

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

National EMEEES Workshop - Sweden

Development of **Bottom-Up** Evaluation Methods

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Contents

- **General principles for method development**
- **Elements of calculation:**
 - Three levels of evaluation efforts
 - Four steps of calculation process
- **Baseline issues**
- **Methods to be developed by EMEEES**

General principles for method development

What are Bottom-Up evaluation methods?

- **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”.*

General principles for method development

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) |

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)*

General principles for method development

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

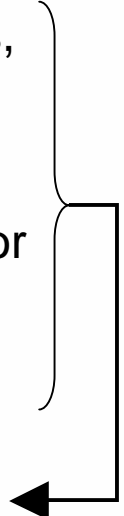
- MS will have to report energy savings based on **harmonised methods** (ESD Annex IV(1.1)) ; this harmonisation covers the following issues:
 - using the **same accounting unit**
 - using a **consistent level of evaluation efforts**
 - using **common basic assumptions** (e.g. baseline)
 - **providing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

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**
- **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 and/or a Member State decides to allow these to be counted towards achieving the ESD target

} *ESD Annex IV*



→ *to be discussed by the ESD Committee*

Elements of Calculation

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**

Elements of Calculation

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 | 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

Elements of Calculation

Three levels of evaluation efforts (3)

- it is **possible to combine** different levels of efforts for the same evaluation (as several parameters are involved) ;
- the **default values** are to be **conservative**, (1) to avoid overestimations and (2) to induce MS to practice level 2 evaluations ;
- **thresholds** could be defined **to require level 2 or 3** evaluations **for special cases** (especially for programmes representing a high share of the claimed savings)

Elements of Calculation

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

Elements of Calculation

Four steps for calculation (2)

+ ***number of participants or units***

+ ***double counting, multiplier effect (+ free-rider effect ?)***

+ ***timing and lifetime (+ persistence factors?)***

Step 1: **unitary** gross annual energy savings
(in gross kWh / year / participant or unit)

Step 2: « **total** » gross annual energy savings
(in gross kWh / year)

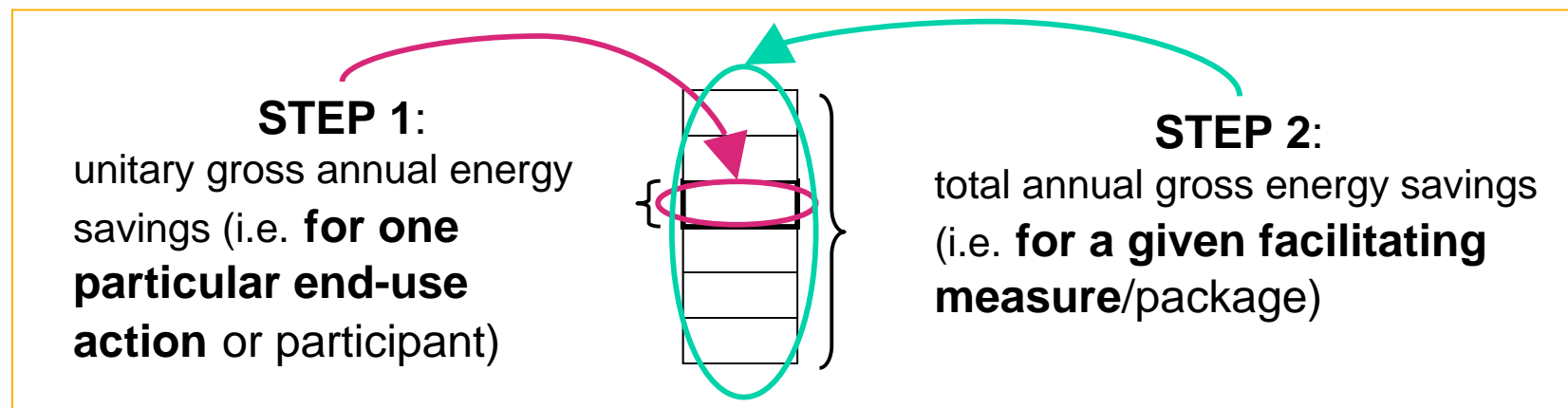
Step 3: « **ESD** » annual energy savings
(in “ESD” kWh / year)

Step 4: «ESD » energy savings **in 2016** (or 2010)
(in “ESD” kWh / year)

Elements of Calculation

Four steps for calculation (3)

