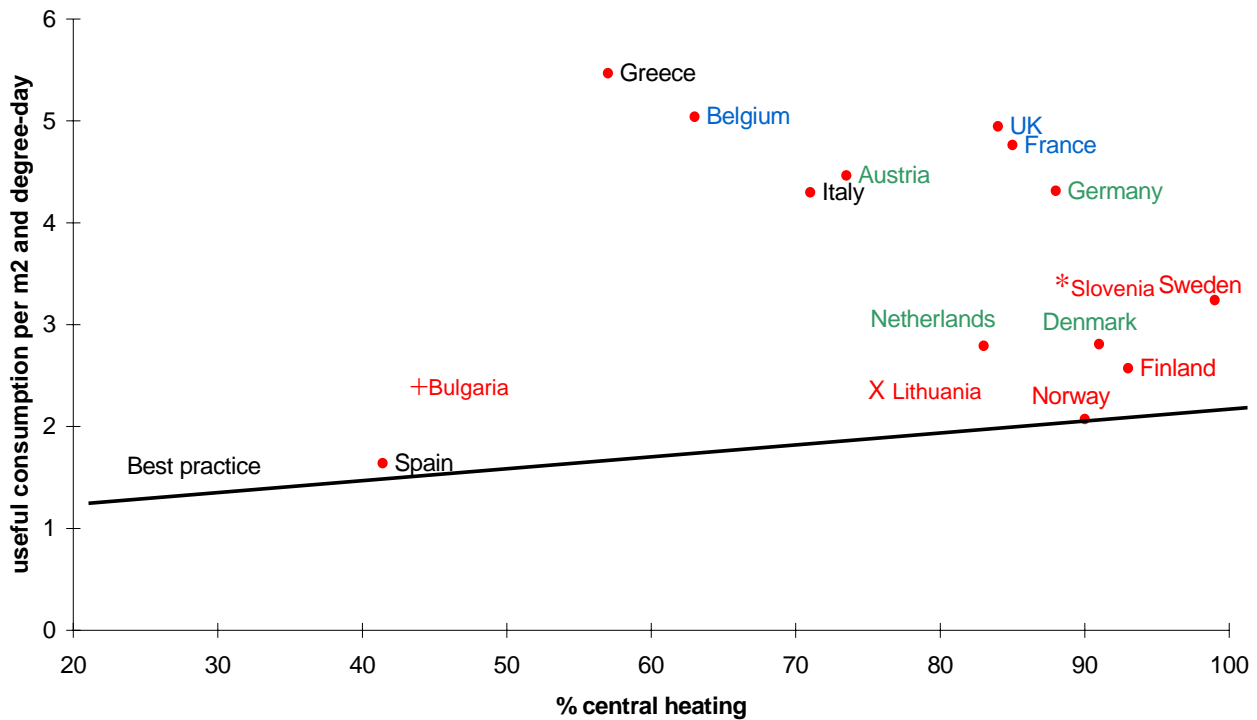


## Average consumption per m2 for thermal uses (electricity excluded) (adjusted to EU 15 average climate) (2004)

- Only 3 countries with data on space heating consumption → strong limitation for assessing energy efficiency trends and levels => non electric consumption as proxy for thermal uses
- Differences in unit consumption per dwelling may be explained by different size of dwellings → need to compare consumption per m2.
- Per m2, ranking of countries change: low value may not necessary reflect high energy efficiency, but the result of price increase and restriction of comfort; high value may indicate poorer efficiency.

