Fondazione Eni Enrico Mattei

CASES

"A full cost approach to energy policy: results from the CASES project"

COST ASSESSMENT FOR SUSTAINABLE ENERGY SYSTEMS

CASES is a Co-ordination Action funded by the European Commission under the Sixth Framework Programme, PRIORITY 6.1.3.2.5, Sustainable Energy Systems

Wouter Nijs

VITO – Vision on Technology

SECURE first stakeholder workshop on
New Approaches to Secure Europe's Energy Supplies
Bruxelles

What is CASES

CASES is the acronym for '**Cost Assessment for Sustainable Energy Systems**', which is an European Commission funded Coordination Action.

A Coordination Action:

Aims at promoting and supporting the coordination, cooperation and networking of a range of research projects and operators for a specific objective.

Aims at achieving improved integration and coordination of European research.

Dates of the project: 1st April 2006 - 30th September 2008

What is CASES

Context – cost assessment of electricity generation

- While effort has been devoted in recent years to the estimation of the external costs of energy, more attention is now being paid to the examination of **both the private and external costs** within one framework.
- Energy policy making is concerned with both **the supply side and the demand side of energy provision**.
- The **geographical dimension** is also important since environmental damage from energy production crosses national borders.
- **Costs are dynamic**: the private costs and the external costs are changing with time, as technologies develop, individual preferences change and knowledge about impacts of energy use on the environment increases.
- The least well and least systematically covered area of external cost is the one related to **energy security**.

What is CASES

Partners of the consortium

The Consortium of the CASES's Co-ordination Action is composed by **twenty-five partners** established in nineteen

FEEM	IT
ISIS	IT
UBATH	UK
NTUA	GR
USTUTT/IER	DE
UFLENS	DE
VITO	BE
CEPS	BE
RISOE	DK
OME	FR
ECN	NL
VU/IVM	NL
WU	NL

CIEMAT	ES
UWARS	PL
CUEC	CZ
LEI	LT
EAP	BG
TUBITAK	TR
SWECO	NO
ECON	NO
PSI	CH
IIMA	IN
ERI	CHN
COPPETEC	BR

Overview of project objectives and results obtained

The main outputs of the project:

- **Databases** on "Life Cycle Inventory of emissions for electricity production", "Value of emissions in EU from present to 2030", "Social costs of electricity production in Europe for present, 2020 and 2030 for different technologies".
- Several **technical reports** on external, private and social costs of electricity generation in Europe and in selected non EU countries.
- **Policy reports** on policy instruments to internalize external costs in the electricity sector.
- A **report on electricity scenarios** by country and primary fuel for 2010, 2020 and 2030: private cost and social cost scenarios.
- A **tool for Multi-Criteria Decision Analysis** to assess policies.
- A **website** reporting all results **http://www.feem-project.net/cases/**
- A **book** on "Social Cost of Electricity: Scenarios and Policy implications" to be published by Edward Elgar Publishing.

Overview of project objectives and results obtained

In addition CASES produced:

- Assessment of **uncertainty** in external costs estimation.
- **Papers** and reports **on electricity insecurity and on uncertainties** in external costs estimation.
- Comparative assessment of private and external costs, by analysing **social costs** of electricity generation in Europe and in selected non-EU Countries.
- Assessment of policy **instruments to promote renewables** energy sources in Brazil, India, China and Turkey.
- Creation of a **tool for MCDA**.

What is an external cost ?

"The negative (or positive) effect on others by the action of someone, not paid for"

- Best example = impact on human healt of air emissions
- Uncertainties have been quantified as factor of 1/3 to * 3

- Only useful when clearly specified: external cost of doing… on …..

"the external cost of security of supply"

"the external cost of increased wind capacity on the number of electricity outages in a certain country"

What is the external cost of security of supply ? (personal note)

- "The deplation of supplies is not an external cost because scarcity leads to a markup in the private cost"

  …not for future generations because they are not in the market now

- "The risk of unexpected fall out is a characteristic of a product. Every market has a trade-off risk/cost"

  … but the market doesn't always give the correct incentives

Social costs

= total costs associated with the generation of 1 kWh electricity with a certain supply security

= sum of private and external costs

Private costs

- private costs = all costs per kWh borne by the electricity producer, but without taxes (VAT) and subsidies
- includes investment, operation and maintenance, fuel, supplies and services, dismantling, waste disposal
- Includes back-up costs (provision of reserve capacity)
- estimation/projection of costs for plants built 2020 and 2030

Which external costs are included ?