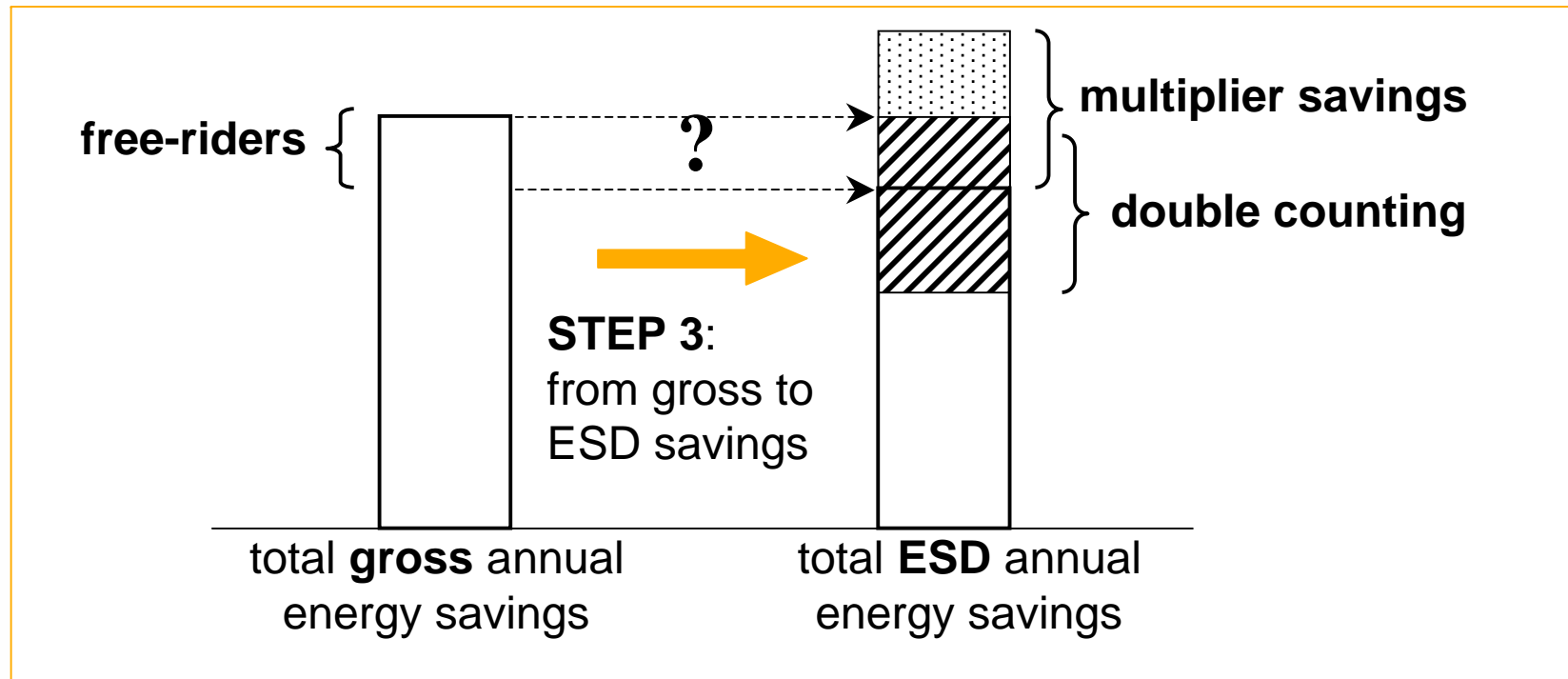
- **step 1:** unitary gross annual savings → defining a **calculation method** (with normalisation factors, e.g., weather)
- **step 2:** total gross annual savings → defining an **accounting method**



Elements of Calculation

Four steps for calculation (4)

