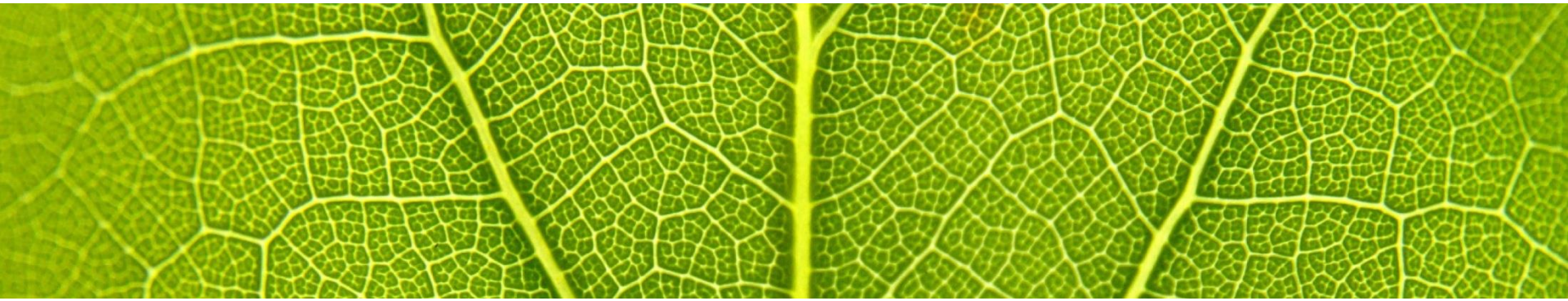
ECOFYS

sustainable energy for everyone



Evaluating Our Future

Main findings about the role of discount rates in EC energy system modelling

Hearing on discount rates in the European Parliament
21/10/2015,

Dr Andreas H. Hermelink, David de Jager

Objectives of the study

- Common understanding about the importance of discount rates in EU energy & climate policy.
- Common understanding about appropriate discount rates to be used in impact assessments and EU energy policy modelling in general.

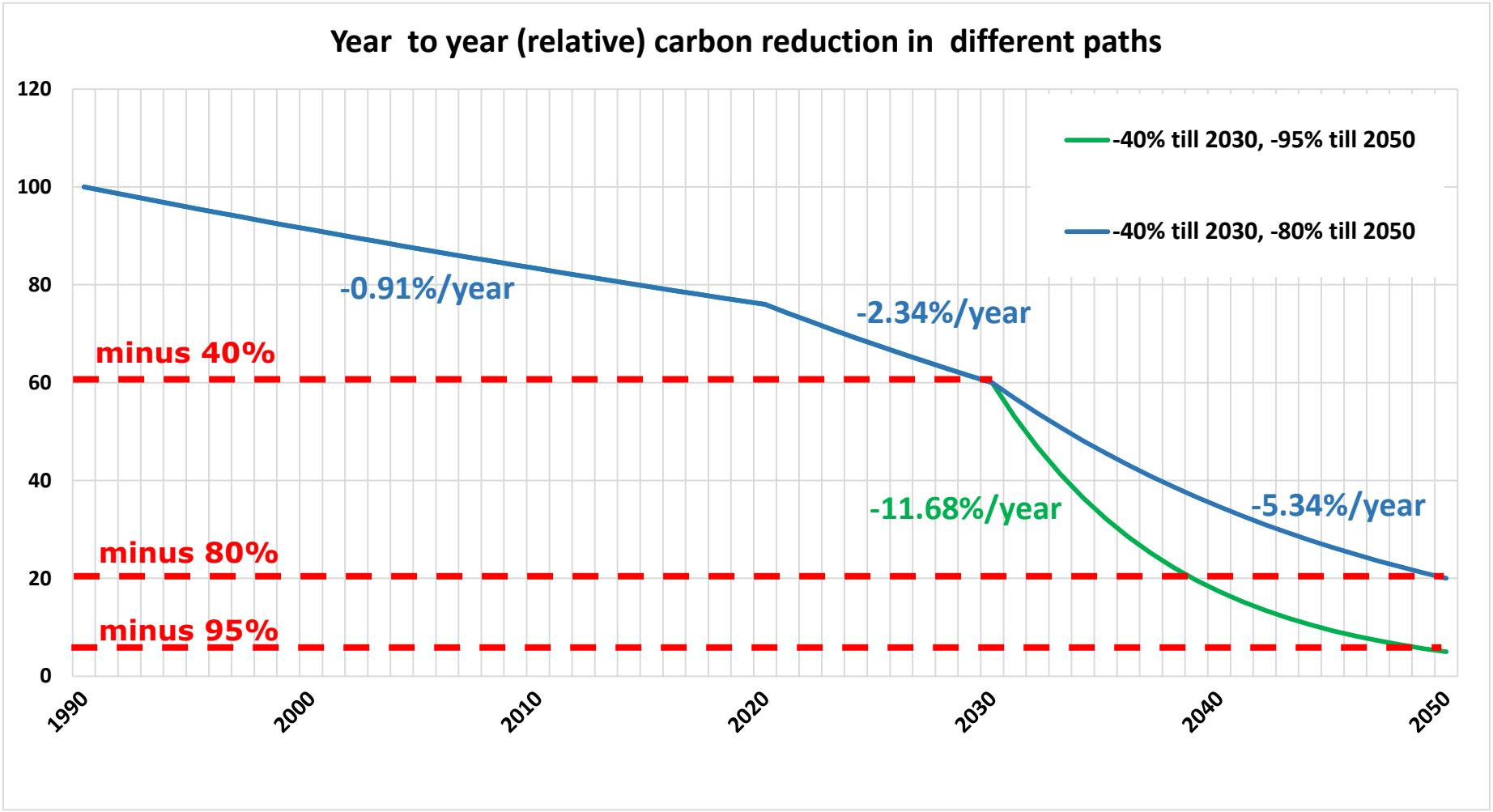
The European Environment Agency about Energy Efficiency and Renewable Energy (20 October 2015)

- "Lower energy consumption levels (encouraged in part by the **energy efficiency** target) and a less carbon-intensive fuel mix (encouraged in part by the **renewables** target) are two **key drivers for reducing GHG emissions"**
- [Renewable Energy] "Growth between 2030 and 2050 will have to be two to three times faster than in the period from 2005 until 2013."
- [Energy Efficiency – 27% reduction target of 2030 framework]: "Achieving the 2030 targets requires not only a strong implementation of energy efficiency measures, but also a rapid change in consumer behaviour."
- "… the EU and its Member States … will have to increase considerably their efforts to meet longer-term energy and decarbonisation objectives for 2050."