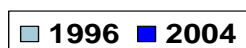
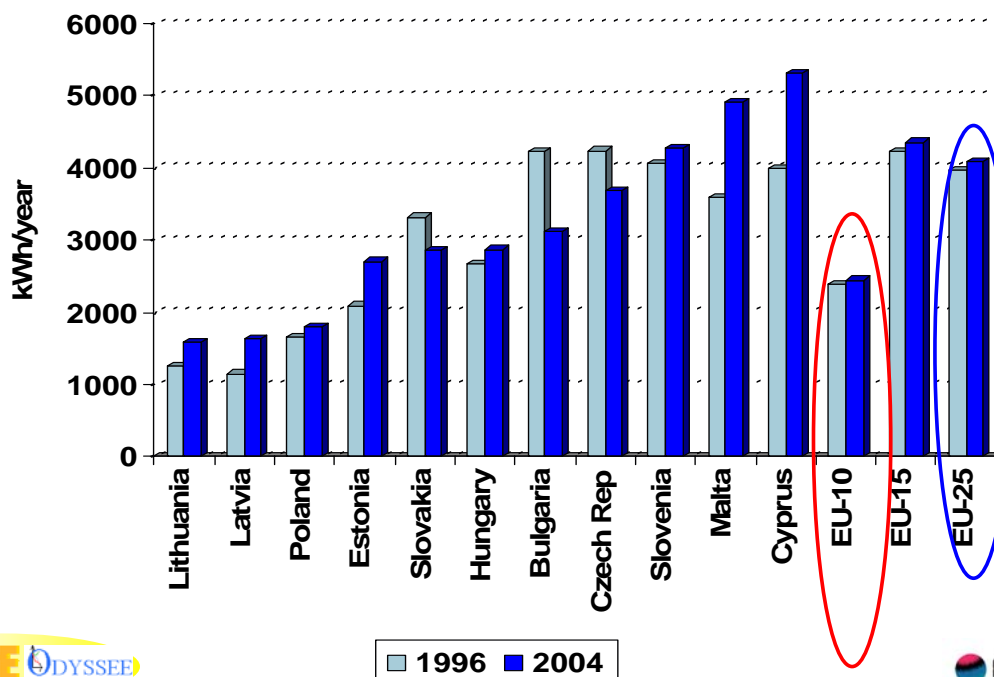