Environmental externalities:
release of a substance or energy (noise, radiation) into environmental media (air, soil, water) causing - after transport and transformation - considerable (not negligible) harm to ecosystems, humans, crops or materials.
For global warming impacts: damage costs and avoidance cost approach is used.

Accidents: Public and partly occupational risks caused by accidents (use of expectation value).

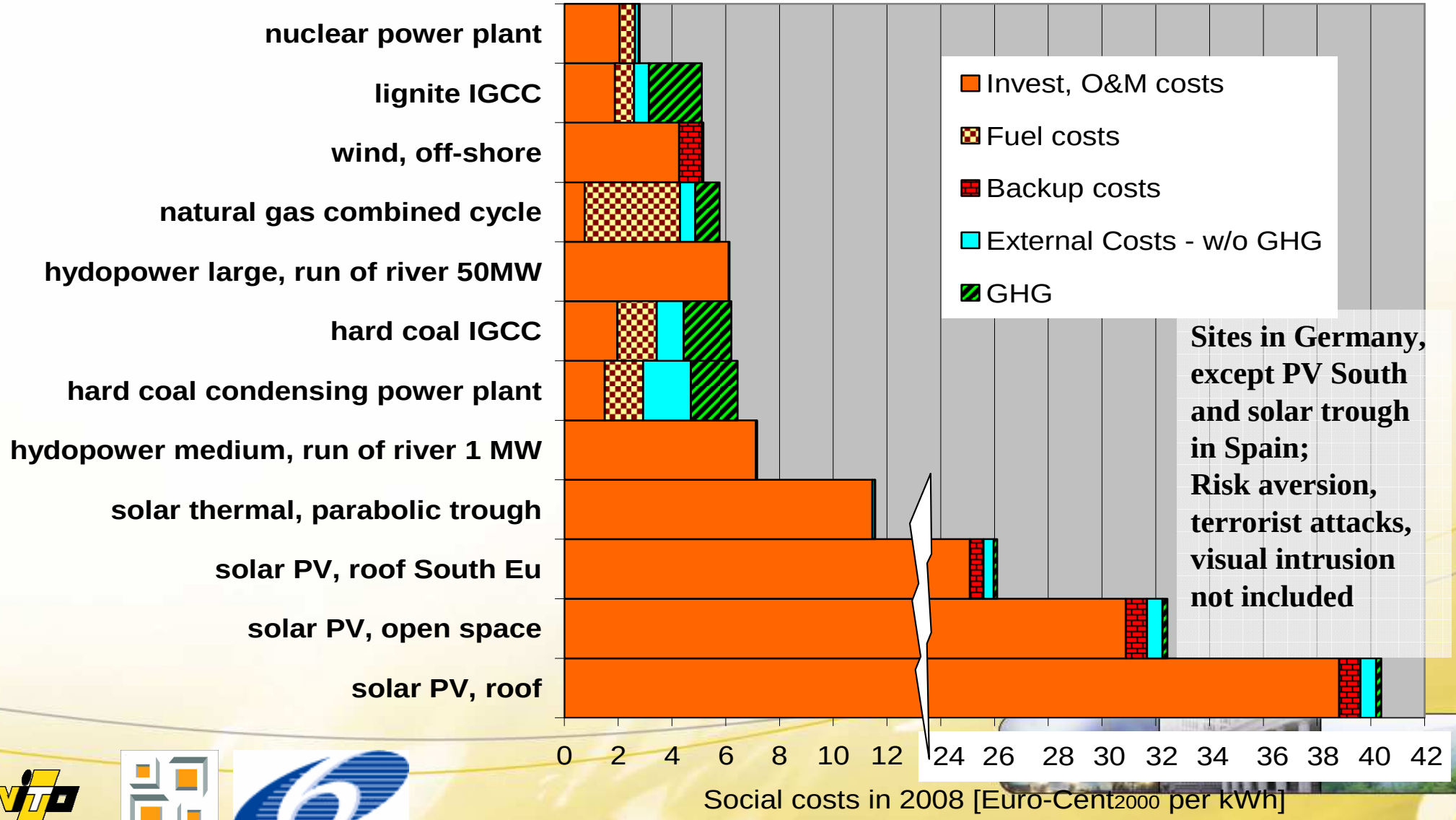
Insecurity of energy supply: Unexpected changes in availability and prices of energy carriers may lead to a reduction in economic growth and other problems

Which effects are not included ?