Source: EEA (20 October 2015):

Trend and projections in Europe 2015 – Tracking progress towards Europe's climate and energy targets

Minus 80% (to 95%) till 2050 – Drastic acceleration is urgently needed

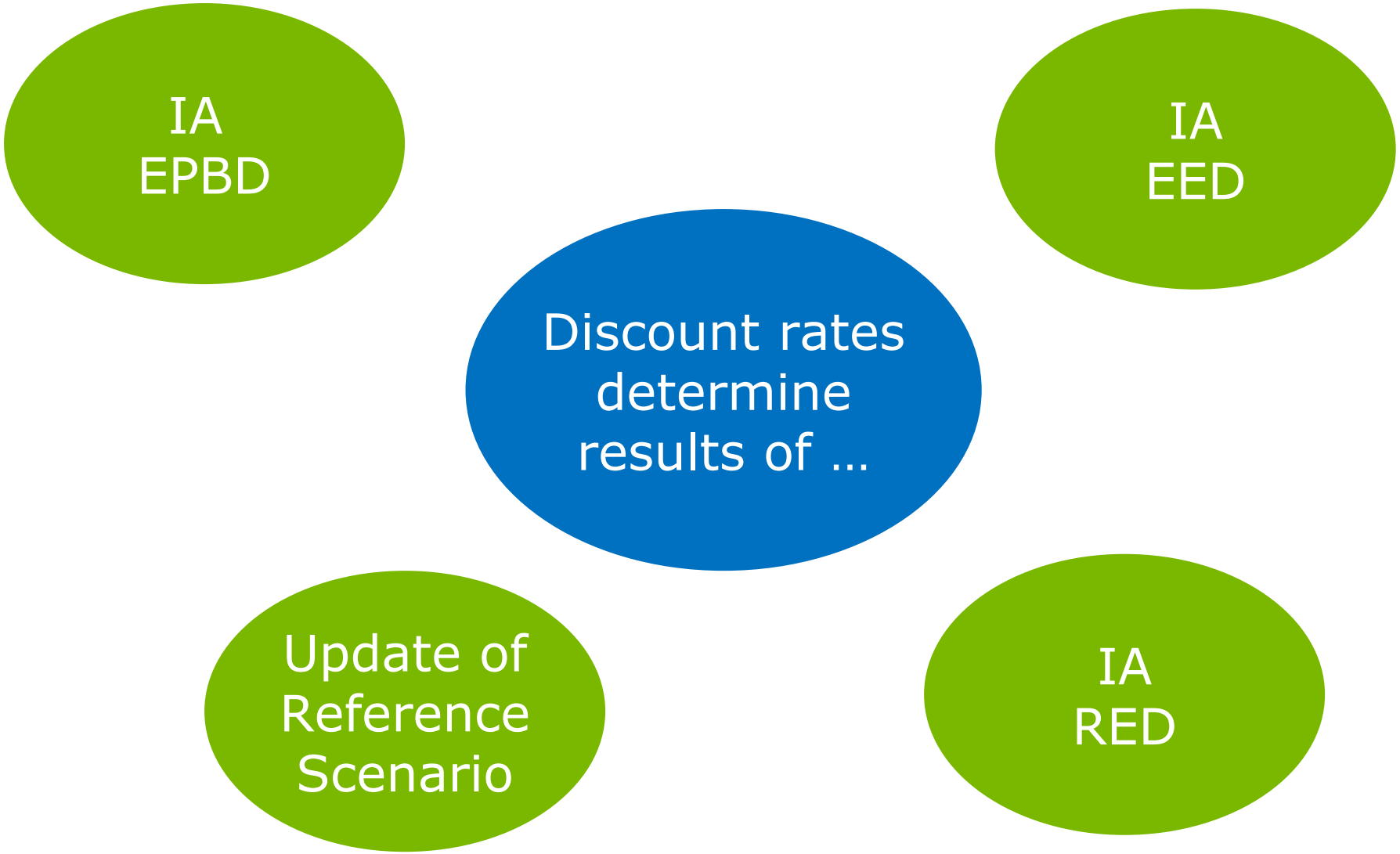


The role of discount rates in EU impact assessments about energy policy

Discount Rate up

Energy Efficiency down

Important applications for discount rates soon to come in several Impact Assessments (IA) …



The electric doorbell:
Mr. R. E. Search is looking for the right policy …

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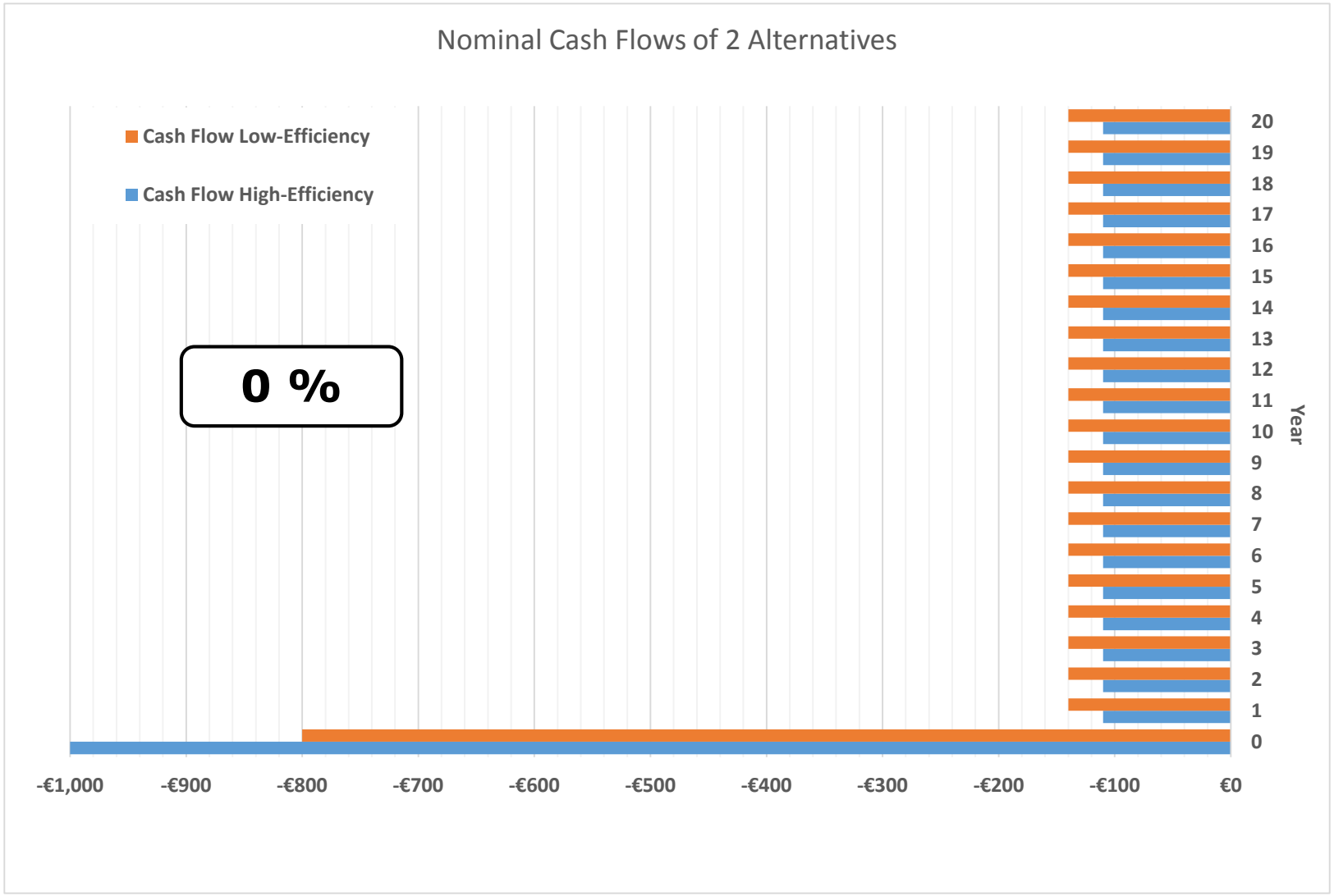
Mr. R. E. Search's Impact Assessment for the Efficient Doorbell Rings the Bell …

