

## Evaluation and Monitoring for the EU Directive on Energy End-Use Efficiency and Energy Services

# Top-down methods for the evaluation of energy savings: main conclusion of case studies

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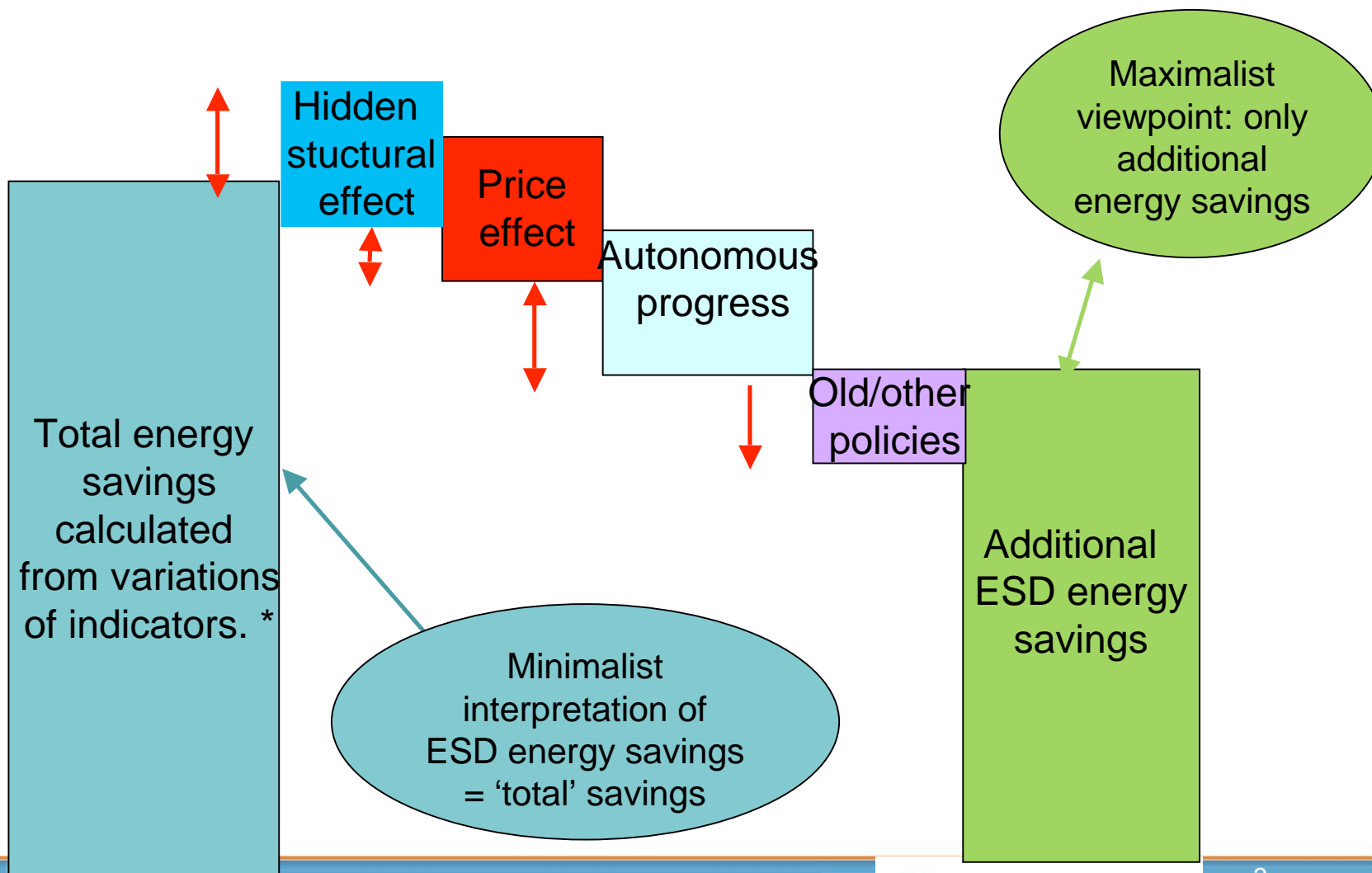
Brussels  
October 15 2008



# Agenda

- **Overview of top-down methods : total vs additional savings**
- **Conclusion from case studies**