# Household space heating : possible targets

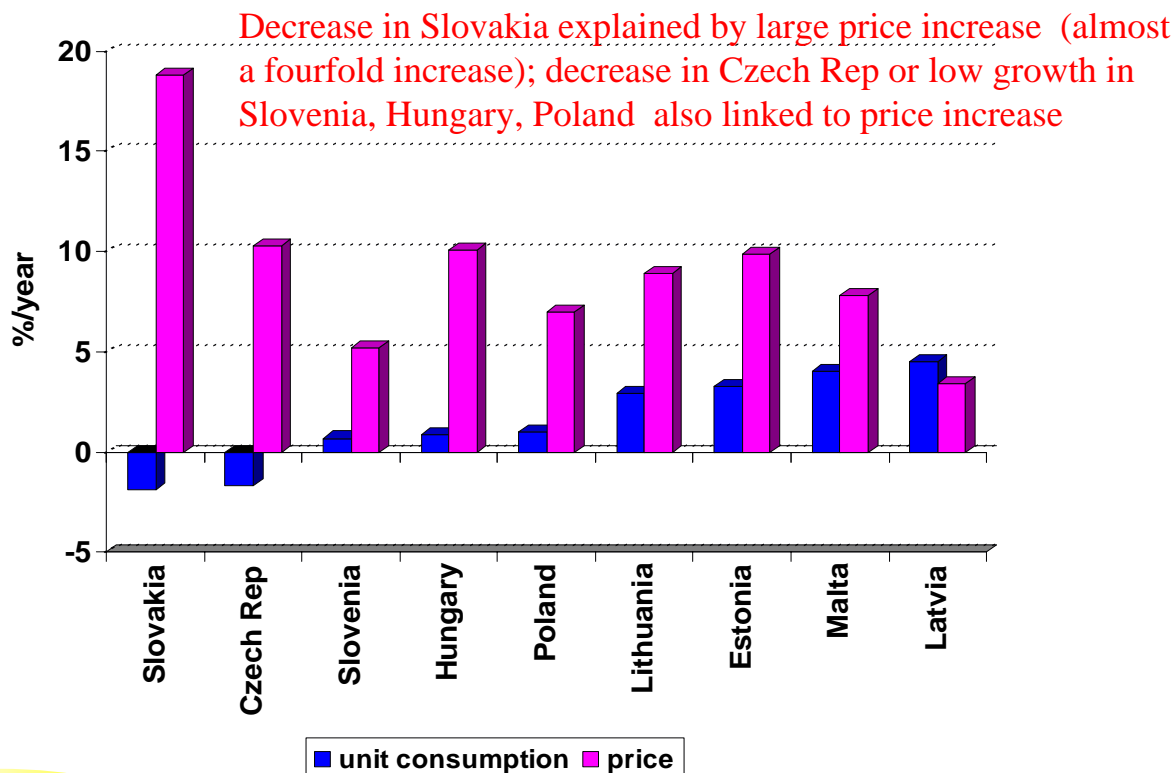


# Electricity consumption per dwelling

Very unequal level and trends of electricity consumption per household: rapid progression (3 to 4%/yr) in Malta, Cyprus, due to air conditioning, and in Baltic countries; low growth in Slovenia, Hungary and Poland (~1%/year); decrease in 3 countries (Slovakia, Bulgaria, and Czech republic), partly due to substitution of other fuels to electricity for thermal uses



## Electricity consumption per dwelling and price variations in the household sector (1996-2004)



Price in €/kWh; source: Enerdata from Eurostat and IEA



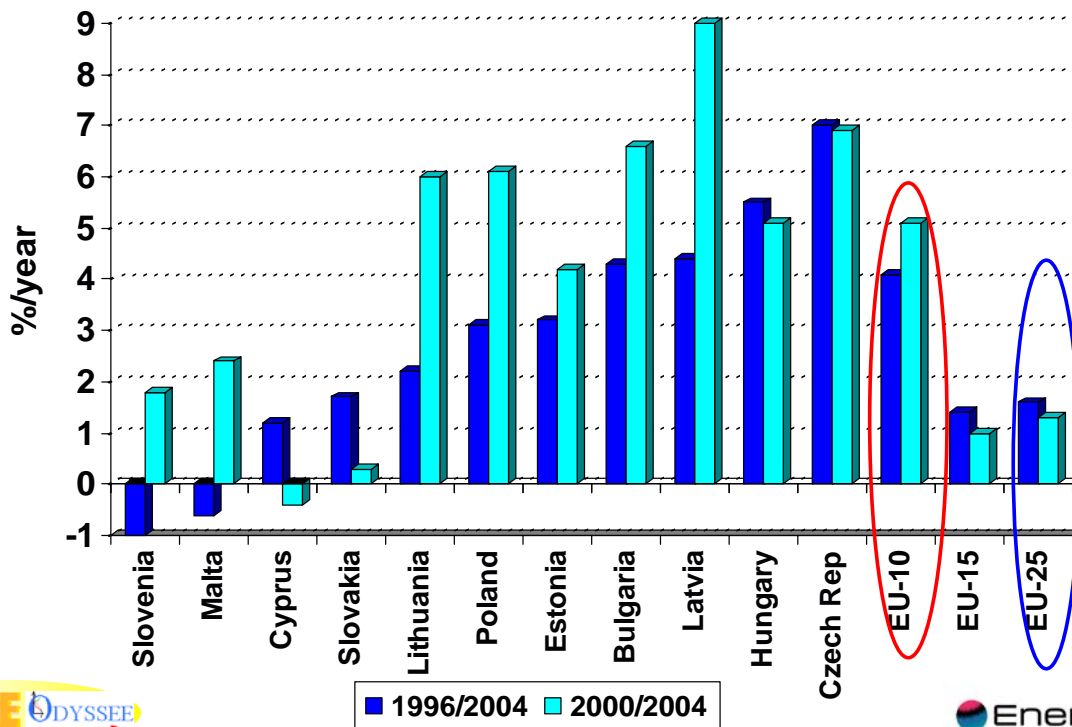
### ➤ Energy efficiency trends in transport