Variable	Unit	Societal perspective	Private perspective
Cost of measure	€	30	
Technical lifetime	yr	20	
Electricity savings	kWh/yr	26	
Cost of electricity	€/kWh	0.15 (excl. taxes)	0.20 (incl. taxes)
Discount rate	€/kWh	4%	17.5%
Annual discounted cost	€/yr	-2.2	-5.5
Annual savings	€/yr	3.9	5.3
Net savings	**€/yr**	**1.7**	**-0.2**

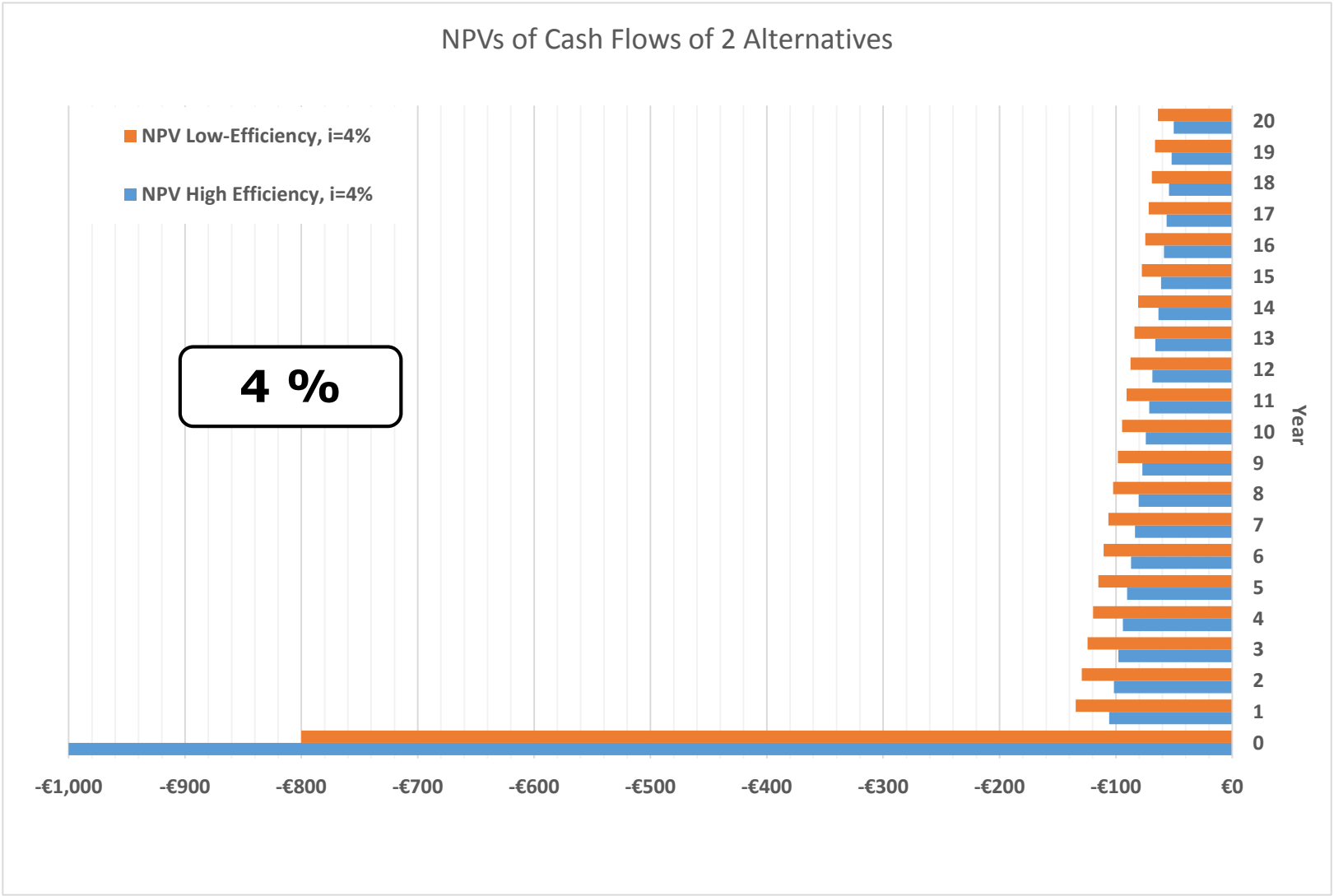
Discount rate example for two alternative EE measures

	High Efficiency	Low Efficiency
Investment today	1000 €	800€
Annual energy cost	110 €	140 €
Price increase	0%	
Discount rate 1	0% (no discounting, nominal cash flow)	
Discount rate 2	4% (real rate, i.e. exclusive inflation)	
Discount rate 3	17.5% (real rate, i.e. exclusive inflation)	
Lifetime	20 years	