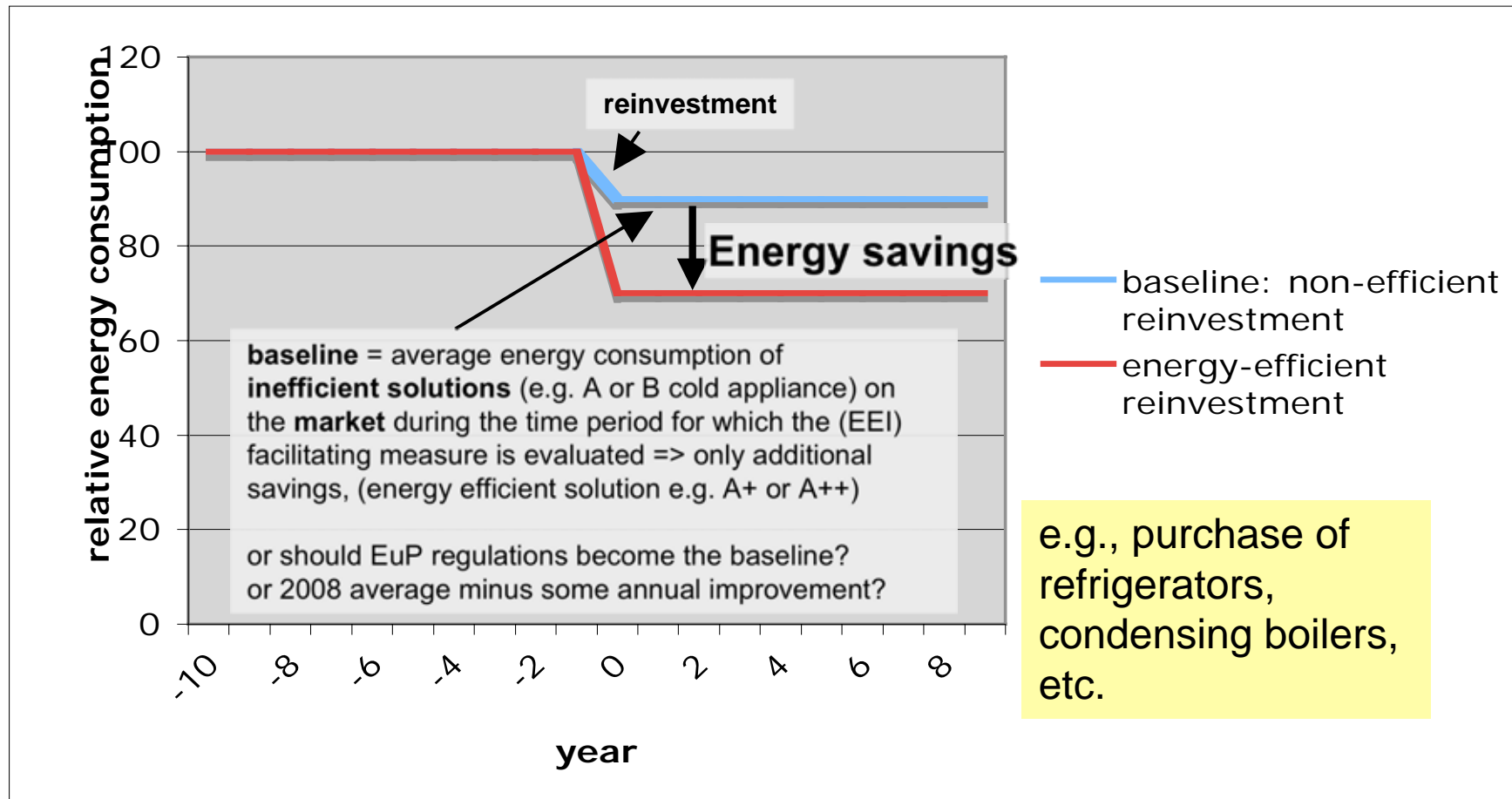
- **step 3: from gross to ESD energy savings → applying gross-to-net correction factors**