# Calculation of energy savings according to ESD with top-down methods: possible corrections



\*already corrected for main structural effects

## Corrections to calculate additional energy savings in EMEEES case studies

- EMEEES has focussed on two possible corrections : autonomous trend and market price;
- The project has outlined the pros and cons of doing such corrections and proposed a method in case such corrections were decided;
- **Simple** econometric methods were used to quantify the impact of autonomous trend and market prices, **on purpose** :
  - ✓ in view of a possibility of **harmonisation** and the **easiness** of their understanding
  - ✓ and taking into account **data limitations** for additional explanatory variables (e.g. price/tax on cars, cost of equipment);
- Generally results of the econometric analysis were **not very robust** as data series used often too short

# Methods to define corrections of total energy savings in EMEEES case studies

$$\ln ES = a + b T + c \ln P + d \ln A + e \ln ES_{-1} + K$$

with:

**ES** : energy saving indicator ; **b**: trend, **T**: time,

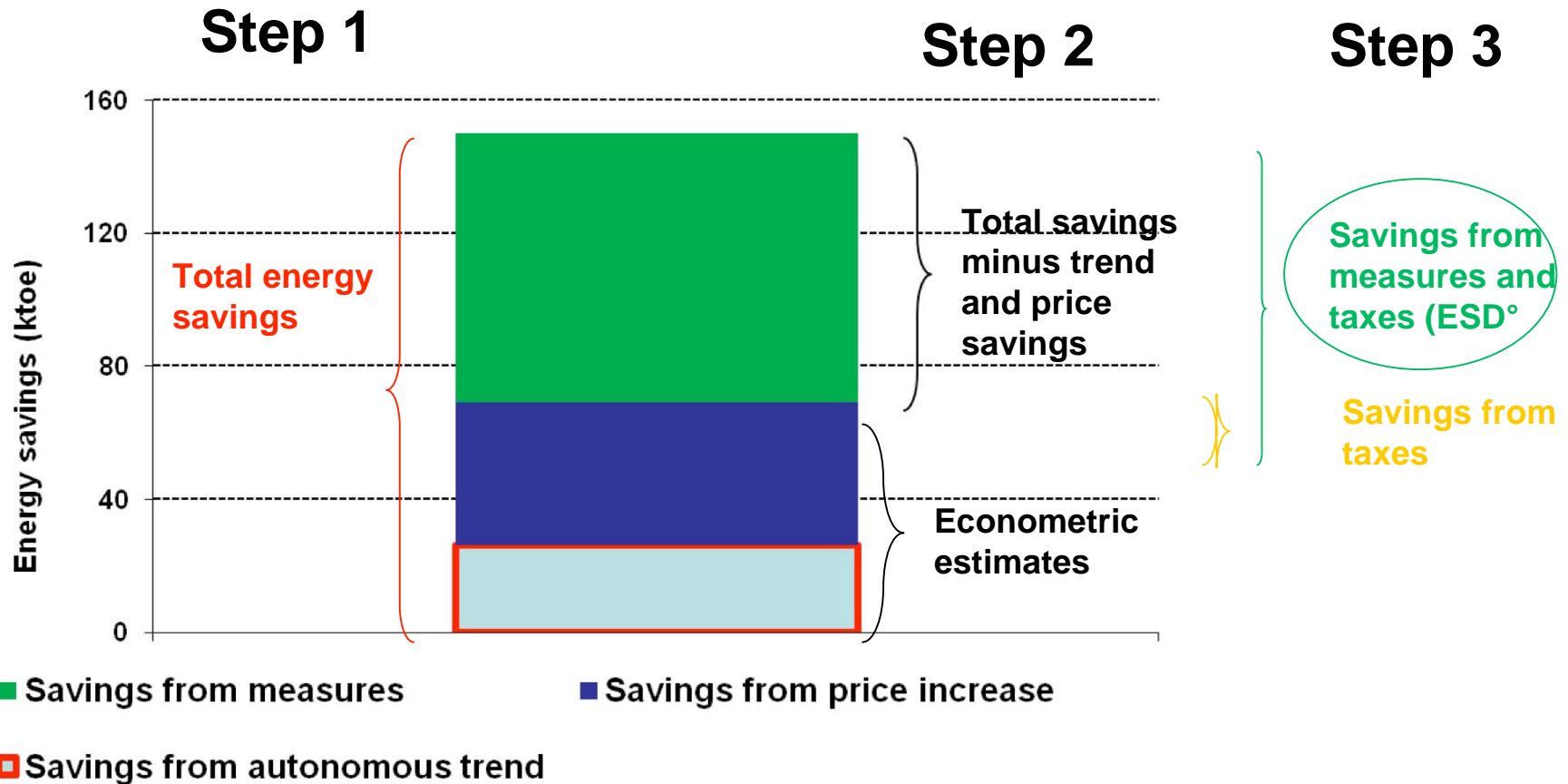
**c** : price elasticity, **P**: energy price (2 components: ex-tax (market) price and tax),

**d**: elasticity to macro economic variable **A** (e.g. GDP) to capture the impact of business cycles

Too simple ...or too complex?