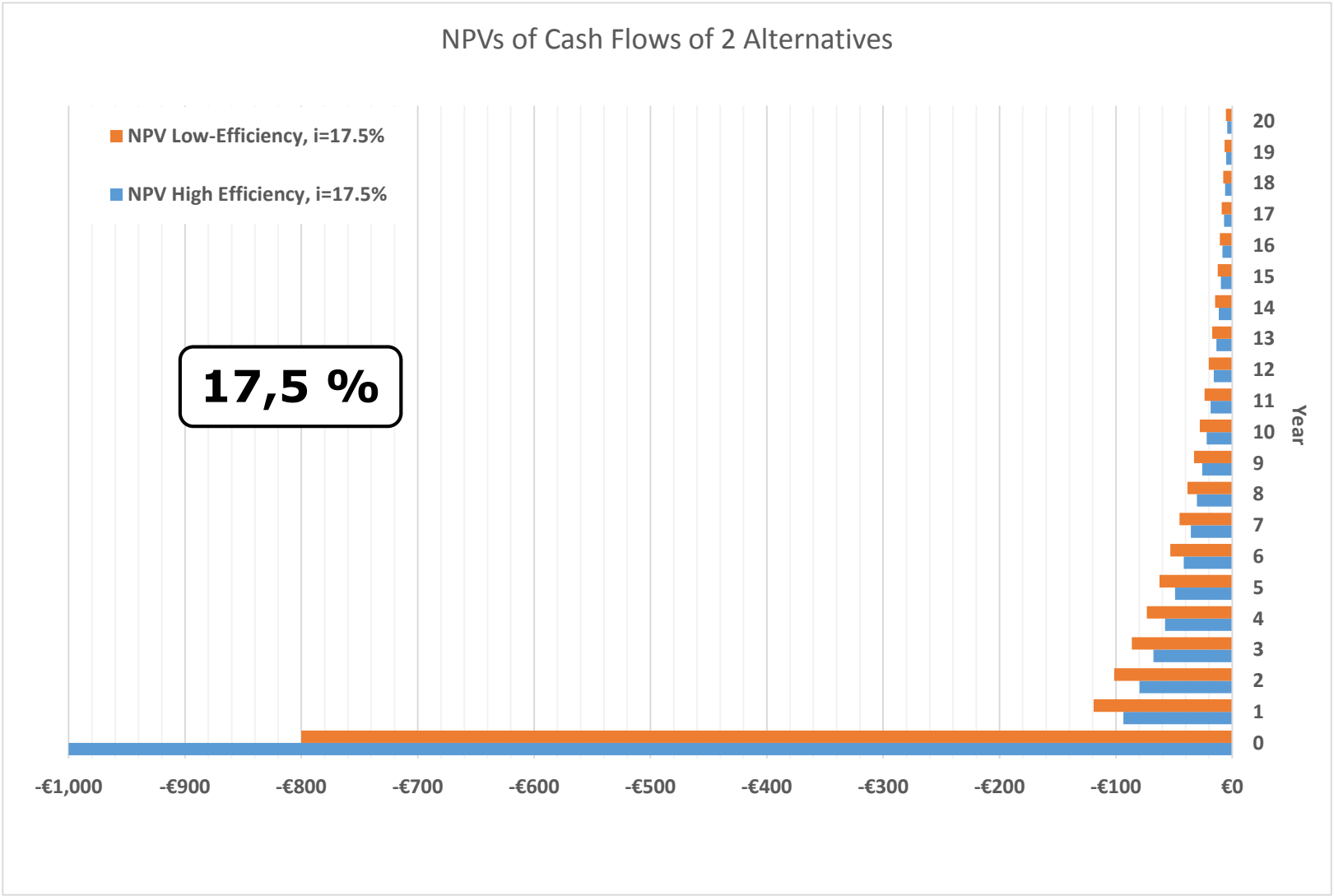
The present value of the future in Impact Assessments
Life-cycle-cost – No discounting ("0" rate)



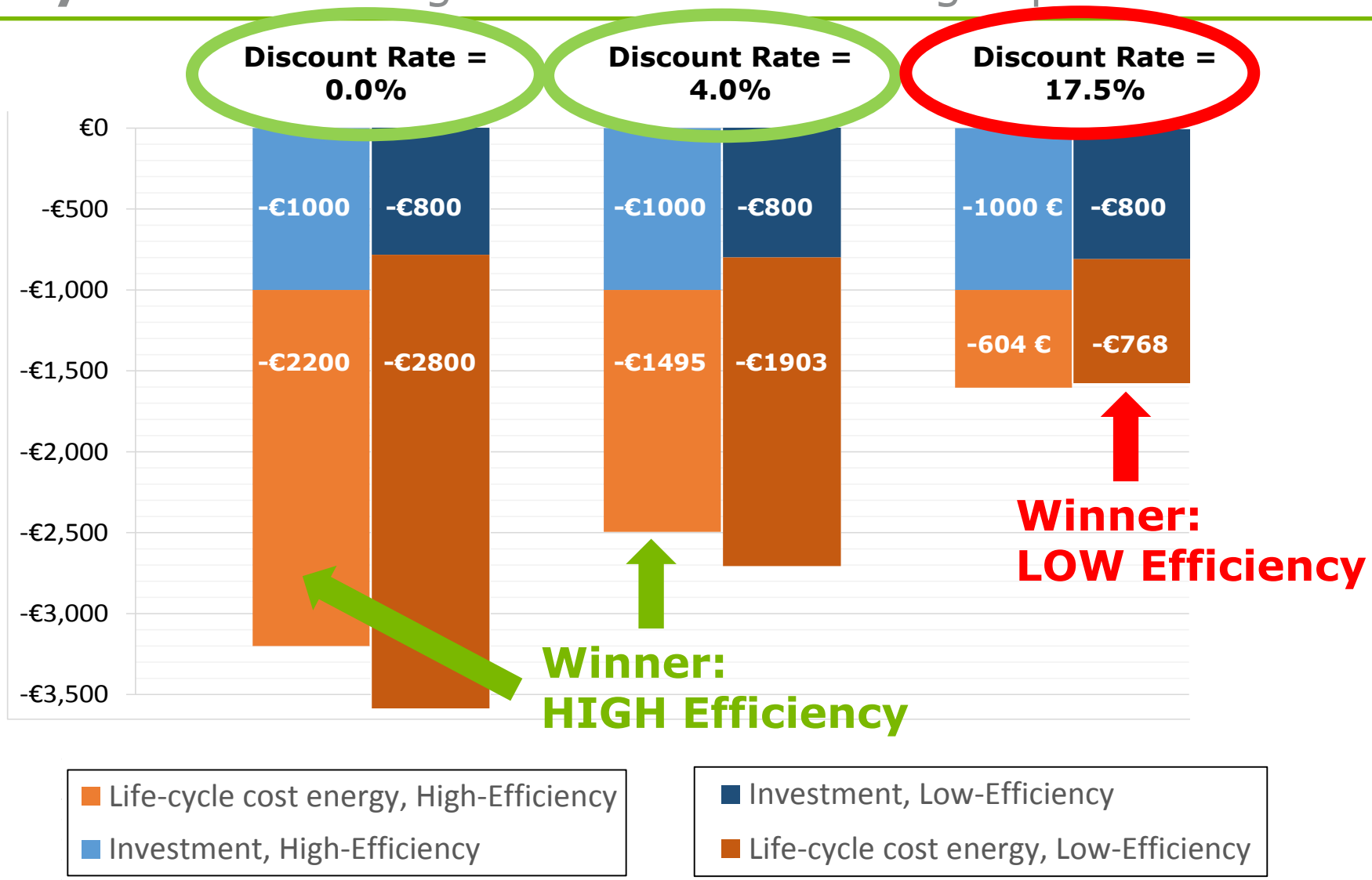
The present value of the future in Impact Assessments
Life-cycle-cost – **Low** discount rate