Baselines for unitary energy savings

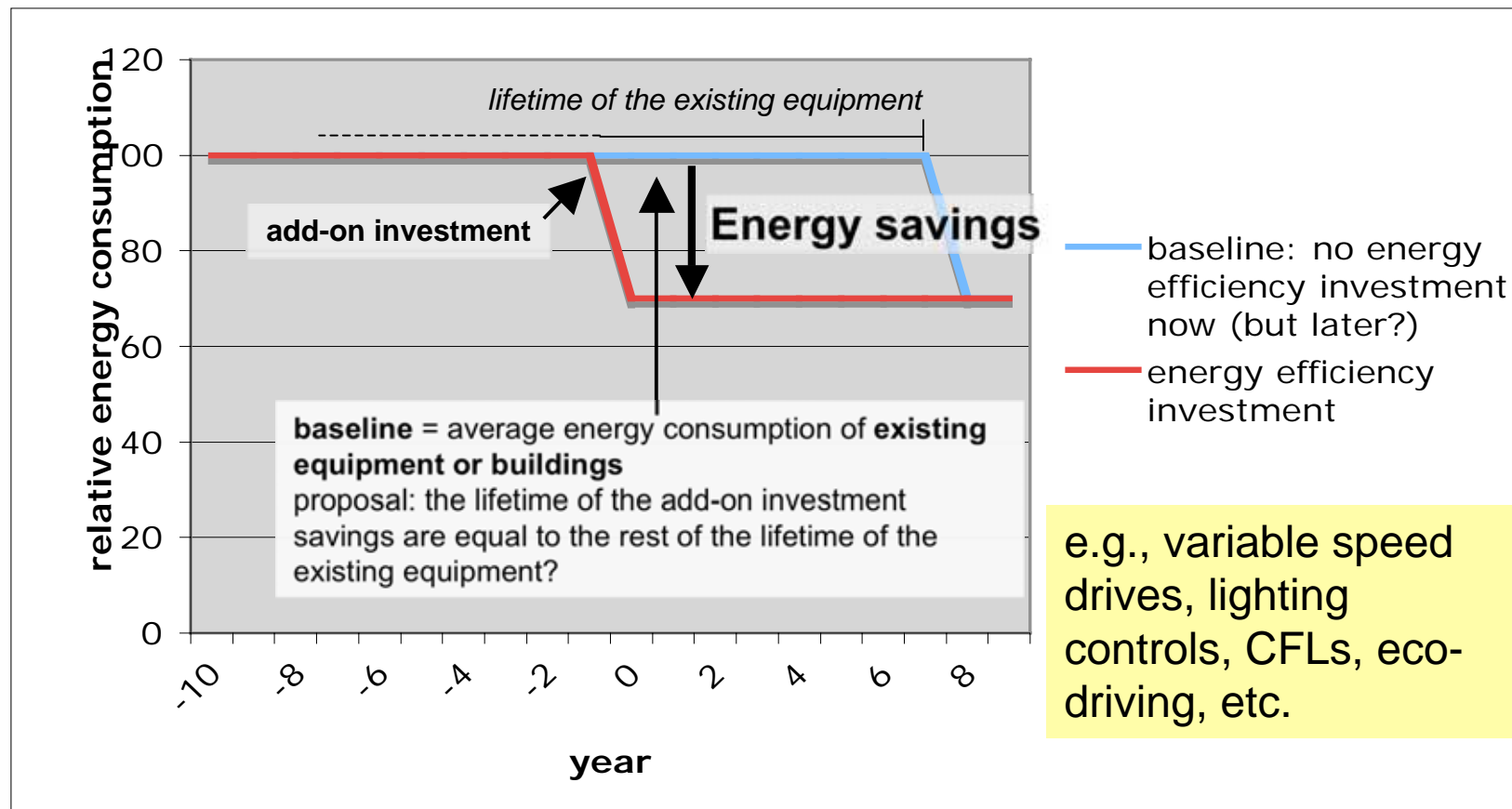
(1) Case of normal reinvestment

(for methods counting participants)



