

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

National Workshop - Finland

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- Objective of the workshop
- EMEES - project context
- Terminology and open issues for working on evaluation and monitoring methods
- Development of bottom-up (BU) and top-down (TD) methods
- Examples: bottom-up method
- Examples: top-down method
- Conclusions and closing

Workshop agenda 2.1.2008

- 9.30** **Registration and coffee**
- 10.00** **Introduction and EMEEES-project context**
- 10.15** **Terminology and open issues for working on evaluation and monitoring methods**
**Development of evaluation methods:
bottom-up (BU) and top-down (TD)**
- 12.30** **Lunch**
- 13.30** **Examples (1): bottom-up (BU) methods**
- 14.30** **Coffee**
- 14.45** **Examples (2): top-down (TD) methods**
- 15.45** **Conclusions**
- 16.00** **End of the Workshop**

1. Objective of the workshop

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1 Objective of the EMEEES National Workshops

- present and discuss preliminary results in the project with the experts from governments, agencies and also other stakeholders like energy companies, ESCO's, science, and other non governmental organisations
- get feedback about the principles and bases for the methods and if they are relevant and acceptable to all MS before finalising the methods
- invite experts also from neighbouring countries not represented by a participant in the project

2. Project Context

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2.1 Project Context: EMEEES (Evaluation and Monitoring for the EU Directive on Energy End-Use Efficiency and Energy Services)

- **support** the implementation of the EU Directive on energy end-use efficiency and energy services, ESD (2006/32/EC)
- develop harmonised **methods** for evaluation of energy savings (20 bottom-up and 15 top-down methods)
- build trust in methods and hence in savings evaluated
- develop a **template** for national energy efficiency action plans
- provide **practical advice and support** for the European Commission
- provide **platform for exchange**:
www.evaluate-energy-savings.eu

2.2 Elements in EMEEES (Work Packages)

- WP1: Management
- WP2: Analysis of good practice
- WP3: Distinction of measures by type of evaluation method
- WP4: Bottom-up evaluation methods
- WP5: Top-down evaluation methods
- WP6: Integration of bottom-up and top-down approaches
- WP7: Planning and reporting requirements
- WP8: Pilot testing
- WP9: Platform for exchange and dissemination
- WP10: Common dissemination activities

2.3 The EMEEES Consortium

21 partners well-experienced in evaluation of energy savings from 14 countries

Project partner	Country
Wuppertal Institut for Climate, Environment, Energy (WI)	DE
Agence de l'Environnement et de la Maitrise de l'Énergie (ADEME)	FR
SenterNovem	NL
Energy research Centre of the Netherlands (ECN)	NL
Enerdata	FR
Fraunhofer-Institut für System- und Innovationsforschung (FhG-ISI)	DE
SRC International A/S (SRCI)	DK
Politecnico di Milano, Dipartimento di Energetica, eERG	IT
AGH University of Science and Technology (AGH-UST)	PL
...sterreichische Energieagentur Š Austrian Energy Agency (A.E.A.)	AT
Ekodoma	LV
Istituto di Studi per l'Integrazione dei Sistemi (ISIS)	IT
Swedish Energy Agency (STEM)	SE
Association pour la Recherche et la Développement des Méthodes et Processus Industriels (ARMINES)	FR
Electricité de France (EdF)	FR
Enova SF	NO
Motiva Oy	FI
Department for Environment, Food and Rural Affairs (DEFRA)	UK
ISR Š University of Coimbra (ISR-UC)	PT
Dong Energy	DK
Centre for Renewable Energy Sources (CRES)	GR

2.4 EMEEES Timeline

- November 06 – April 2009 **Duration of the whole project**
- December/January 2007/8 **National Workshops in 13 MS, Review of methods, Advice to Commission on NEEAPs assessment**
- Spring 2008 **Subcommittees on top down and bottom up planned by Commission**
- May 2008 **Finalising, publishing and presenting results on methods**
- Autumn 2008 **Final Conference on methods**
- Winter 2007 to early 2009 **Six Pilot cases testing the methods**
- April 2009 **End of the project**

3. Terminology and open issues for working on evaluation and monitoring methods

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3.1 ESD - Energy End Use Efficiency and Energy Services Directive

- The ESD sets an indicative target for EU MS to achieve a **9% annual energy saving by 2016** from energy services and other energy efficiency (EEI) measures.
- But until now there has not been developed a ***common methodology on how to measure and evaluate these savings.***
- The set of common and harmonised evaluation methods to be developed will ***enable the MS to report EEI activities and their impacts in a common way and with a harmonised accounting system.***
- Consequently, the methods designed will help the MS to prove to the Commission the fulfilment of the indicative cumulative annual energy savings target of 9 percent by 2016.

3.2a EMEEES analytical clarification (1a):

some original text's from the ESD...

■ ESD Art 3 (d) and (h):

- d: "energy savings": an amount of saved energy determined by measuring and/or estimating consumption before and after implementation of one or more energy efficiency improvement measures, whilst ensuring normalisation for external conditions that affect energy consumption
- h: "energy efficiency improvement measures": all actions that normally lead to verifiable and measurable or estimable energy efficiency improvement

■ ESD Art 4 – General target:

- Member States shall adopt and aim to achieve an overall national indicative energy savings target of 9% for the ninth year of application of this Directive, to be reached by way of energy services and other energy efficiency improvement measures

■ ESD Annex IV – General:

- In measuring the realised energy savings as set out in Article 4 with a view to capturing the overall improvement in energy efficiency and to ascertaining the impact of individual measures, a harmonised calculation model which uses a combination of top-down and bottom-up calculation methods shall be used

3.2 EMEEES analytical clarification (1): subject of monitoring and evaluation

- Energy efficiency improvement (EEI) measure (ESD Art 3 (h)):
- Distinction useful between

(EEI) facilitating measure(s)
(abbr.: facilitating measures)
 stimulate end-use EEI actions
 and are delivered to final
 consumers or other market actors
 (↑ *a cause for an end-use action*)

and

end-use (EEI) action(s)
(abbr.: end-use action)
 taken by final consumers
 or other market actors
 (↑ *can be an impact
 of a facilitating measure*)

3.3 Analytical clarification (2): subject of monitoring and evaluation

(EEI) facilitating measures can be:

- Energy services, EEI programmes, EEI policy instruments, and other EEI measures
- **Examples:**
 - energy performance contracting,
 - incentive programme,
 - building codes,
 - voluntary agreement

end-use (EEI) action(s) can be:

- technical, organisational, or behavioural action that actually improves energy efficiency at the end-use level
- **Examples:**
 - thermal insulation,
 - energy management,
 - purchase of efficient car instead of „gas-guzzler“,
 - practicing eco-driving

3.4 Analytical clarification (3): subject of monitoring and evaluation

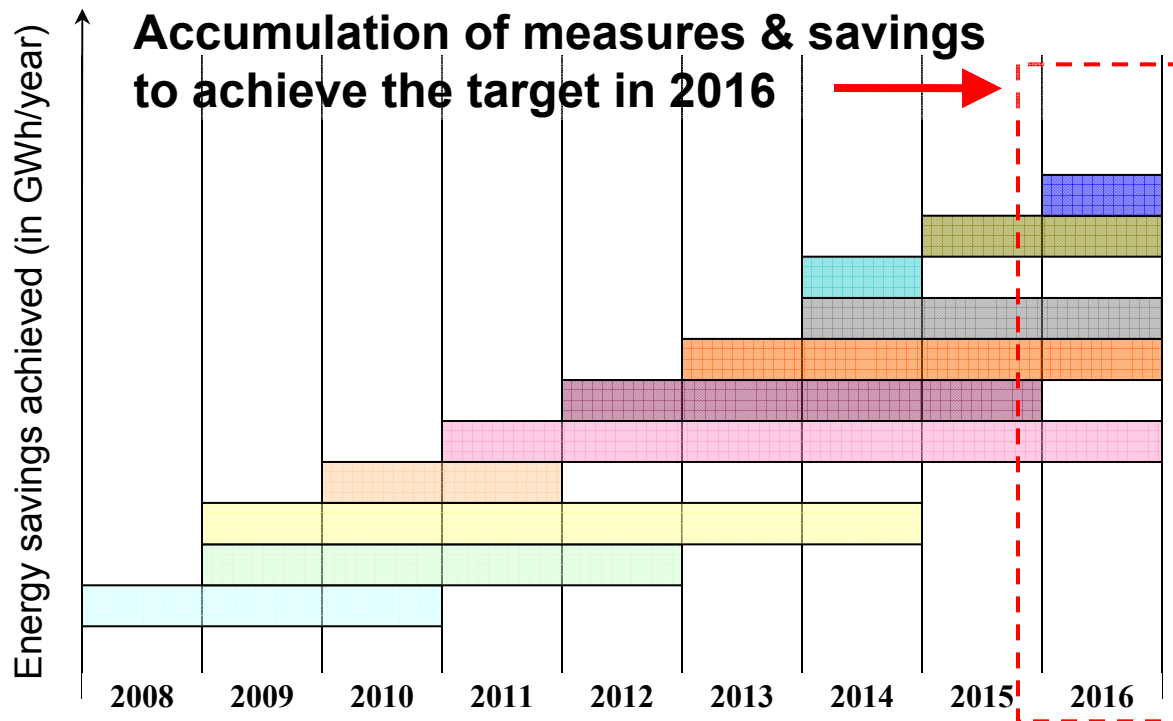
				(EEI) Facilitating measures			
				Example 1: energy performance contracting	Example 2: white certificate schemes	Example 3: energy taxation	
End-use (EEI) actions	Sector	Energy end-use	Efficient Solution				
	Residential	example 1: heating	efficient boilers			B1	C
			heat pumps			B2	
			etc.				
		example 2: lighting	CFL			Bi	
		etc.					
	Tertiary	example 1: heating	efficient boilers, pumps, etc.	A1		Bj	
			etc.				
		example 2: lighting	CFL			etc.	
			efficient ballasts	A2			
	etc.						