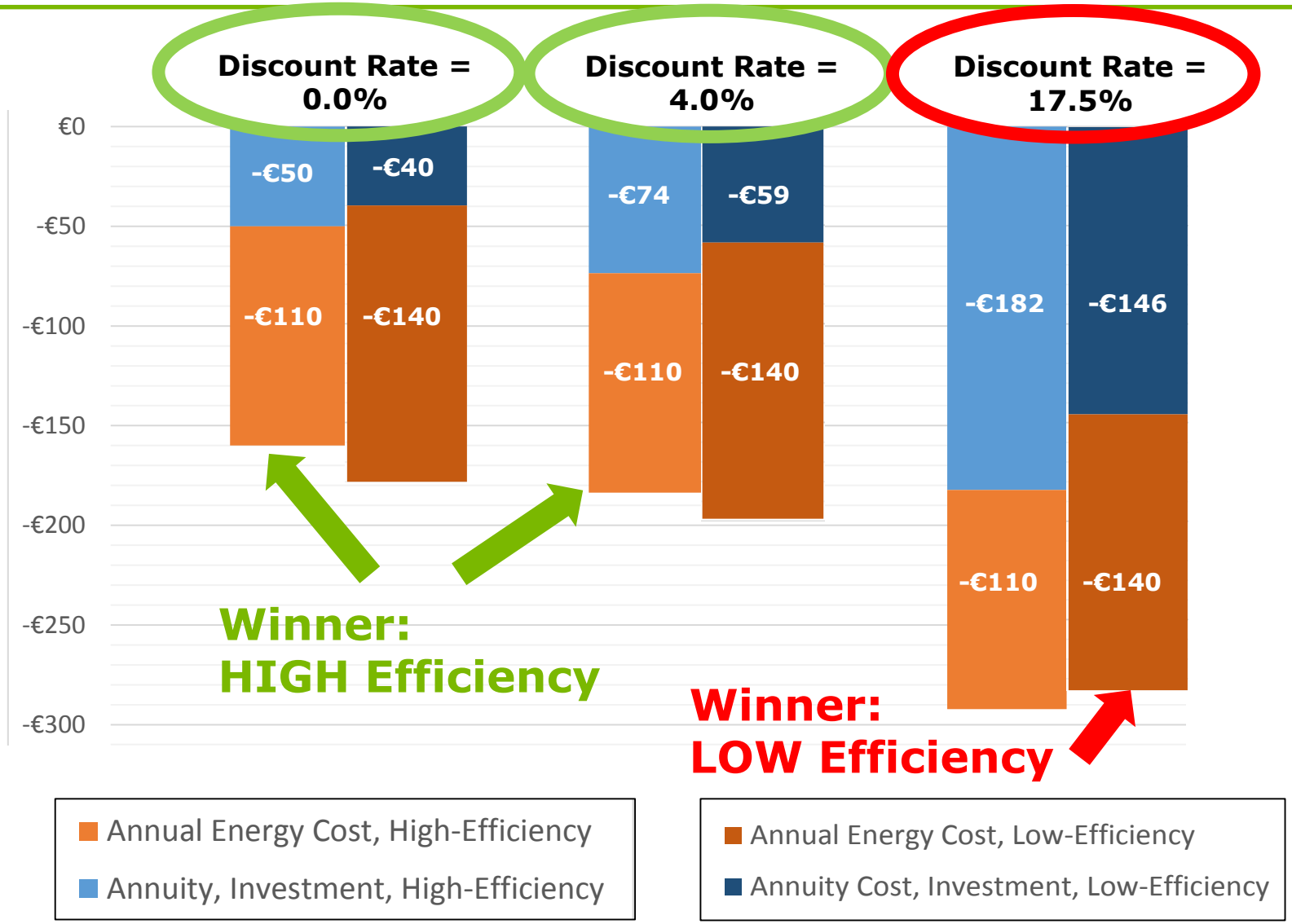
The present value of the future in Impact Assessments
Life-cycle-cost – **High** discount rate



Decision rule: The better option has the smaller **Life-cycle**-cost => High Discount rate changes preference!



Decision rule: The better option has the smaller **Annual**-cost => Same result: High Discount rate changes preference!



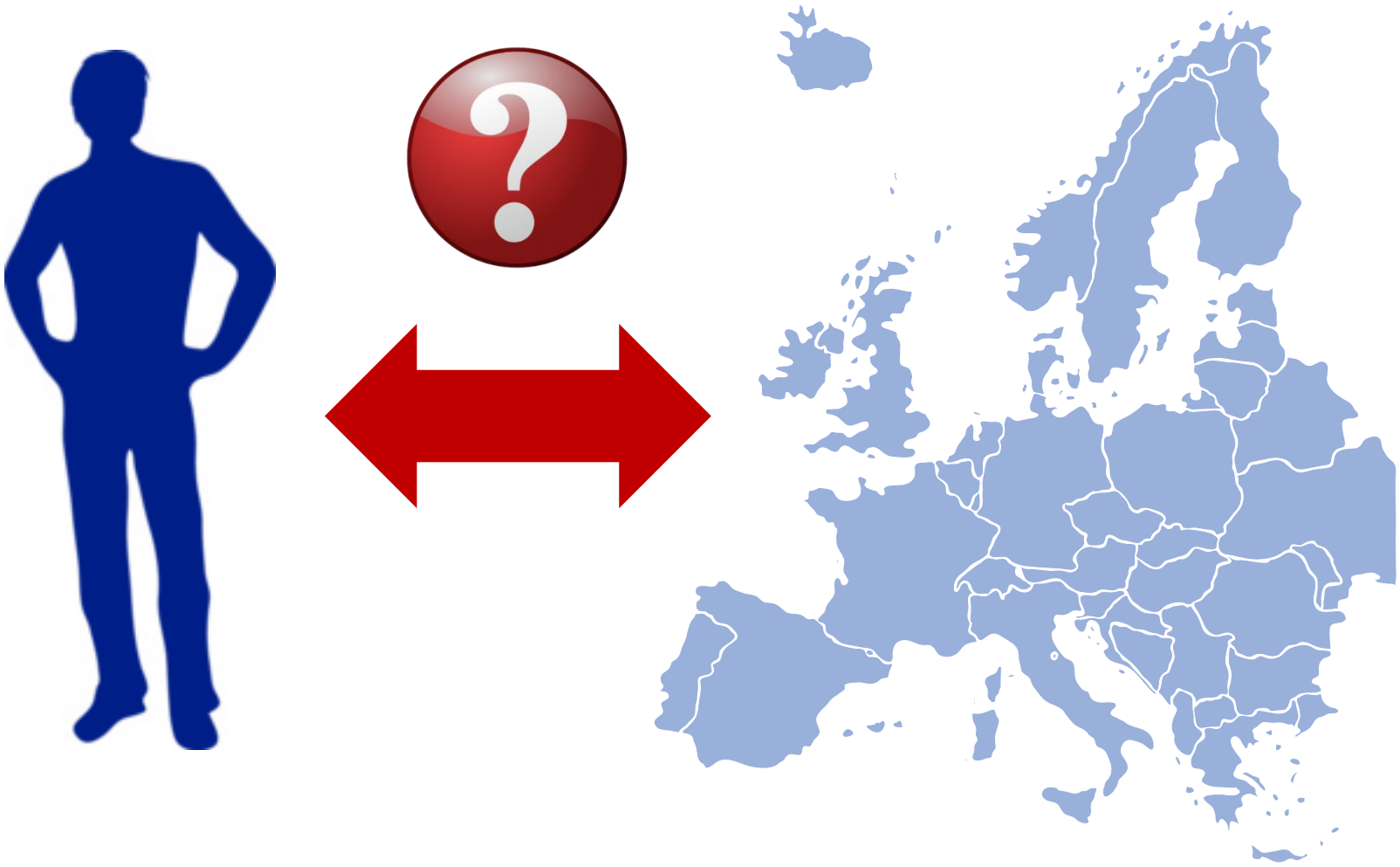
The role of discount rates in the Evaluation of costs and benefits of energy efficiency measures