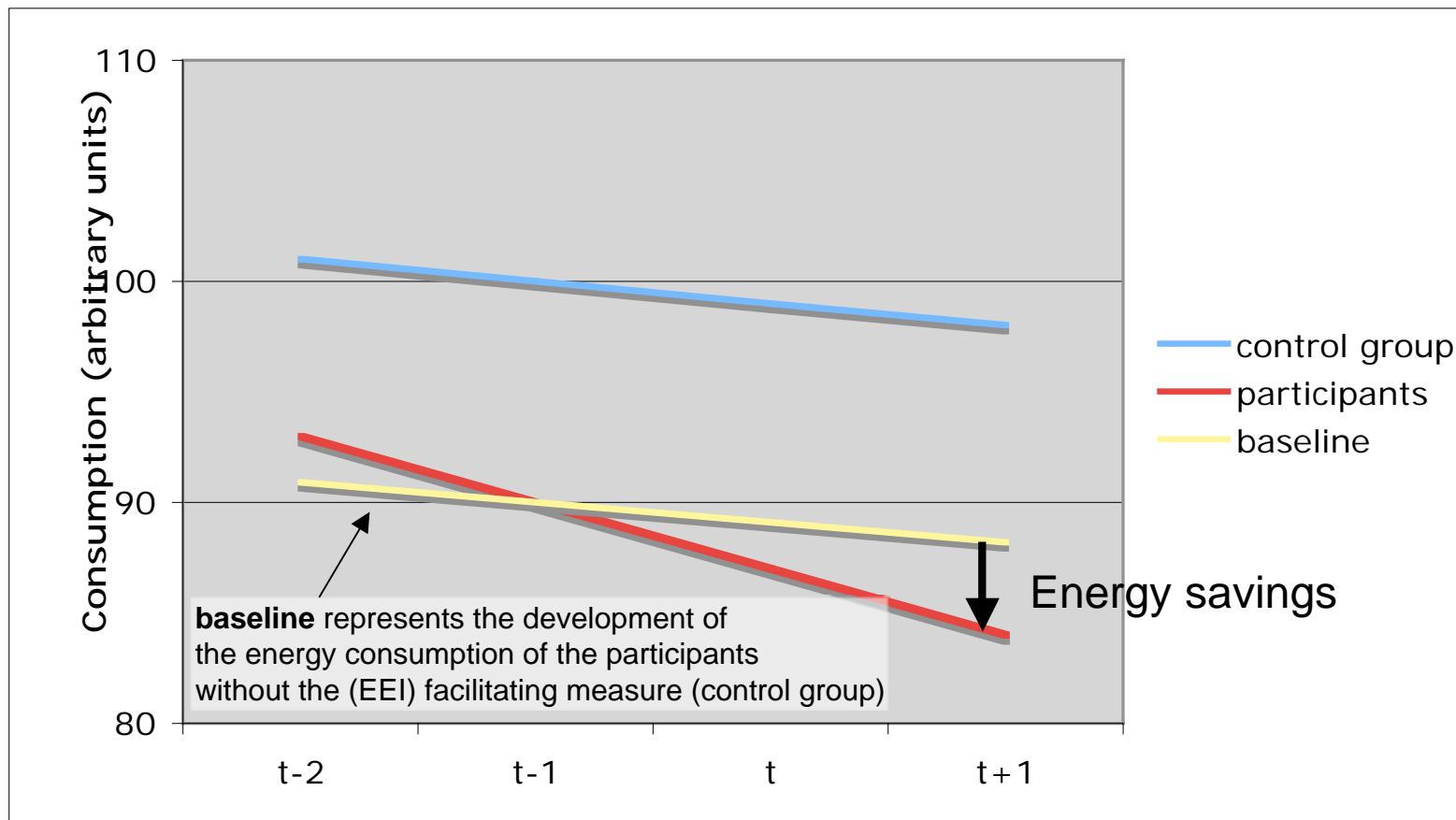
Baselines for unitary energy savings

(2) Case of add-on energy efficiency investment or energy management *(for methods counting participants)*



Baselines for (unitary) energy savings

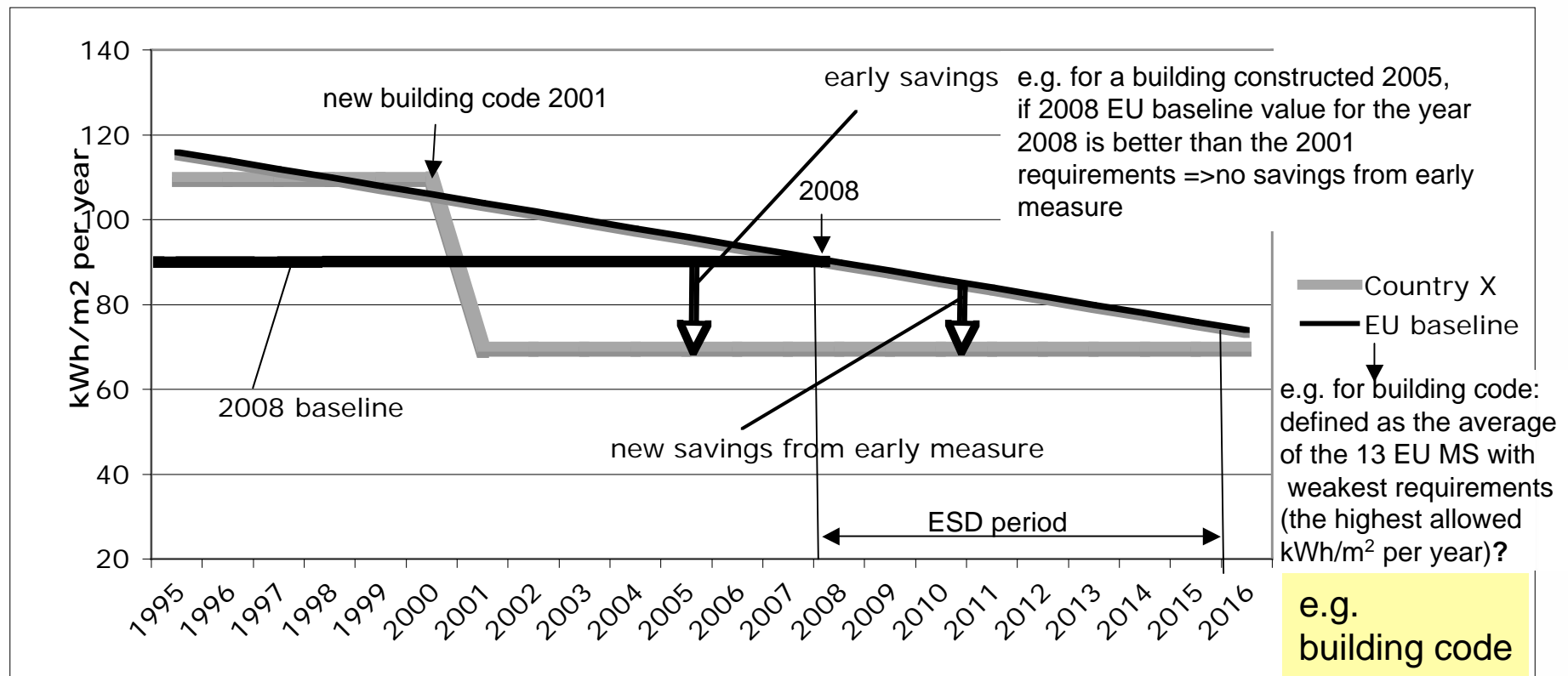
For billing analysis with a control group: End-use actions at time t-1 (example)