3.5 ESD energy savings and targets (1)

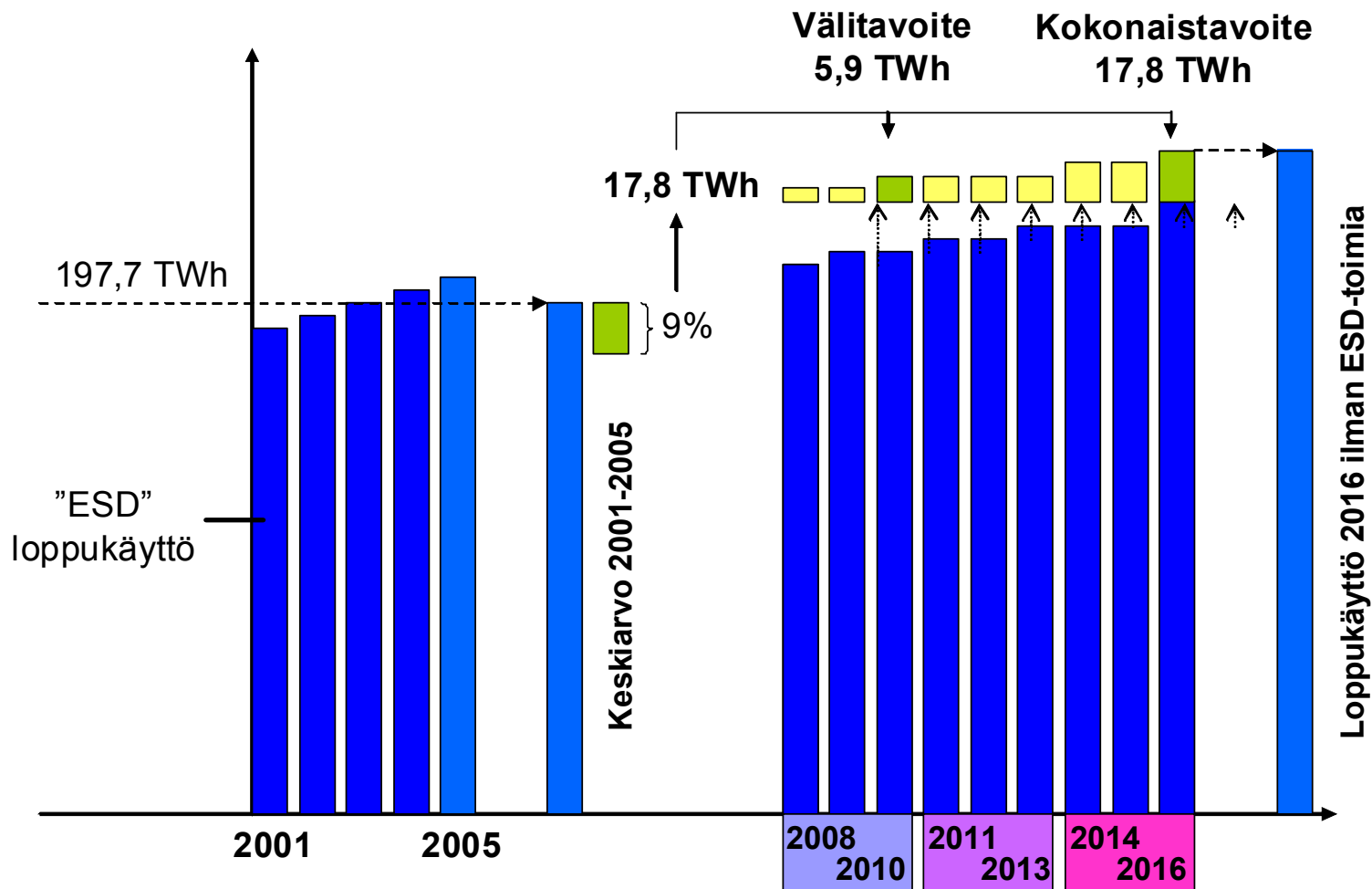
What does “cumulative annual energy savings” mean?



sum of the annual energy savings (kWh/year) from the different EEI measures, but **only in 2010 and 2016**



3.5 ESD energy savings and targets (2)



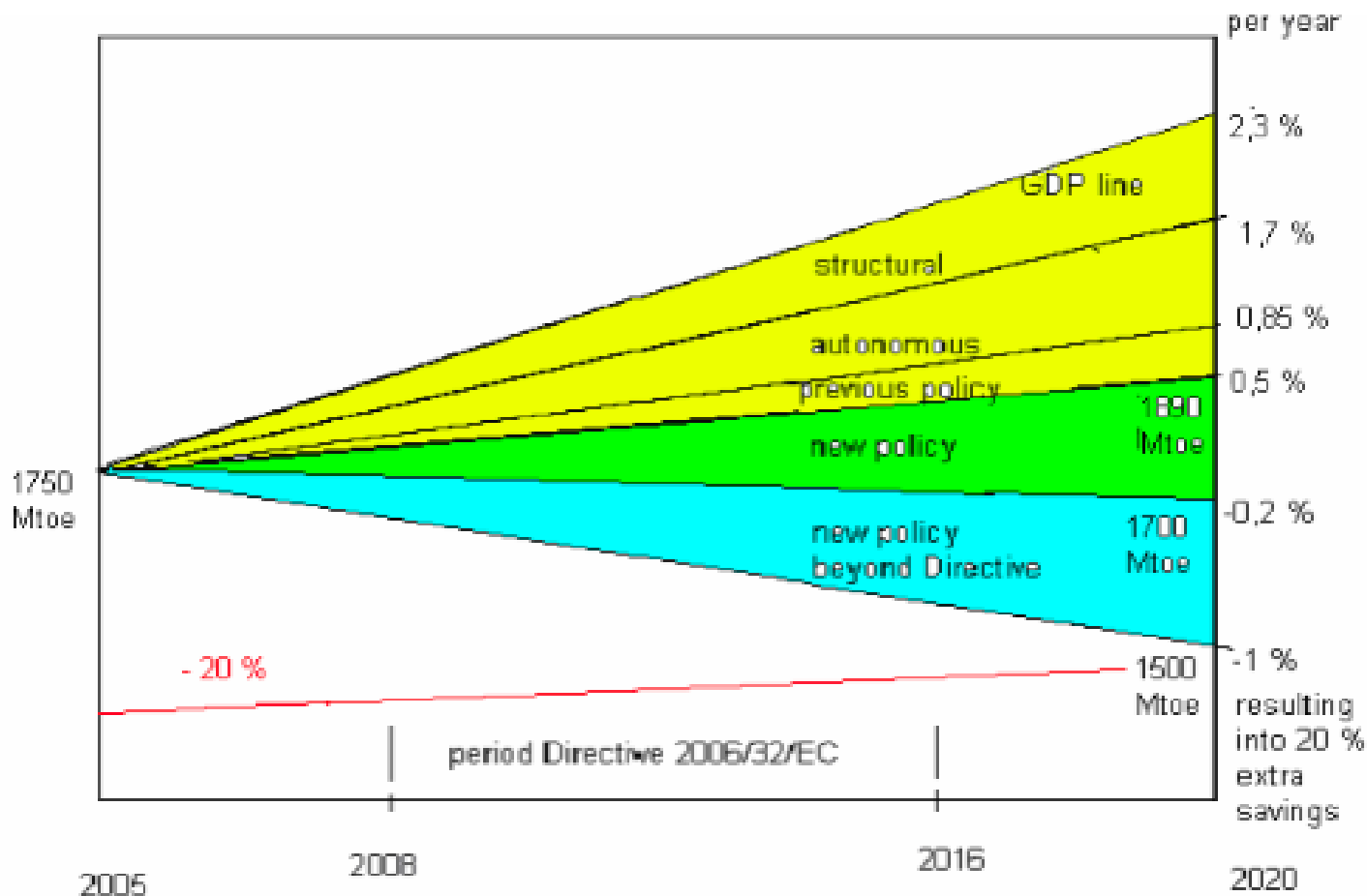
3.6 Additional energy savings? (1)