> **Both life-cycle cost and annual cost lead to exactly the same result:**

Discount Rate up

Energy Efficiency down

When to use which discount rate?
Private vs. societal perspective/rate



Two applications of discount rates

- 1) Modelling („mimicking") of individual investment decisions
  - Private + commercial investors: „subjective discount" rates
  - Power sector: weighted average cost of capital (WACC)
- 2) Determination of total annual energy system costs

Economic agent category	Discount rate	Adjusted discount rate due to the implementation of the Energy Efficiency Directive	
	Default	2015	2020-2050
Power generation	**9%**	**9%**	**9%**
Industry sector	**12%**	**12%**	**12%**
Tertiary sector	**12%**	**11%**	**10%**
Public transport	**8%**	**8%**	**8%**
Trucks/inland navigation	**12%**	**12%**	**12%**
Private cars	**17.5%**	**17.5%**	**17.5%**
Households	**17.5%**	**14.75%**	**12%**

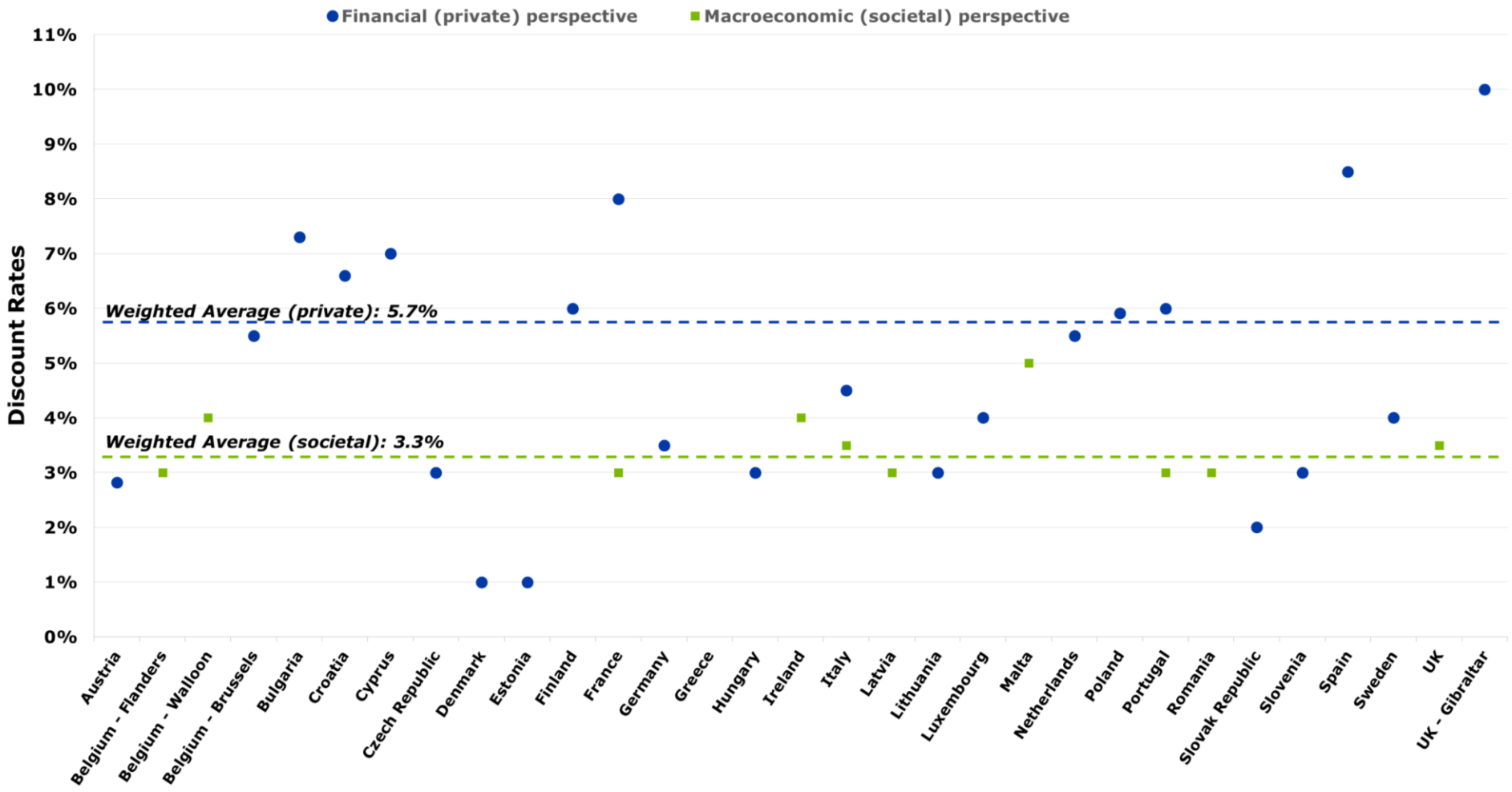
Major concern with the use of Discount Rates

- The **same high** discount rate is used for both
  - modelling of individual decision making and
  - calculation of annual total energy system costs.
    Energy system costs are in fact **NOT** calculated from a societal but from an end-user perspective (from an opportunity cost perspective = „economy-wide-modelling“).
- **These applications must be kept apart.**
- **For political target setting energy system cost should be calculated from a societal perspective.**

The use of discount rates for assessing the societal impact of policy making in literature and selected MS

- France: societal perspective, 4 %
- Germany: Societal perspective, usually just below 4%
- The Netherlands: 4%-5.5%
- United Kingdom: 3.5%
- EC Impact Assessment Guidelines 2009, Annex
  - „When 'discounting' is used, it should be applied both to costs and benefits. You should use a discount rate of **4%**."
- Better Regulation Guidelines 2015: "The social discount rate is the rate most used in Impact Assessments, … The recommended [real] social discount rate is **4%** [costs/benefits]".