Baselines for (unitary) energy savings

“Early energy savings” evaluated bottom up

→ **Pragmatic compromise proposal:**
use 2008 EU average baseline values



Methods to be developed by EMEEES

Selection criteria

Compromise between:

- covering the most important energy uses and/or policy instruments
- taking advantage of available experience and knowledge

⇒ The methods are developed by experts who were involved in past European projects, dealing with energy uses (e.g. DEFU) and/or policy instruments for energy efficiency (par ex. AUDIT)

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 |

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 |

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 |

Discussions

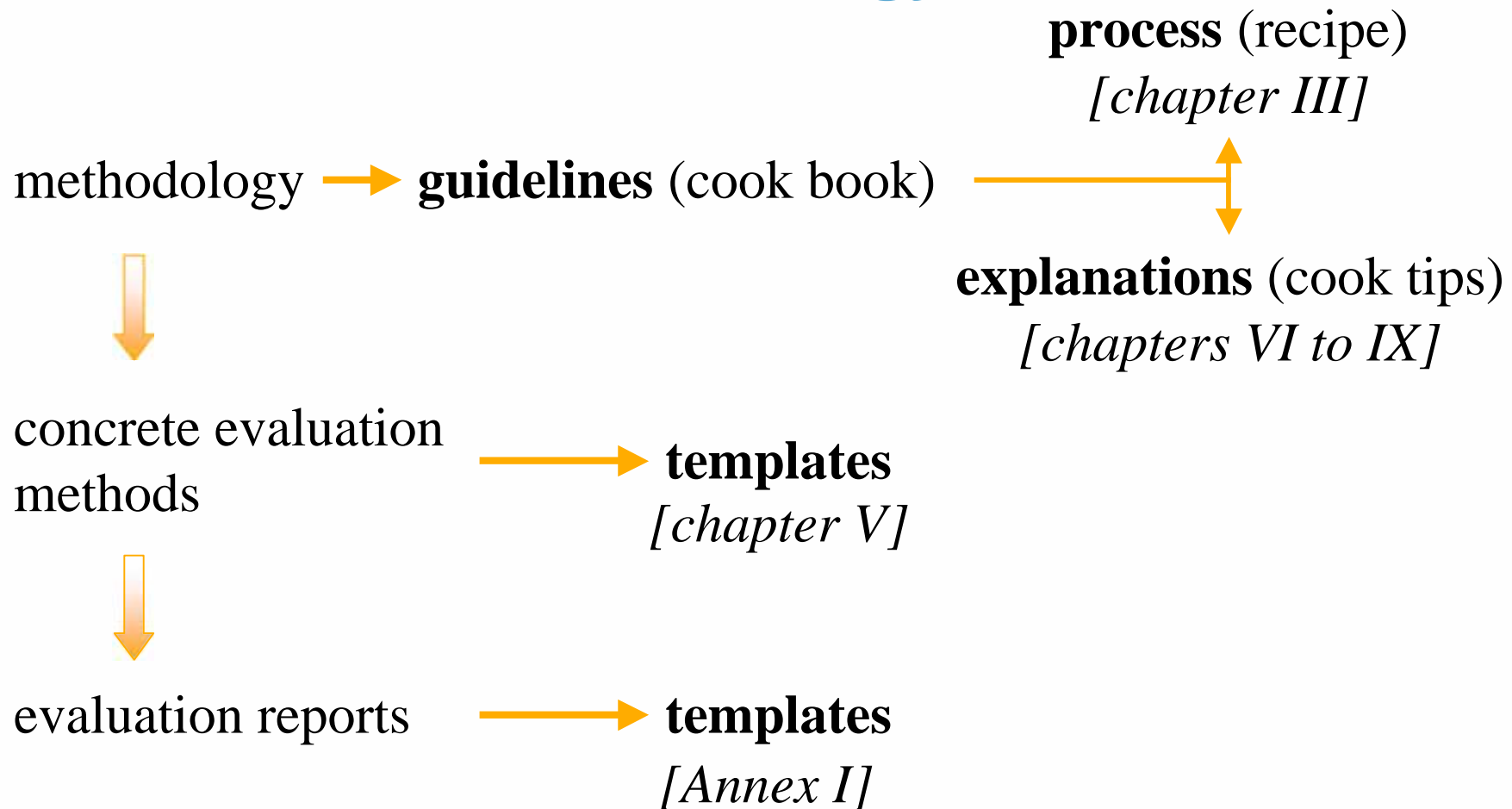


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General principles for method development