- **ESD does not mention** that energy savings counting towards the 9% target must be in addition to energy savings from autonomous changes and previous policy
- **EU Action Plan for Energy Efficiency** obviously expects strong contribution from ESD (and other recent Directives):
„new policy“ leading to **new and additional** energy savings compared to autonomous changes and previous policy
 - EU Action plan requires 1.5% per year of primary energy efficiency improvement; „new policy“ to bring 0.7% per year (equivalent to 1% per year in non-ETS sectors)
 - autonomous changes: “brought about by natural replacement, energy price changes, etc.” (EU Action Plan)



3.7 Additional energy savings? (2)

The EU Action Plan



3.8 „Early Action“ (1)

- ESD Annex I: “**Energy savings** in a particular year following the entry into force of this Directive that result from energy efficiency improvement **measures** initiated in a previous year not earlier than 1995 and **that have a lasting effect** may be taken into account in the calculation of the annual energy savings.“
- EMEES: “... that have a lasting effect”: Interpretation unclear!
 - ‘**Early measures**’?
(e.g., building code from 2005 and still in force in 2008–2016, => savings accounted only from the period 2008–2016)

Or

- ‘**Early energy savings**’?
(e.g., from energy-efficient building constructed in 2005, => savings accounted from the whole period 2005–2016)
 - still saving lifetimes crucial

3.8a „Early Action“ (2)

The definition of early actions may include two possibilities (to be clarified by the European Commission and the ESD Committee):

- early (EEI) facilitating measures, and only those energy savings that result from end-use actions that are implemented during 2008-2016, as a result of these facilitating measures that still have a lasting effect during 2008-2016, are eligible

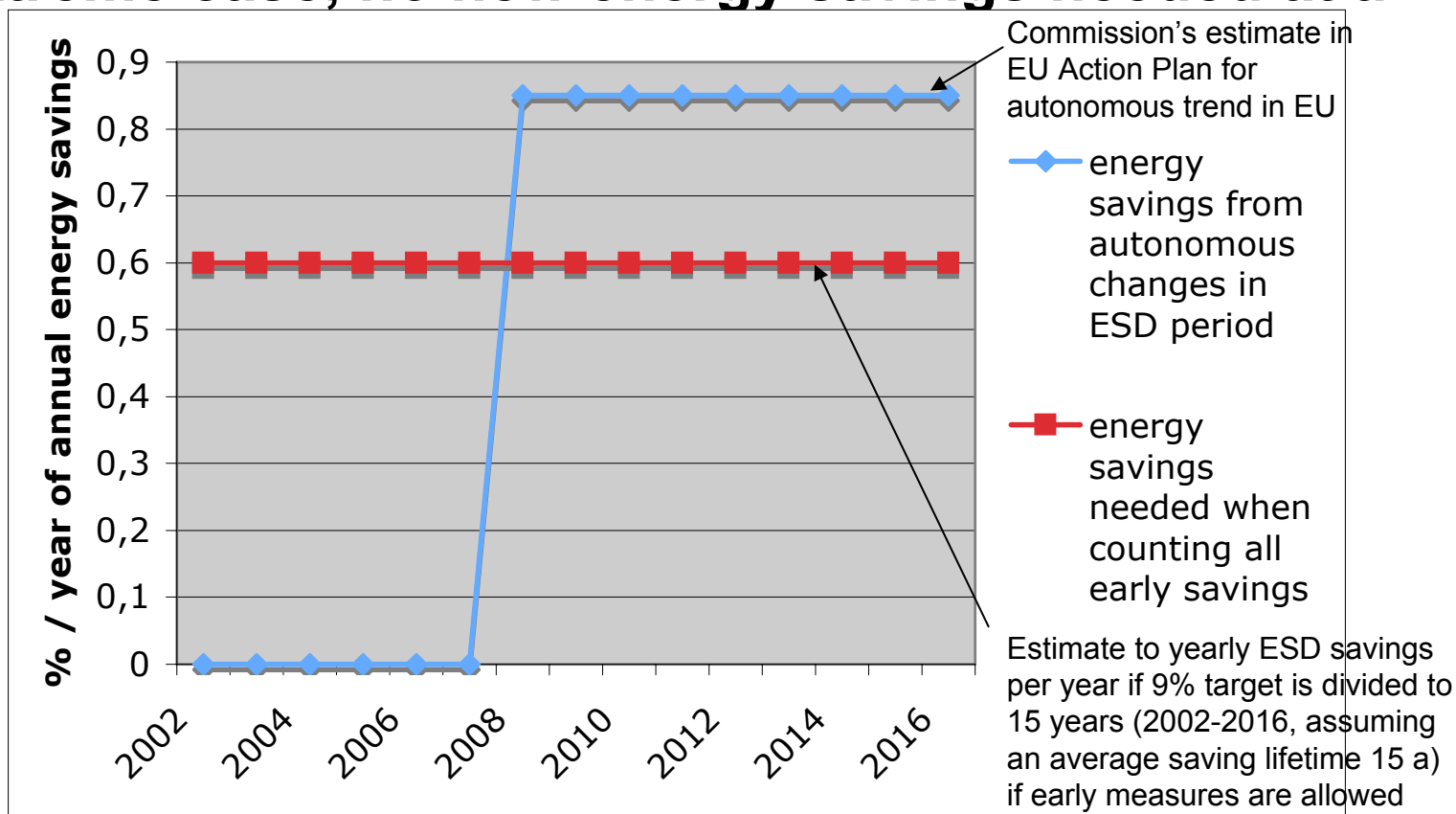
Or

- early energy savings from end-use actions initiated between 1995 and 2008, with the end-use actions having a lasting effect in 2010 (for the intermediate target) or 2016 (for the overall target).

The conditions, under which early energy savings can be claimed for counting towards the 9% target, need to be defined by the Commission in accordance with the following sentence in ESD Annex I anyway:

- Measures of a technological nature should either have been updated to take account of technological progress, or be assessed in relation to the benchmark for such measures.
- “The Commission shall provide guidelines on how the effect of all such energy efficiency improving measures should be measured or estimated, based, wherever possible, on existing Community legislation, such as Directive 2004/8/EC of the European Parliament and of the Council of 11 February 2004 on the promotion of cogeneration based on a useful heat demand in the internal energy market and Directive 2002/91/EC”.

3.9 Potential consequences of admitting both autonomous and early energy savings: in the extreme case, no new energy savings needed at all