Discount Rates Used in MS‘ Cost-Optimality Assessments

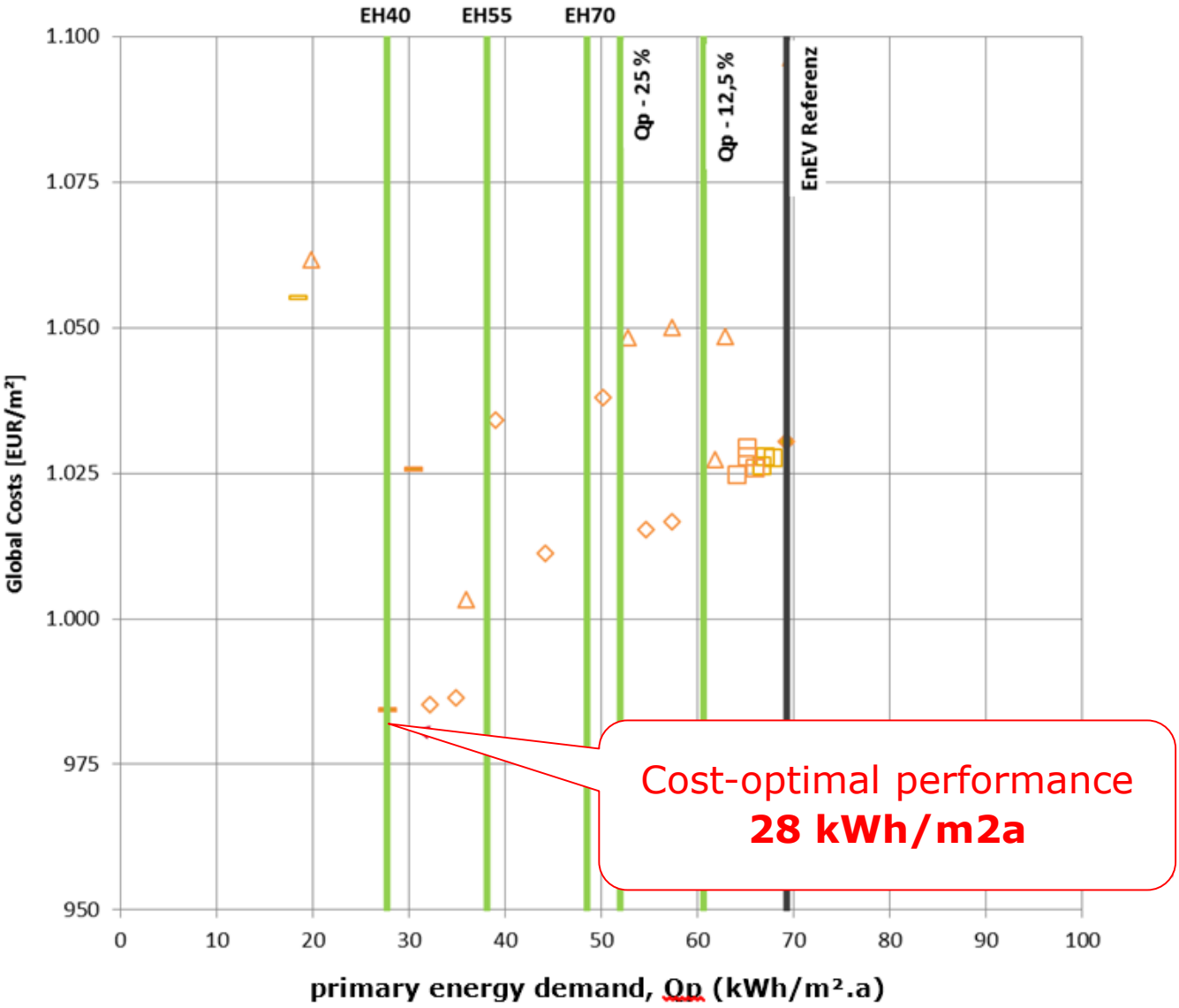


Concrete example: Cost Optimality (Life-cycle cost-method) Minimum Energy Performance Requirements for Buildings