Structure of the methodology



General principles for method development

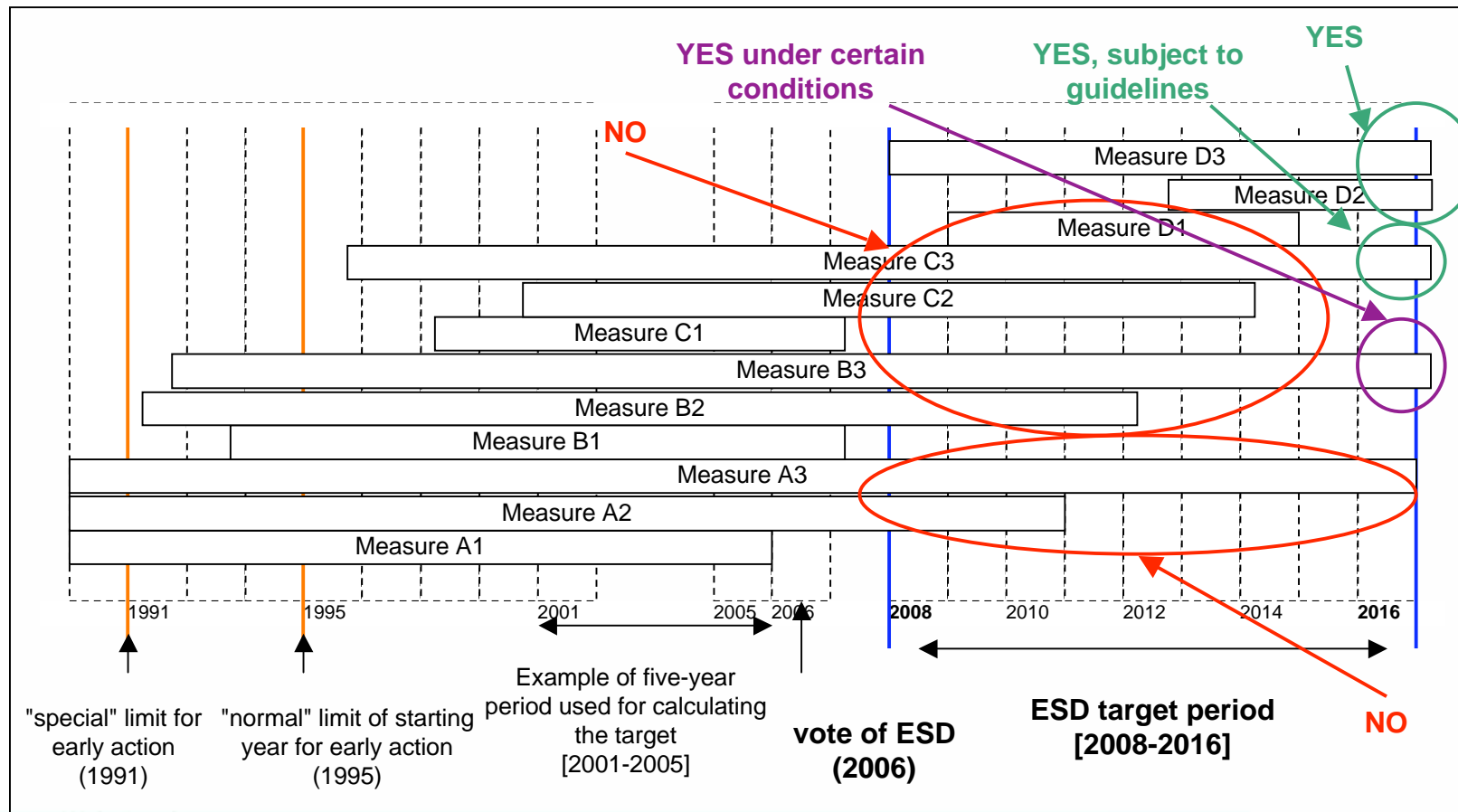
Subject of monitoring and evaluation

| | | | | (EEI) Facilitating measures | | | | |
|------------------------------|------------------------------|-------------------------|-----------------------------------|---|--|-------------------------------|---|------|
| | | | | Example 1: energy performance contractin g | Example 2: white certificate scheme s | Example 3: energy taxation | | |
| (EEI) end-use actions | End-use (EEI) actions | Sector | Energy end-us e | Efficient Solution | | | | |
| | Resi- dential | example 1: heatin g | efficient boiler s | | | B 1 | C | |
| | | | heat pump s | | | B 2 | | |
| | | | etc. | | | | | |
| | | example 2: lightin g | CFL | | | B i | | |
| | | etc. | | | | | | |
| | Tertiary | example 1: heatin g | efficient boilers, pumps, etc. | A1 | | B j | | |
| | | | example 2: lightin g | CFL | | | | etc. |
| | | | efficient ballasts | A2 | | | | |
| | | | etc. | | | | | |