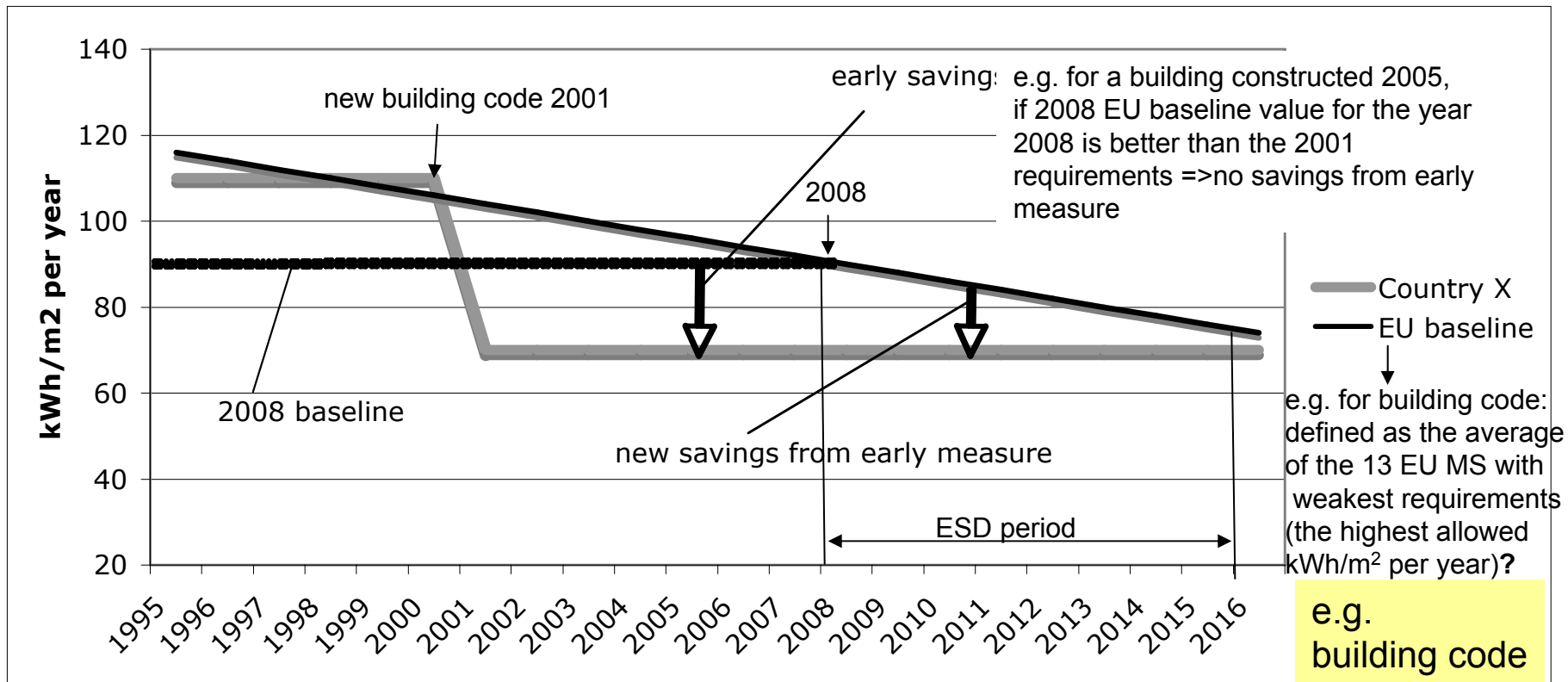


3.10 Conclusions on autonomous and early energy savings (EMEEES)

- **Enable** the evaluation of energy savings **additional** to autonomous changes, if the ESD Committee and/or a Member State decides to aim at this
=> develop methods to estimating the **free-rider effect** and provide information for choosing the appropriate **baseline**
- **Enable** the evaluation of **early energy savings**, if the ESD Committee and/or a Member State decides to allow these to be counted towards achieving the ESD target
- Analyse consequences of a **potential compromise**: allow on the part of early energy savings that exceeds the 2008 baseline level

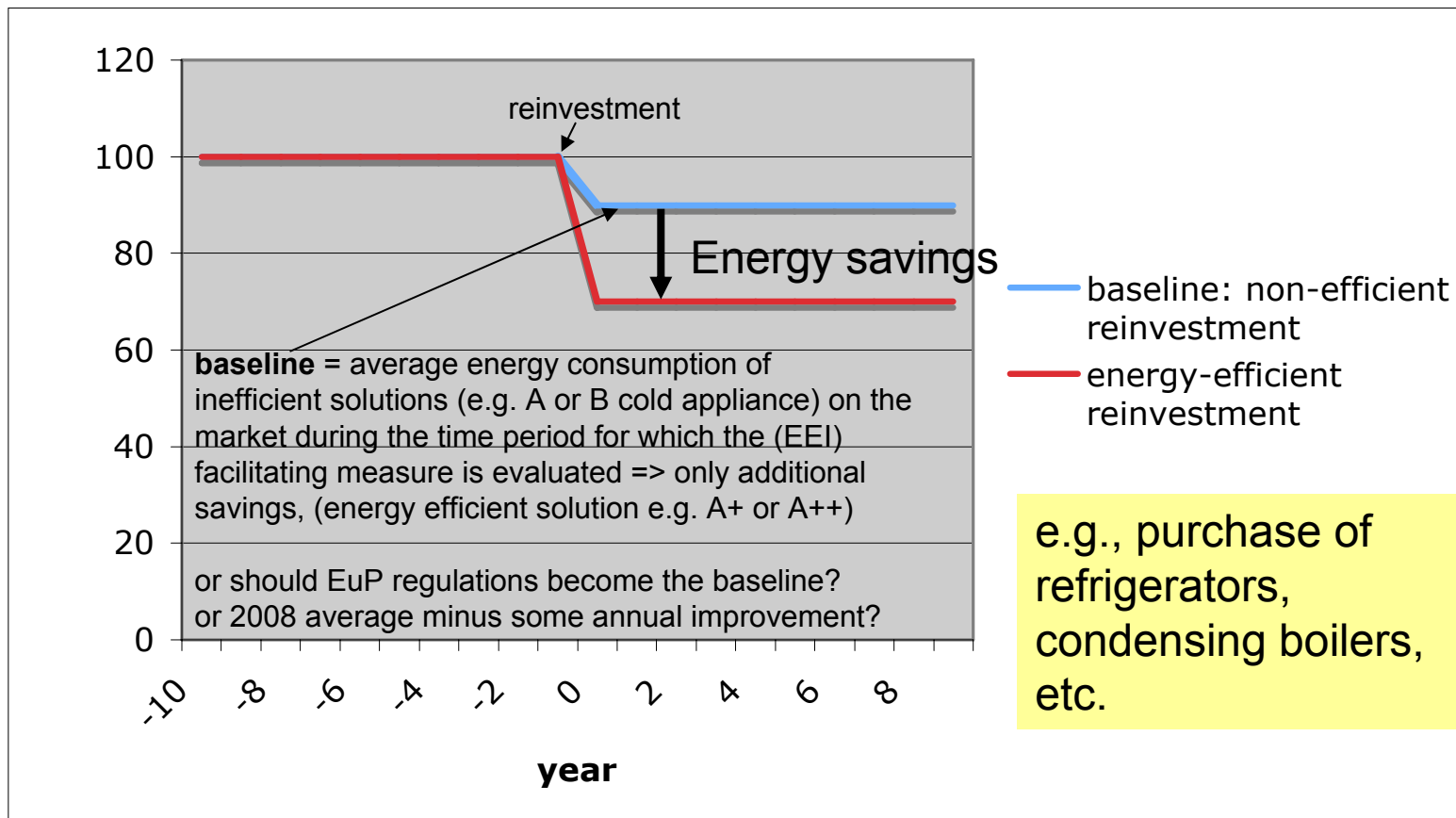
3.15 “Early energy savings” evaluated bottom up

Pragmatic compromise proposal:
Use 2008 EU average baseline values



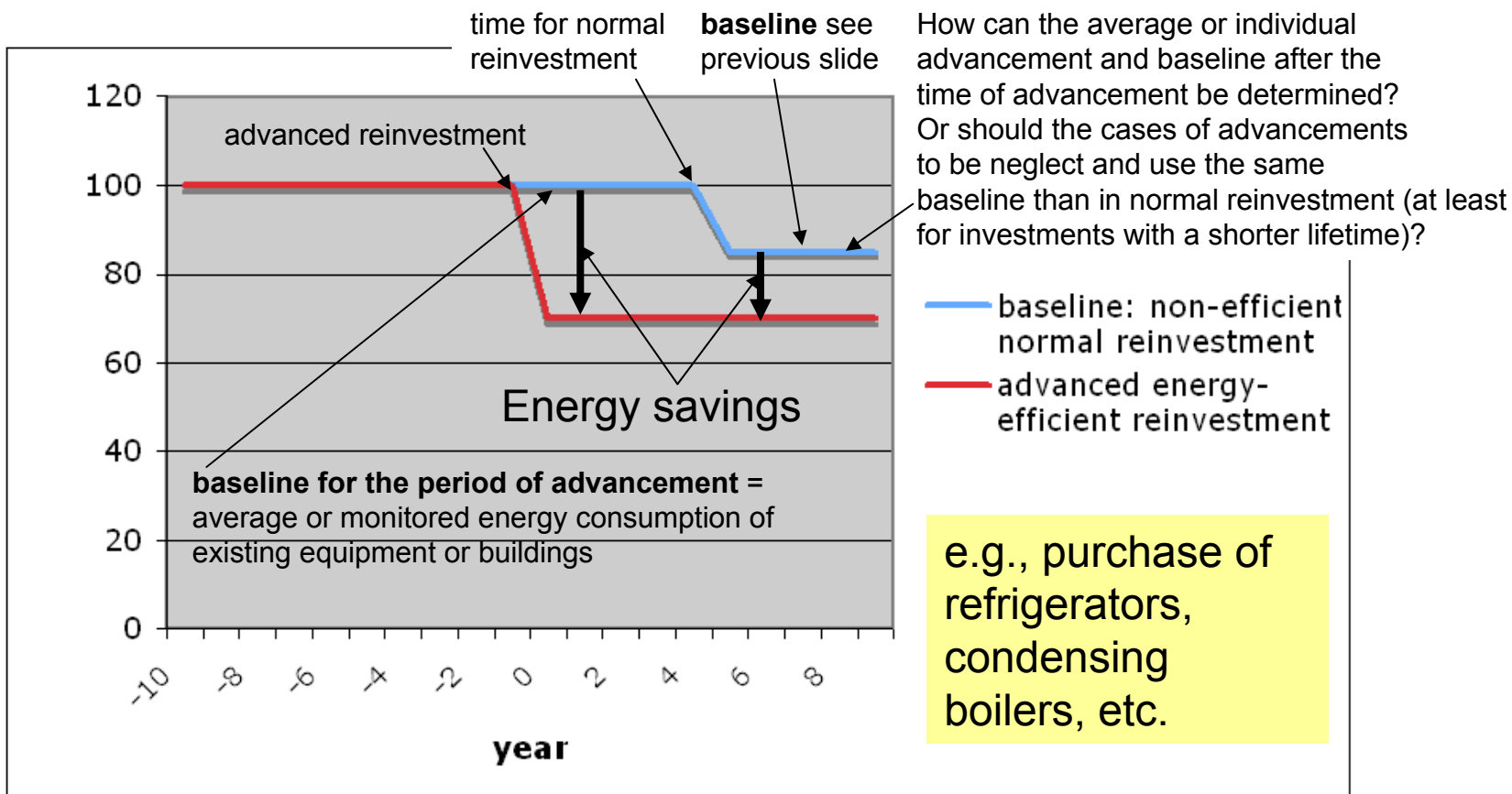
3.11 Baselines for unitary energy savings (1):