- **Germany**
- **Multi-Family**
- **New built**

Discount rate

0%

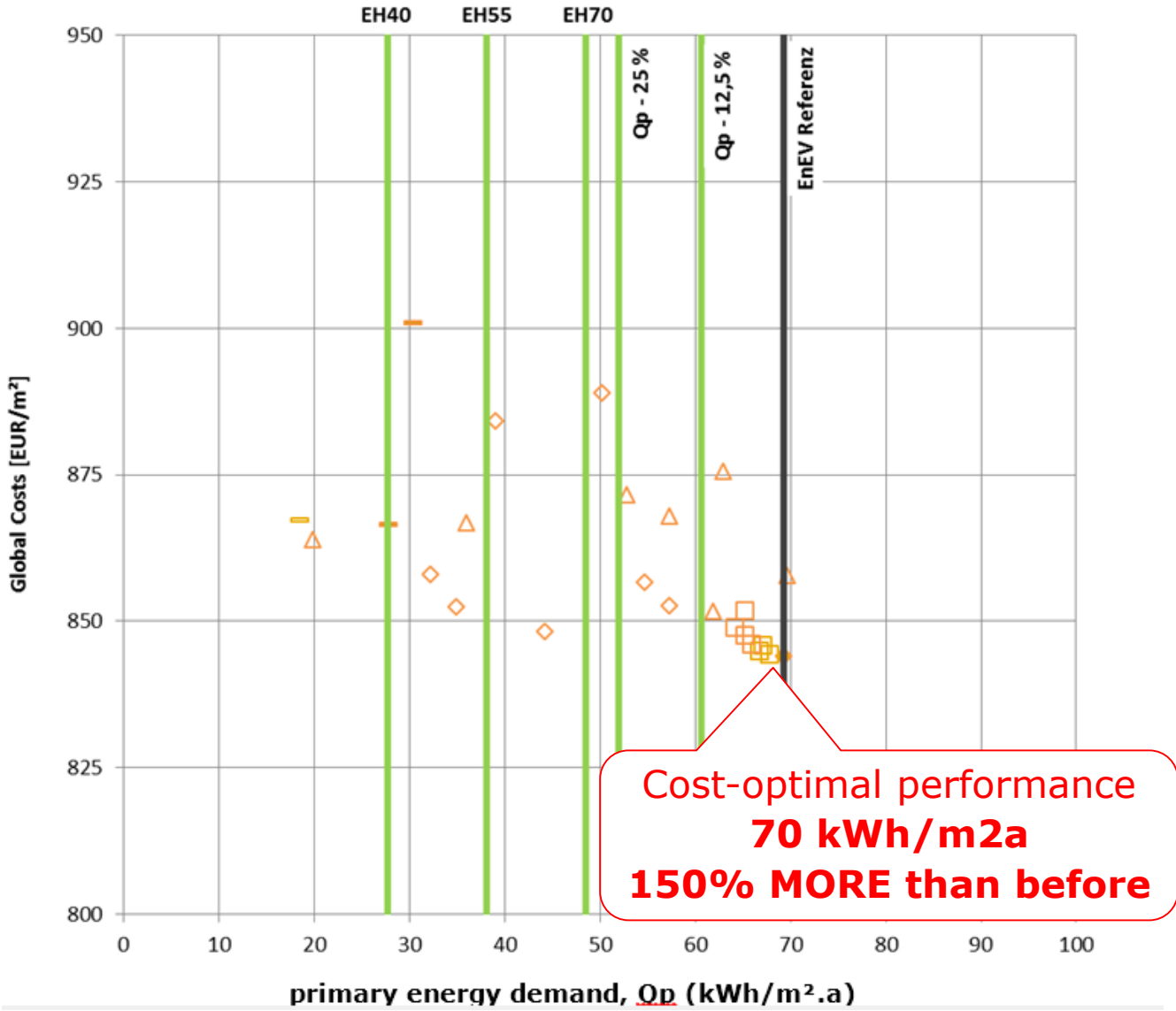


Concrete example: Cost Optimality (Life-cycle cost-method) Minimum Energy Performance Requirements for Buildings

- **Germany**
- **Multi-Family**
- **New built**

Discount rate

15%



The role of discount rates in the Evaluation of costs and benefits of energy efficiency measures

Discount Rate up

Energy Efficiency down

Additional issue in recent use of discount rates in EC impact assessments

- Energy efficiency policies (partly) reduce discount rates for individual decision making => yet the relation between policies and reduction of discount rates remains unclear.
- Energy efficiency policies do NOT reduce default discount rates for calculating annual total energy system cost

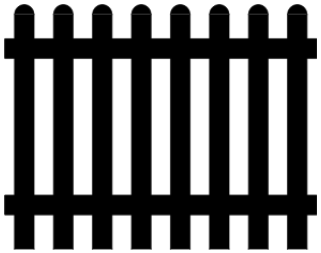
- **"... *it appears appropriate to revisit this issue in future analyses." [European Commission, July 2014]***

Recommendations

Apply a societal discount rate for determining annual total energy system cost

- Strictly **discern discount rates**

Discount rates for mimicking decision making



Discount rates for determining energy system cost

- **A societal discount rate of approx. 4% seems to be appropriate for target setting**, which is based on energy system cost, as done by many MS

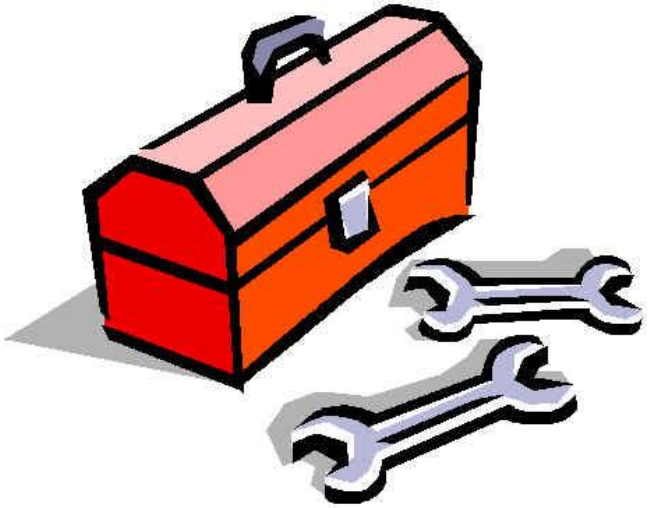
- => **Discount rates** used in EC Impact Assessments for determining the annual total energy system costs **should be revised** to a lower, uniform level.

Apply „Economy Wide Modelling“ (cf. Better Regulation Guidelines) only complementary to societal cost

- Better Regulation Guidelines offer the ***option*** of “economy wide modelling” (= sum of individual perspectives).
  - This **only** should be used **in addition** to but not as a replacement of the societal perspective.
  - Such approach helps to **show the “efficiency gap”** that needs to be bridged by EU energy policy.

Use Impact Assessment as a tool, not as a substitute for political decision making

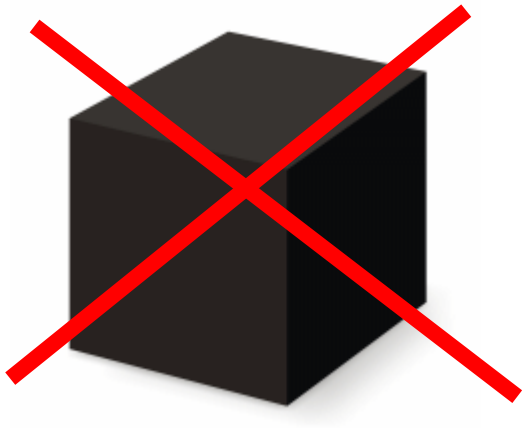
- EC Impact Assessment Guidelines 2009, Annex
  - "Impact assessment is an **aid** to political decision-making, not a substitute for it. "
  - Policy makers **need to** sufficiently **understand** which changes in assumptions cause which changes in Impact Assessment results.
  - Currently not even scientists are **able to replicate results**.



Provide full transparency about modelling

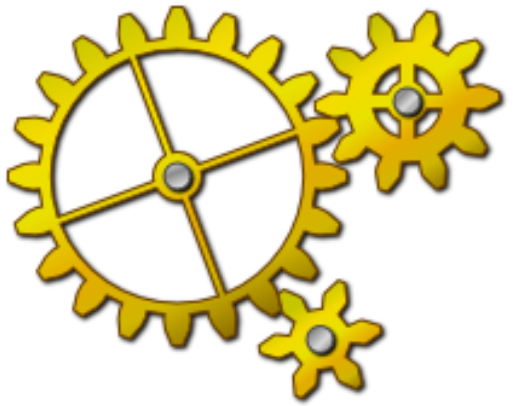
- An exhaustive description of inputs, outputs and the (assumed) mechanisms in between should be included in each impact assessment. => **avoid "black box" impression**.

- **Sensitivity analysis** should be conducted in order to demonstrate mechanisms and major influencing parameters.
- Always **verify model outputs** with another model. Detect reasons for differences.
- **Adapt models** to fundamental changes in energy systems.



Link policy measures to individual decision making

- More **research** is needed about the impact of policy measures on individual decision making.
- Impact assessment must **make explicit assumptions** about which policy measures affect individual decision making behaviour to what extent. => This is also explicitly required in the Better Regulation Guidelines.
- "The definition of policies supporting the energy transition requires **improved methods and tools to assess** the social, political, economic and environmental dimension of energy systems, considering **costs and benefits for consumers and for society** as a whole." [JRC, 2014]



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