Elements of Calculation

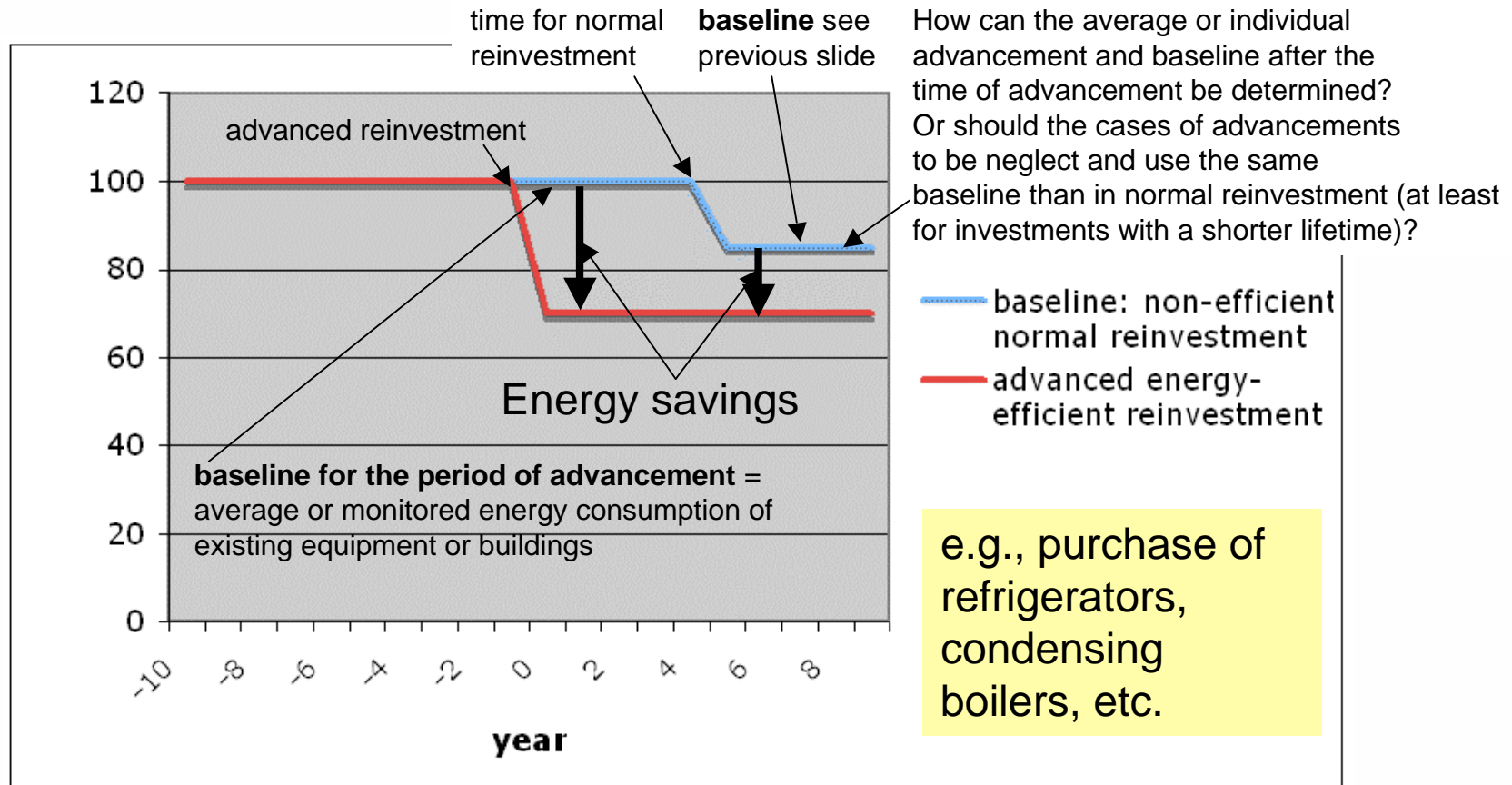
Four steps for calculation (5)

- Step 4: checking **timing** and **lifetime** of the measures



Baselines for unitary energy savings

(3) Case of advanced energy efficiency reinvestment (for methods counting participants)



Elements of calculation

Taking account of free-rider effect?

| | | |
|-----|---|--|
| YES | + | <ul style="list-style-type: none"> ensuring additionality of the savings encouraging actions toward “hard-to-reach” targets inducing more actions |
| | - | <ul style="list-style-type: none"> additional evaluation issues but options do exist risk of arbitrary / bias in certain cases risk to penalize past multiplier effects |
| NO | + | <ul style="list-style-type: none"> making easier the accounting of the savings encouraging multiplier effects |
| | - | <ul style="list-style-type: none"> risk to account for «everything and nothing » (no additionality) encouraging actions towards “easy-to-reach” targets risk of double counting for “early measures” |

⇒ *The principle of additionality is more and more considered in the international agreements. If the additionality principle is not included, then the target should be higher, otherwise the ESD will be meaningless and will have no credibility.*