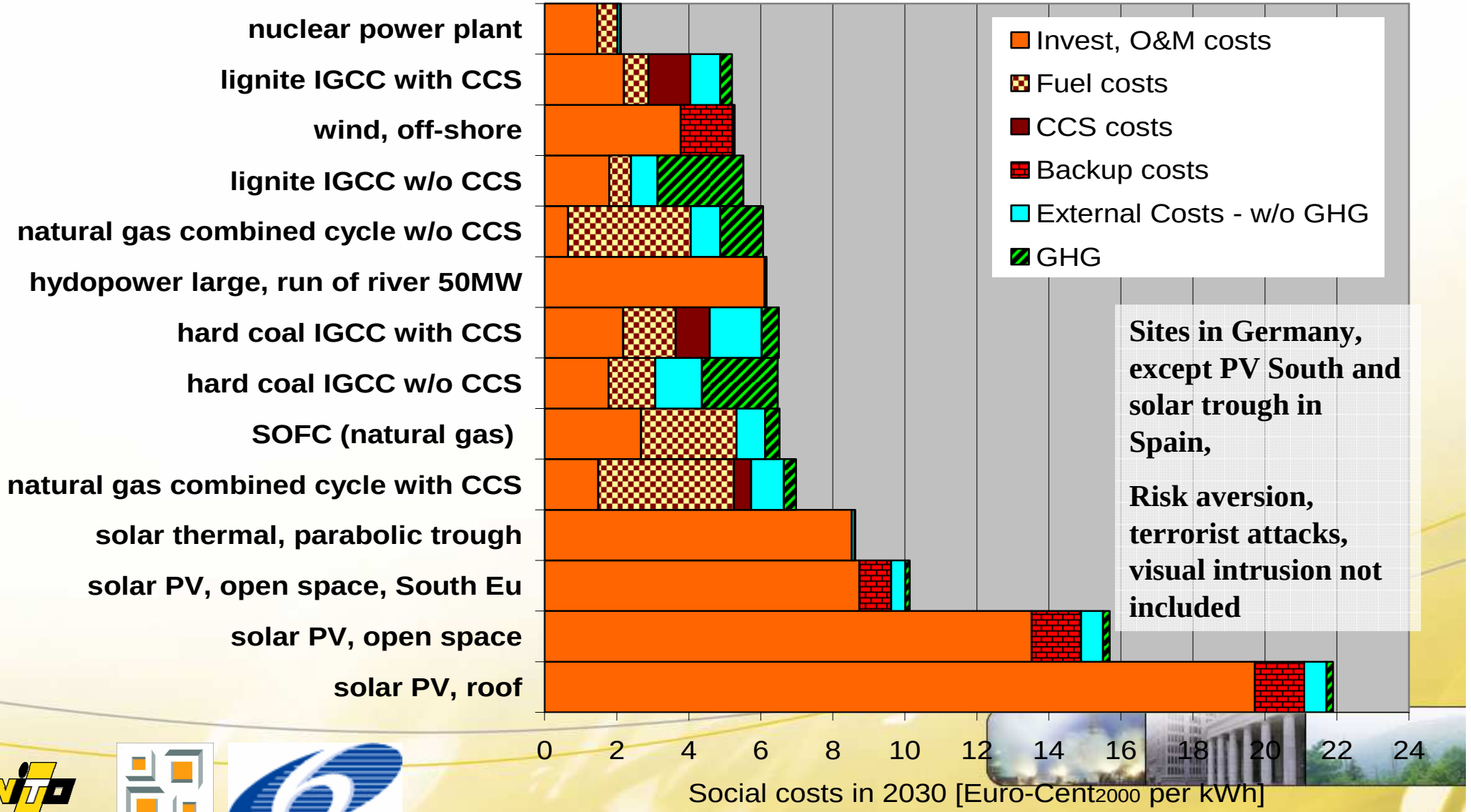
- Effects on Employment
- Depletion of non-renewable resources (oil, gas, silicon, copper, …)
- Research and development (sunk costs)
- Income distribution
- Local ecosystem damage (however addressed and at least partly compensated within the Environmental Impact Assessment)