# Methods to remove other factors from total top-down energy savings – example )

Estimation of energy savings in year t (e.g. 2012)



# Conclusions on top-down case studies: correction for autonomous trend and market price

## Top-down case studies in EMEEES

Case studies were classified according to the statistical indicator used to calculate the energy savings

Type of indicator	Example
Market diffusion indicator of energy saving technology or practice	Modal share for transport of goods or passengers; stock of solar water heaters ; share of cogeneration
Specific energy consumption of an equipment	New cars, electricity consumption per appliance (kWh/year)
Unit energy consumption indicator of a sub-sector (e.g. electricity uses in household, industry or services )	Electricity consumption per employee in service, heating fuel consumption per household (kWh/year)
Total energy consumption	Evaluation of the effects of energy taxation

## Indicators used to evaluate top-down energy savings in EMEEES case studies

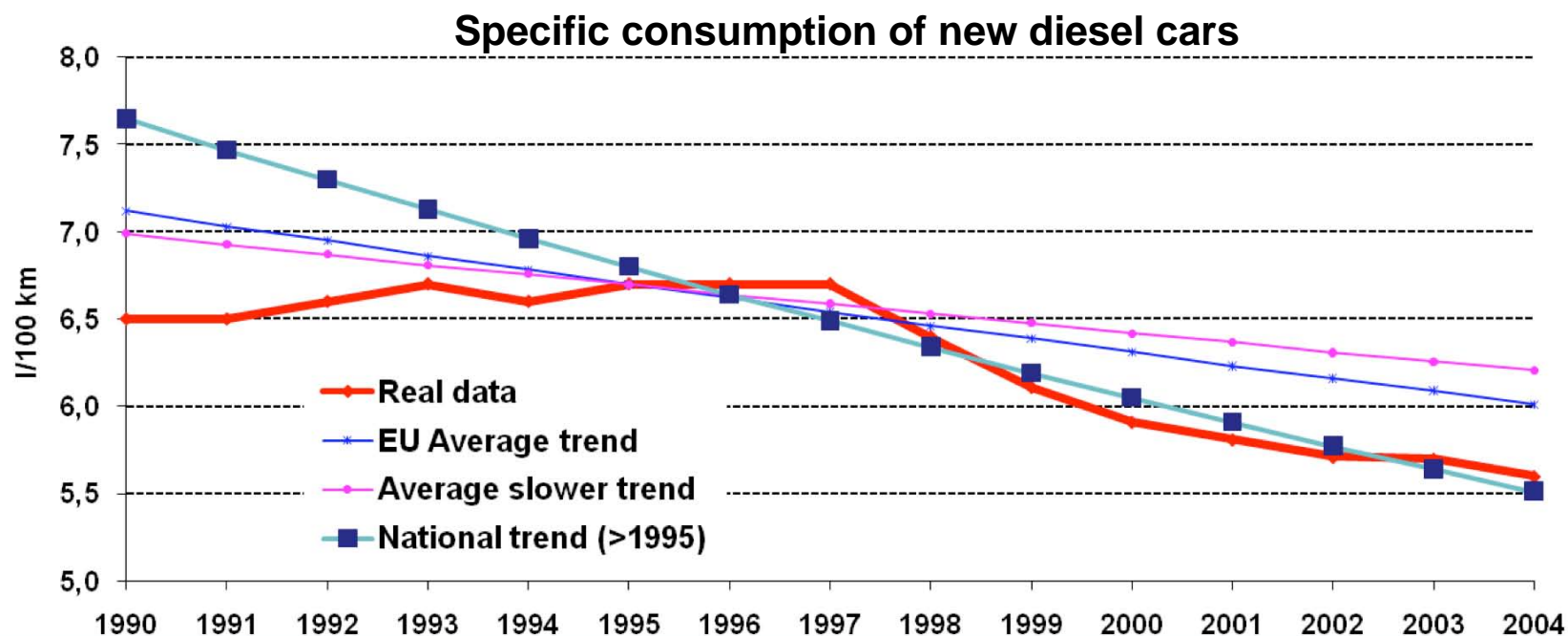
1 Building shell & heating (households)	Heat consumption per m2
2 Household electricity uses	Specific consumption (kWh/dwelling)
3 Specific white goods (refrigerators)	Specific consumption (kWh/dwelling)
4 Solar thermal collectors	m2 installed
5 Building shell & heating in tertiary sector	Energy use per employee/m2
6 Electricity end-uses in tertiary sector	Electricity use per employee/m2
7 Industrial thermal energy use	Energy use per output
8 Industrial electricity consumption	Electricity use per output
9 Industrial CHP	Share of electricity cogenerated
10 New cars	Specific consumption (l/100 km)
11 Car, bus and truck stock improvement	Specific consumption (l/100 km)
11 Modal shift in passenger transport	Share of public transport
13 Modal shift in goods transport	Share of rail & water transport
14 Energy taxation	ODEX or final energy intensity