Case of normal reinvestment for methods counting participants



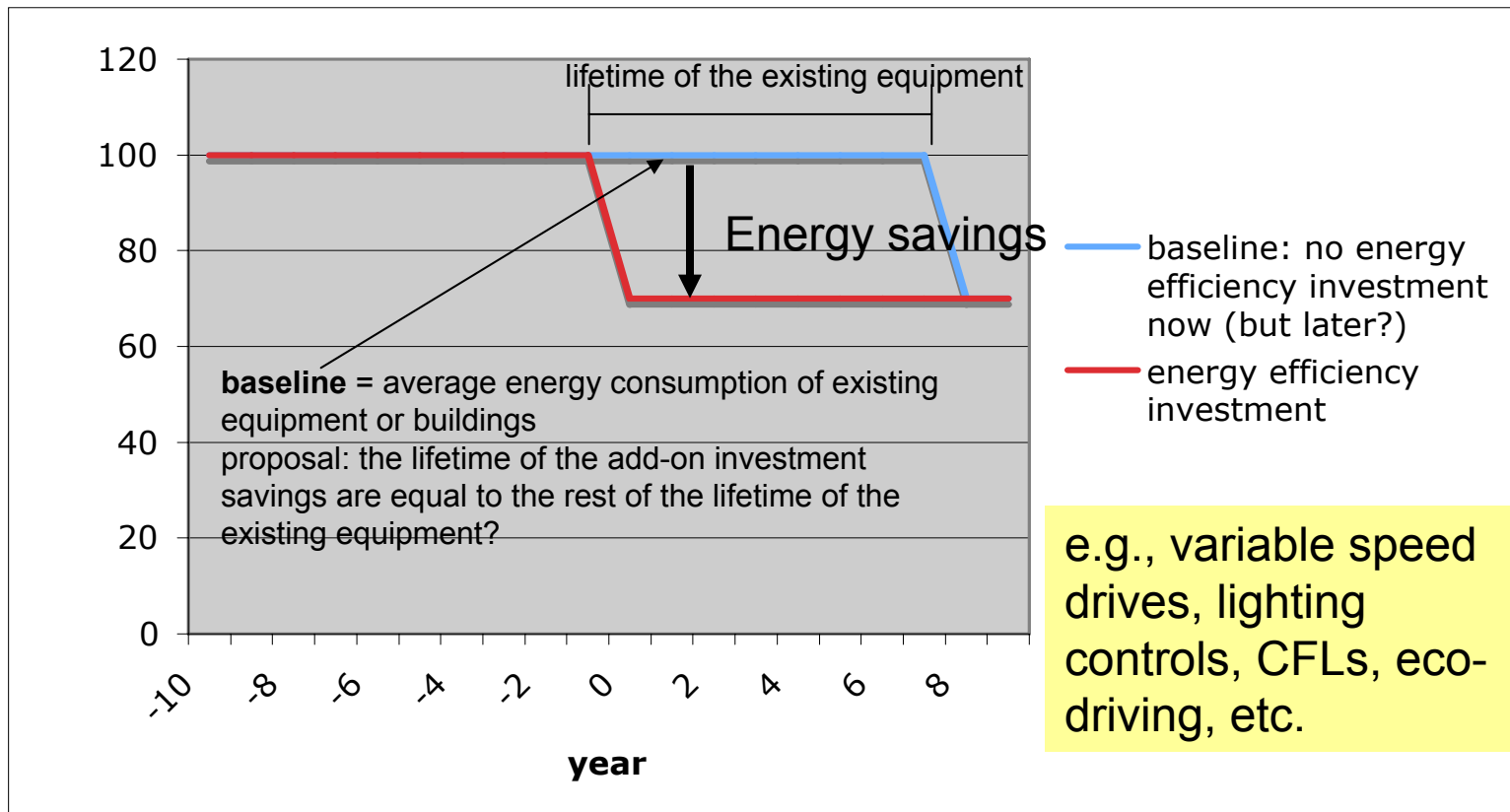
3.12 Baselines for unitary energy savings (2):

Case of advanced energy efficiency reinvestment for methods counting participants



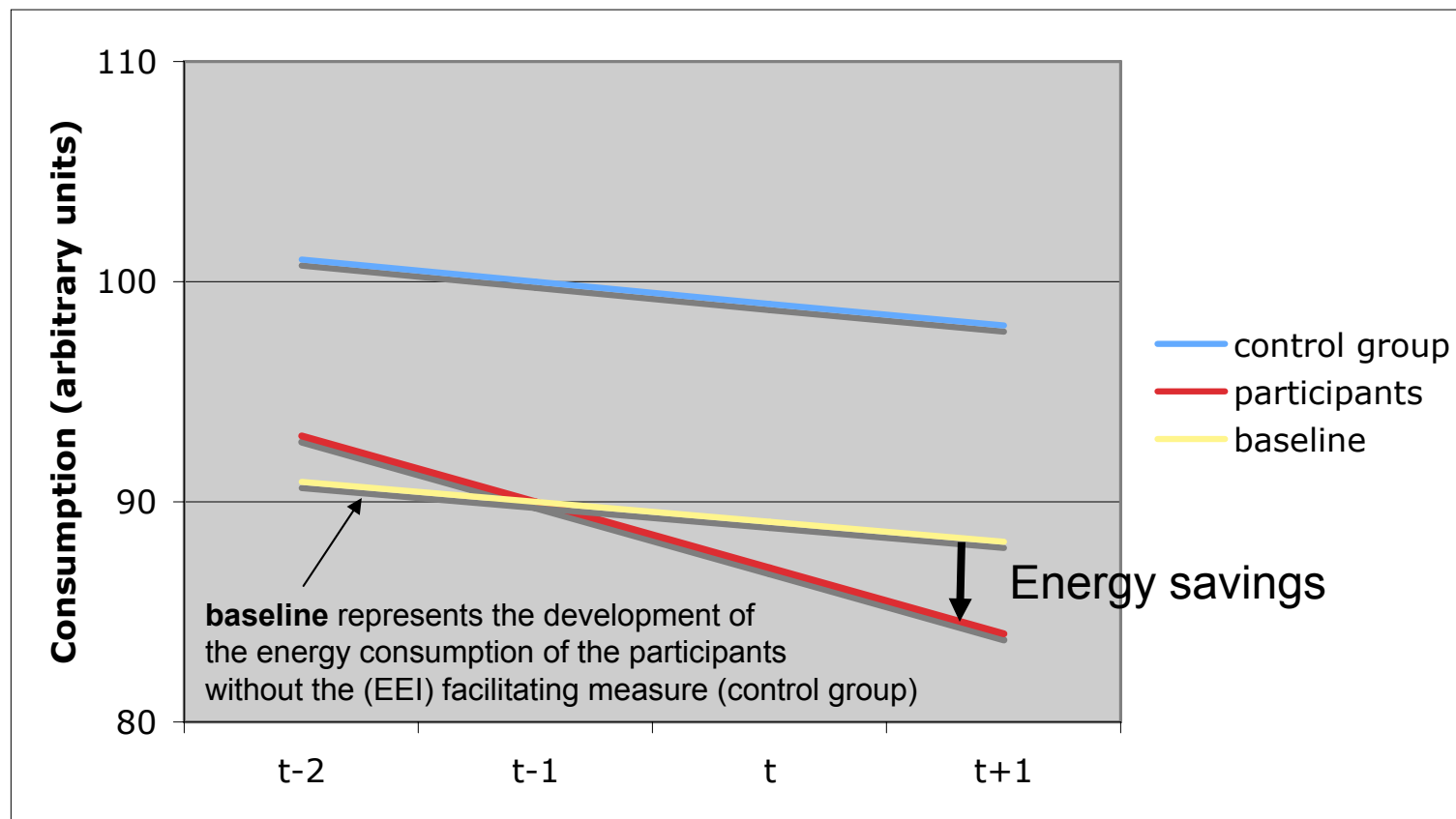
3.13 Baselines for unitary energy savings (3):

Case of add-on energy efficiency investment or energy management without replacement of existing equipment for methods counting participants