# Energy consumption trends in road transport

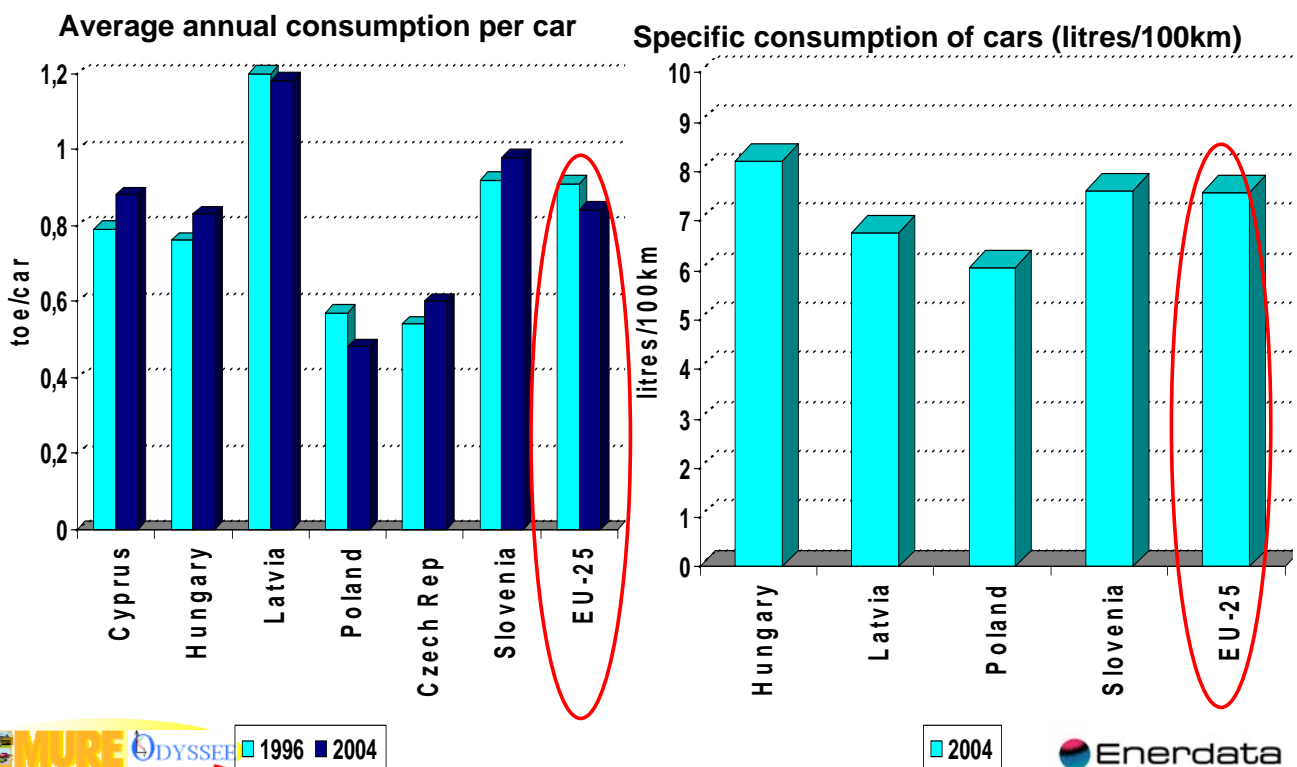
High growth in most new EU member countries with an acceleration since 2000

High share of air transport in Cyprus and Malta; for other NMC's, road transport share higher than in EU-15 (around or above 90% compared to 80% for EU-15)



## Unit consumption of cars

Only 6 countries with energy consumption data for cars. Average annual consumption per car in general lower in NMC's, due to lower distance travelled



## Conclusions

- Energy intensity still much higher than EU average, ...but rapid decrease
- Remaining discrepancies in energy intensities after all adjustments for national circumstances may be partly linked to differences in energy efficiency
- Detailed analysis by sub-sector or end-use through benchmark indicators enable to show possible potentials of energy efficiency improvement, compared either to the EU average or the EU best practices
- Preliminary estimates of energy efficiency progress with ODEX shows significant improvement, beyond the target of the ESD Directive target
- For households and transport conclusion still preliminary due to data limitations (lack of data by end use for households or by vehicle type in transport) → data improvement one of the target of ODYSSEE-MURE project for 2007-2009



**Thank you**

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