# Correction of autonomous technological trends for equipment (e.g. household appliances, vehicles)

# Correction for autonomous technological trend (1): the different options

Which autonomous progress?

- National trend: -2,2%/year **or**
- Harmonised default values:
  - EU average trend: - 1.1%/year
  - Average trend of countries with the lowest autonomous trend (“average slower trend”) = > - 0.8%/year
  - Expert value



## Correction for autonomous technological trend (2): pros and cons of different default values

	Pros	Cons
EU average trend (weighted average)	Simple	Gives a too great importance to the trend in a few large countries
<b>Average trend of the 3 countries with the slowest trend</b>	<b>Value assumed to be close to situation without policies and measures, i.e. close to autonomous trend</b>	
Expert value	Simple	Difficult to agree on the value

## Correction of market (ex-tax) energy prices

## Market prices (1):if corrections are made, how to concretely account for price effects?

- **What value to be used for the price elasticity?**
  - ✓ National data if relevant (for the few countries where the values obtained from statistical regression were significant)
  - ✓ Or **harmonised values, the same for all countries, by sector/end-use**

### Use of national price elasticity vs harmonised values ?

<b>Pros</b>	<ul style="list-style-type: none"> <li>• Better reflect the specificity of the consumers price response of each country</li> <li>• Account implicitly for the actual price level</li> </ul>
<b>Cons</b>	<ul style="list-style-type: none"> <li>• Without harmonisation, there is a risk of having very different evaluations of savings associated to the same price variation</li> </ul>

Note: in red, our proposal

## Market prices (2): if harmonised price elasticity, what value to be used?

- ✓ An EU average value → not meaningful in most of the cases
  - Calculation on the EU average (gives a too high importance to large EU countries );
  - Arithmetic average of countries with relevant price elasticities (need a sample large enough of representative countries)
  - Pooled average (calculation over all countries) → no good results
  
- ✓ Expert judgement with a low and asymmetric price elasticity:
  - Low: the lower the elasticity the lower the correction, and the higher the ESD energy savings (e.g. 0,1 or 0,2 )
  - Asymmetric: correction made only when prices increase (no correction if prices decrease).

Note: in red, our proposal

# Conclusions on the application of top-down calculation methods for the ESD

## Conclusions on the applicability possibilities of top-down calculation methods (provided data availability)

	Name	Robustness of results	Data MS
TD-1	Space heat. households	Yes	most
TD-2	Elec.uses (all appliances)	No	EU-15
TD-3	Main appliances.	Yes	EU-15
TD-4	Solar thermal	Yes	all
TD-5	Space heat. Tertiary	Yes	few
TD-6	Elec.general Tertiary	No	few
TD-7	Heat general industry	No	all
TD-8	Elec.general industry	No	all
TD-9	CHP - industry	No	all
TD-10	New cars	Yes	most
TD-11	Vehicle stock	Yes	most
TD-12	Modal shift persons	Yes ?	all
TD-13	Modal shift goods	Yes ?	all
TD-14	Tax on energy	Yes?	all

## Summary of the proposed approach Correction of autonomous trend

- **Case of specific energy consumption indicators** (e.g., appliances, cars):
  - **Set an EU default value** for the autonomous technical progress, based on regression analysis, and on the average of the three countries with the slowest trend
  
- **Case of unit energy consumption indicators** (e.g., electricity consumption in industry, tertiary, households; heating and process fuel consumption in households, industry and tertiary) **and diffusion indicators** (e.g., solar water heaters, CHP industry, modal split in passenger and goods transport) :
  - **Do the regression analysis** for each country,
  - **Identify** plausible autonomous trends if possible

# Summary of the proposed approach

## Correction of market price

**For all types of indicators:**

- **Set** an **EU default value** for the price elasticity between 0.1 and 0.2
- **Correct** reference trend if market energy price is going up