3.14 Baselines for (unitary) energy savings (4):

For billing analysis with a control group:
End-use actions at time t-1 (example)



4. General Principles for the Development of Evaluation and Monitoring Methods:

bottom-up (BU) and top-down (TD)

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4.1 General principles for method development

- Be as **thorough as possible** in analysing the relevance of correction factors, and the possibilities to evaluate them.
- But be as **pragmatic as possible** in the methods proposed as a result of the analysis
- With as many **EU-level average values as possible**
- Avoiding **double-counting** (ESD)
- Estimating the **multiplier effect**, if possible (ESD)
- **Enable** the evaluation of **additional** and **early** energy savings
- Distinction between **bottom-up** and **top-down** methods

4.2 General principles for method development (1): compromise between exhaustive and cost-effective

- Be **as thorough as possible in analysing** the relevance of correction factors, and the possibilities to evaluate them
 - But be **as pragmatic as possible in the methods proposed** as a result of the analysis
- *the evaluation system has to be **applicable** (technically), **not costly** (economically) and **fair** (ethically)*

4.3 General principles for method development

(2): harmonisation (between MS; between measures)

- Member States (MS) will have to report energy savings based on **harmonised methods** (ESD Annex IV(1.1)); this harmonisation covers the following issues:
 - using the **same accounting unit**
 - using a **consistent level of evaluation efforts**
 - using **common basic assumptions** (e.g. baseline*)
 - **providing a minimum set of information** for each type of calculation
- MS have **different experiences**, starting points
 - but they shall use harmonised requirements for reporting their results

*"baseline" not mentioned in ESD – Art 3 (d) "energy savings": "...consumption before and after implementation of one or more measures"

4.4 General principles for method development (3): concrete objectives

- Proposing a progressive approach in a harmonised frame
 - Providing **as many EU-level average values as possible**
 - Avoiding **double-counting**
 - Estimating the **multiplier effect**
 - Distinction between **bottom-up** and **top-down** methods
 - **Enable** the evaluation of energy savings **additional** to autonomous changes, if the ESD Committee and/or a Member State decides to aim at this
=> estimating the **free-rider effect** and choosing the appropriate **baseline**
 - **Enable** the evaluation of **early energy savings**, if the ESD Committee/EU Commission decide to allow these to be counted towards achieving the ESD target
- } *ESD Annex IV*

5. Development of Evaluation and Monitoring Methods (1):

bottom-up (BU)

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5.1 Elements of Calculation (BU): Three levels of evaluation efforts (1)

- MS should have **freedom to adjust their evaluation efforts** according to their own evaluation practice and ambition
- A **same starting point** for all MS with potential for **future improvements**

5.2 Elements of Calculation (BU): Three levels of evaluation efforts (2)

	Data scale	Main data sources	Data processing and documenting
Level 1	European default values	existing/available European regulation, studies and statistics	security factor according to the level of reliability of the default value
Level 2	National representative values	up-to-date national statistics, surveys, samples, registries	requirements = minimum set of information and justifications to be reported
Level 3	Program- or Participant-specific values	specific monitoring systems, registries, surveys, measurements	requirements to report on the specific data and justifications in detail (standard report at least available)

➔ an evaluation method may combine different levels of efforts, as several parameters are needed in the calculations

5.3 Bottom-up methods (1)

- **ESD Annex IV (1)**

*“A bottom-up calculation method means that energy savings obtained through the implementation of a **specific energy efficiency improvement measure** are measured in kilowatt-hours (kWh), in Joules (J) or in kilogram oil equivalent (kgoe) and added to energy savings results from other specific energy efficiency improvement measures”.*

5.4 Bottom-up methods (2): classification of methods

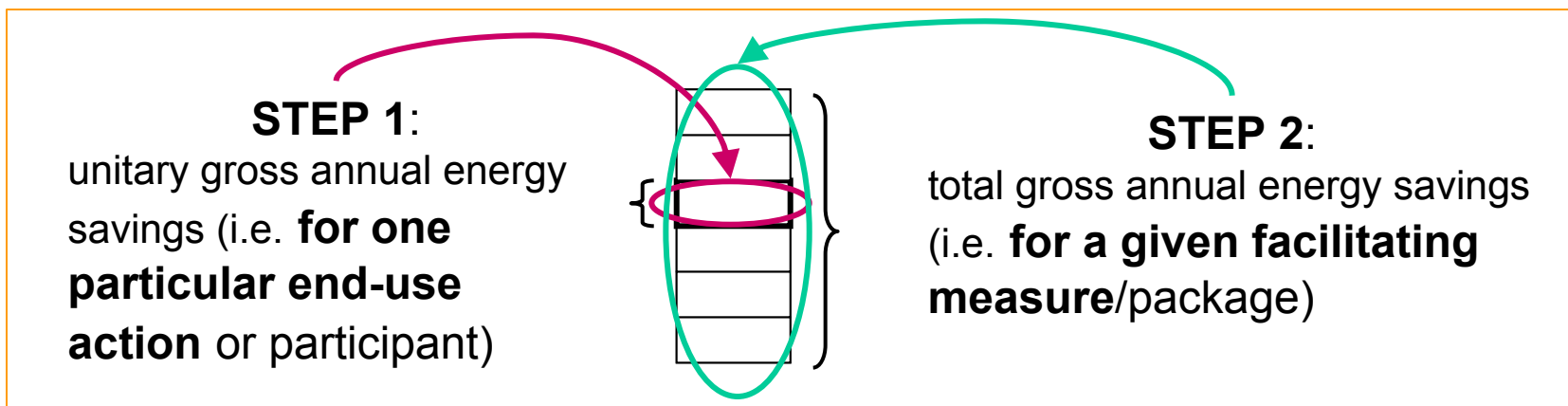
Type of method	Example of existing method
1 Direct measurement	EPS building standards (NL), ex post validation; Energy Performance Contracting
2 Analysis of energy bills and energy sales data	Electricity Savings Trust (DK)
3 Enhanced engineering estimates	Energy audit programme (FI); Energy Performance Contracting
4 Mixed deemed and ex-post estimate	Energy Efficiency Commitment (UK): Government estimate of real savings
5 Deemed estimate (may include some participant data)	White certificates activities (FR, IT) (Energy Efficiency Commitment (UK): proof of supplier target achievement)
6 Bottom-up modelling based on surveys	Effect of building codes (e.g., DE, NL)

5.5 Elements of Calculation (BU): Four steps for calculation (1)

- **breaking down the whole calculation process to make the calculation work easier**
 - **clarifying what are the issues to be dealt with**
 - **targeting the most influencing parameters**
 - **listing the information to be reported**
 - **ensuring transparency in the calculations**

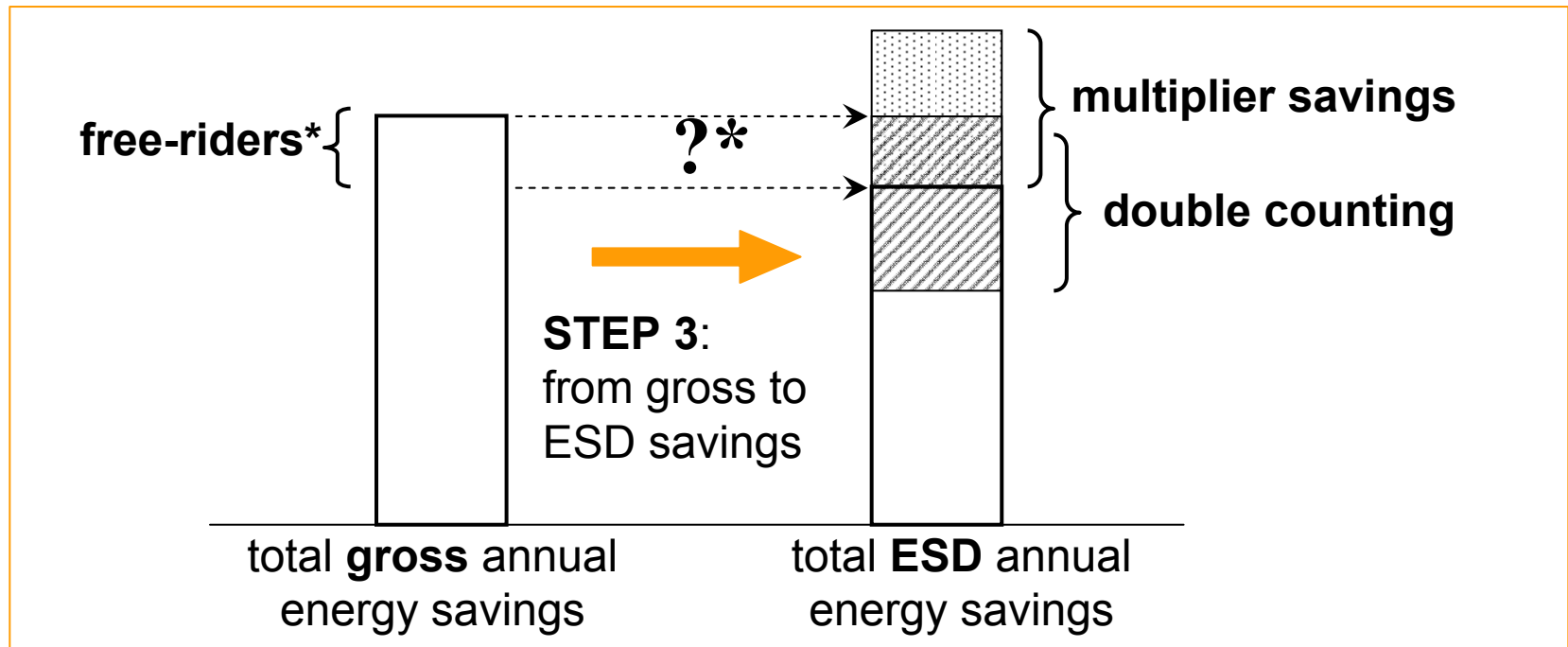
5.7 Elements of Calculation (BU): Four steps for calculation (3)

- **step 1:** unitary gross annual savings → defining a **calculation method** (with normalisation factors, e.g., weather/degree days)
- **step 2:** total gross annual savings → defining an **accounting method**



5.8 Elements of Calculation (BU): Four steps for calculation (4)

- **step 3:** from gross to ESD energy savings → applying **gross-to-net correction factors**



* not mentioned in ESD

5.9 Elements of Calculation (BU): Four steps for calculation (5)

- **Step 4:** ESD energy savings in 2016 (or 2010) → application of savings lifetimes
- Recommended for the time being: savings lifetimes according to CEN/CWA 27
- According to ESD, Commission has to present to the ESD Committee a proposal for updating the lifetimes included in Annex IV (4) (should have been done by November 2006)

5.10-5.13 Baselines for unitary energy savings and “Early energy savings”

- See slides 3.11 – 3.15

5.14 Methods to be developed by EMEEES

(1) for the residential sector

End-use or end-use action or facilitating measures	Responsible organisation
1 Energy performance of new buildings	SenterNovem
2 Building envelope improvement	A.E.A
3 Improvement of heating system	AGH-UST
3b: Condensing Boilers	Armines
4 Energy-efficient white goods (appliance purchased anyway)	ADEME
5 Hot water: solar water heaters, heat pumps, water-saving faucets	AGH-UST

5.15 Methods to be developed by EMEEES

(2) for the industry and tertiary sector

End-use or end-use action or facilitating measures	Responsible organisation	Sector
6 Energy performance of new non-residential buildings	SenterNovem	tertiary
9 Improvement of lighting system	eERG	tertiary – (industry)
10 Improvement of ventilation/air conditioning system, including heat recovery, free cooling	Armines	tertiary
11 Office equipment	Fraunhofer	tertiary
13a High efficiency electric motors	ISR-UC	industry
13 b Variable speed drives separate, including for industrial pumping systems	ISR-UC	industry
19 Energy performance contracting	Stem	tertiary - industry
20 Energy audit programmes (or as commercial energy efficiency service)	Motiva	tertiary - industry
21 Voluntary agreements with end use sectors	SenterNovem	tertiary - industry

5.15 Methods to be developed by EMEEES (3) for the transportation sector

End-use or end-use action or facilitating measures	Responsible organisation
15 Vehicle (car; <i>possibly</i> : bus, truck) energy efficiency	Wuppertal Institute
16 Modal shifts in passenger traffic, including towards non-motorised traffic	Wuppertal Institute
17 Eco-driving	SenterNovem

6. Development of Evaluation and Monitoring Methods (1):

top-down (TD)

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6.1 Top-Down methods

- **ESD Annex IV**

*“A top-down calculation method means that the amount of energy savings is calculated using the **national or larger-scale aggregated** sectoral levels of energy savings as the starting point”.*

- In other words, top-down methods rely on **energy efficiency indicators** calculated from national statistics (also called “top-down indicators) (e.g. ODYSSEE indicators*)

* in the ESD mentioned ODEX model (index) which is based on ODYSSEE indicators

6.2 Calculation of energy savings according to ESD with top-down methods (1/3)

- In top-down methods, **total energy savings** are calculated from statistical indicators, by removing the influence of factors that are not linked to energy efficiency
 - ↑ case of ODYSSEE with energy consumption indicator of a sub-sector

- The measurement of **energy savings according to ESD** definition is then carried out by removing from total energy savings, the energy savings linked to “**other factors**” than energy efficiency improvement measures

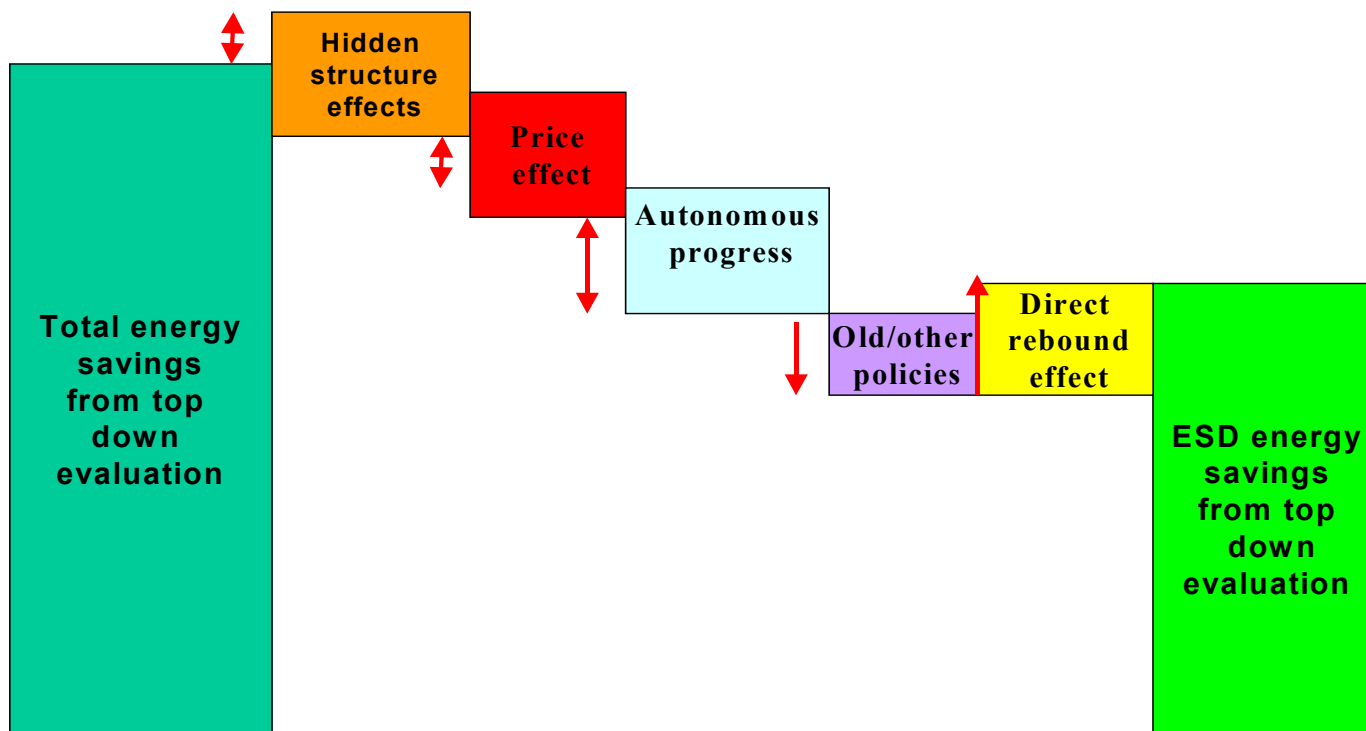
6.3 Calculation of energy savings according to ESD with top-down methods (2/3)

- **In principle**, the effect of the following “**other factors**” could be considered for correction:
 - Other residual hidden structure effects, not yet corrected in the indicators used to calculate the total energy savings
 - due to lack of statistical data, it is not possible to take account of all structure effects => so-called hidden structure-effects e.g. lower occupancy rates for dwellings, change in product mix, lifestyle trends, opening hours...)
 - Price-induced energy efficiency progress linked to increase in international market prices (tax component can be generally linked to policy measures).
 - Autonomous energy efficiency progress (e.g. autonomous technical trends that would take place even in the absence of EEI measures).
 - Others: earlier policies, other policies and direct rebound effects (mainly for cars and households).

- **In practice**, corrections will depend on what is feasible, from a statistical view point, and on decision of the Commission and /or ESD Committee

6.4 Calculation of energy savings according to ESD with top-down methods (3/3):

- possible effects to be cleaned from total energy savings and not linked to ESD eligible measures



6.5 Classification of top-down methods in EMEEES

- Methods can be classified according to the statistical indicator used to calculate the energy savings:

Type of method	Example of existing indicator
TD 1 Monitoring of market diffusion indicator of energy saving technology or transport mode	Modal share for transport of goods, stock of solar water heaters (ODYSSEE indicators)
TD 2a Monitoring of specific energy consumption indicator of an equipment	New cars, electricity consumption per appliance (kWh/year) (ODYSSEE indicators)
TD 2b Monitoring of unit energy consumption indicator of a sub-sector (e.g. thermal uses, electricity uses in household, industry or services)	Electricity consumption per employee in service, heating fuel consumption per household (kWh/year) (ODYSSEE indicators)
TD 3 Total energy consumption (econometric modelling)	Evaluation of the effects of energy taxation (e.g., DE, SE)

6.6 Top-down methods planned in EMEEES

- **Residential sector**

- (i) Building shell and heating systems (unit energy consumption indicator)
- (ii) Household electricity use excluding thermal uses (i.e. electric appliances as a whole including lighting) (unit energy consumption indicator)
- (iii) Specific white goods (e.g. cold appliances, dryers) (specific energy consumption indicator)
- (iv) Solar thermal collectors (market diffusion indicator)**

- **Transport sector**

- (i) New cars (specific energy consumption indicator)**
- (ii) Improvement of the car, bus and truck stock (unit energy consumption indicator)
- (iii) Modal shift in passenger transport (market diffusion indicator)
- (iv) Modal shift in goods transport (market diffusion indicator)**

6.7 Top-down methods planned in EMEEES

- **Industry sector**
 - (i) Industrial thermal energy use (excluding electricity) (unit energy consumption indicator)
 - (ii) Industrial electricity consumption (unit energy consumption indicator)
 - (iii) Industrial CHP; own production at the site of the end-users (market diffusion indicator)

- **Tertiary sector**
 - (i) Building shell and heating systems (unit energy consumption indicator)
 - (ii) **Electricity end-uses excluding thermal uses (unit energy consumption indicator)**

- **General policy instruments**
 - (i) Energy taxation

6.8 **Methods to clean total top-down energy savings from other factors (1/3)**

- **Energy savings are explained by different variables:**
 - one of which will be the time - to capture the autonomous trend
 - and another one the energy price - to capture the effect of market price increases
- **Econometric analysis is used to quantify the impact of these different variables**

6.9 Methods to clean top-down energy savings from other factors (2/3)

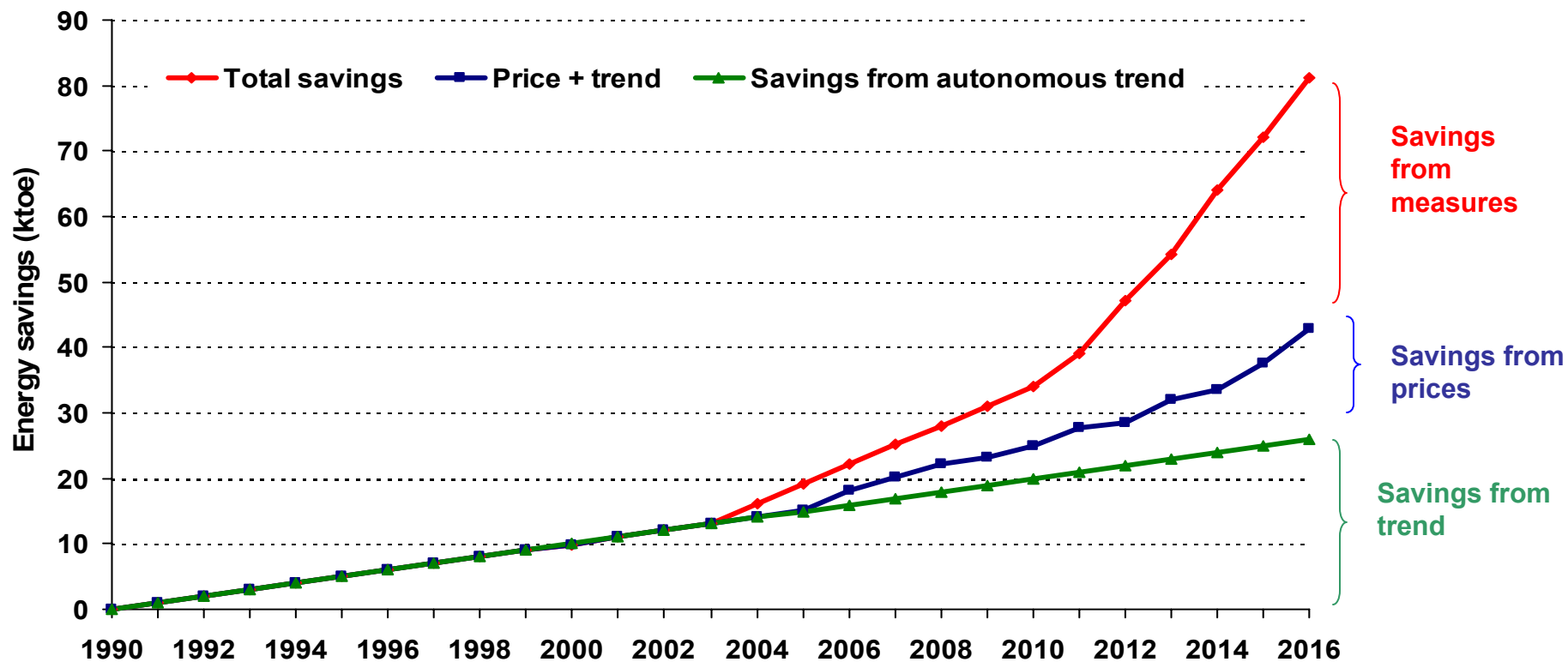
$$\ln ES = a + b T + c \ln P + d \ln A + e \ln ES_{-1} + K$$

with:

ES : energy saving indicator, **b**: trend, **T**: time, **c** : price elasticity,
P: energy price (2 components: ex-tax price and tax), **d**: elasticity to GDP, **A**: macro economic variable (e.g. GDP) to capture impact of business cycles

- **Estimation of the regression coefficient** made over a period ending before the effects of EEI measures will have to be assessed (e.g. before 1995).
- Then, the impact of the different effects will be removed using the regression coefficients over the recent period on which ESD savings are calculated

6.10 Methods to clean top-down energy savings from other factors - example (3/3)



Data availability in 25 EU countries according to ODYSSEE*

Availability of ODYSSEE indicators in EU-25 member states																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Households																									
Space heating, water heating, cooking	█				█	█	█	█	█	█	█	█	█	█	█					█		█	█		█
Electricity consumption for	█				█	█		█	█	█	█	█	█	█	█					█		█	█		█
Electricity consumption by electrical appliance					█	█		█	█	█	█	█	█	█	█					█		█	█		█
Electricity consumption for lighting	█				█	█		█	█	█	█	█	█	█	█					█		█	█		█
Industry																									
Chemical	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Food and drink	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Engineering products	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Textile / leather	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Construction			█													█	█					█	█		
Agriculture	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Transport																									
Cars	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Motorcycles	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Trucks	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Buses	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Rail ¹	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Boats, inland	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Services																									
Space Heating					█	█																			
Cooling					█	█														█					
Ventilation					█	█														█					
Water heating					█	█														█					
Office equipment					█	█														█					
Installed lighting					█	█														█					

*spring 2007

7. Integration of top-down and bottom-up

evaluate
energy savings^{EU}

7a Integration (?) of top-down and bottom-up methods

- ESD Annex IV General
 - “In measuring the realised energy savings as set out in Article 4 with a view to capturing the overall improvement in energy efficiency and to ascertaining the impact of individual measures, **a harmonised calculation model which uses a combination of top-down and bottom-up calculation methods** shall be used to measure the annual improvements in energy efficiency for the EEAPs referred to in Article 14.”
- The term “integrated methods” was introduced in the EMEEES proposal and work programme
 - The EMEEES Work Programme says that a set of bottom-up, top-down, and integrated methods will developed
 - In those cases, for which there is either a TD method only, or a BU method only, it proposes to use these. Only where there are both available, it proposes rules for combining the results into one, by either choosing the more reliable result (basic integration approach) or combining the results into one number (advanced integration approach).

7.1 Bottom-up or top-down methods?

Two types of methods can be either-or

Type of method	Example of existing method	Conditions for switching type
BU 6 Bottom-up modelling based on surveys	Effect of building codes (e.g., DE, NL)	If cause for end-use (EEI) actions taken is not known ↑ top-down
TD 1 Monitoring of diffusion indicators	ODYSSEE indicator on average energy consumption per appliance (kWh/year)	If change in indicator is exclusively due to (EEI) facilitating measures or if control area for facilitating measure(s) is possible ↑ bottom-up

7.2 Integrated methods (EMEEES)