- Assessment of Damocles risks (risk aversion)
- Risk of terrorism and proliferation
- Visual Intrusion

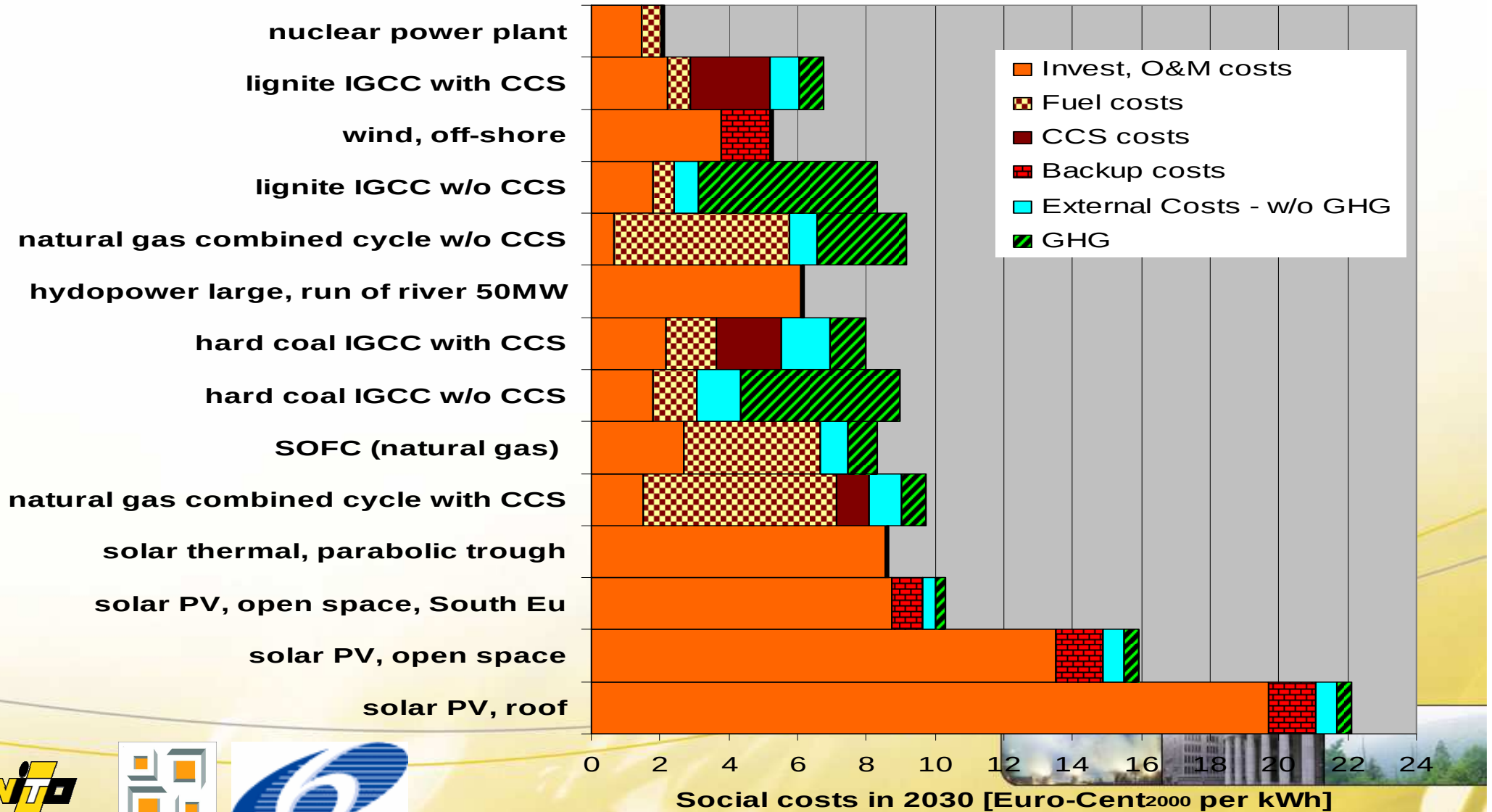
Social Costs 2008 in €-cent$_{2000}$ per kWh



Social costs 2030 in €-cent$_{2000}$ per kWh



Social Costs 2030, CTS 30€/t & CC 67€ per t CO2 & gas 50%



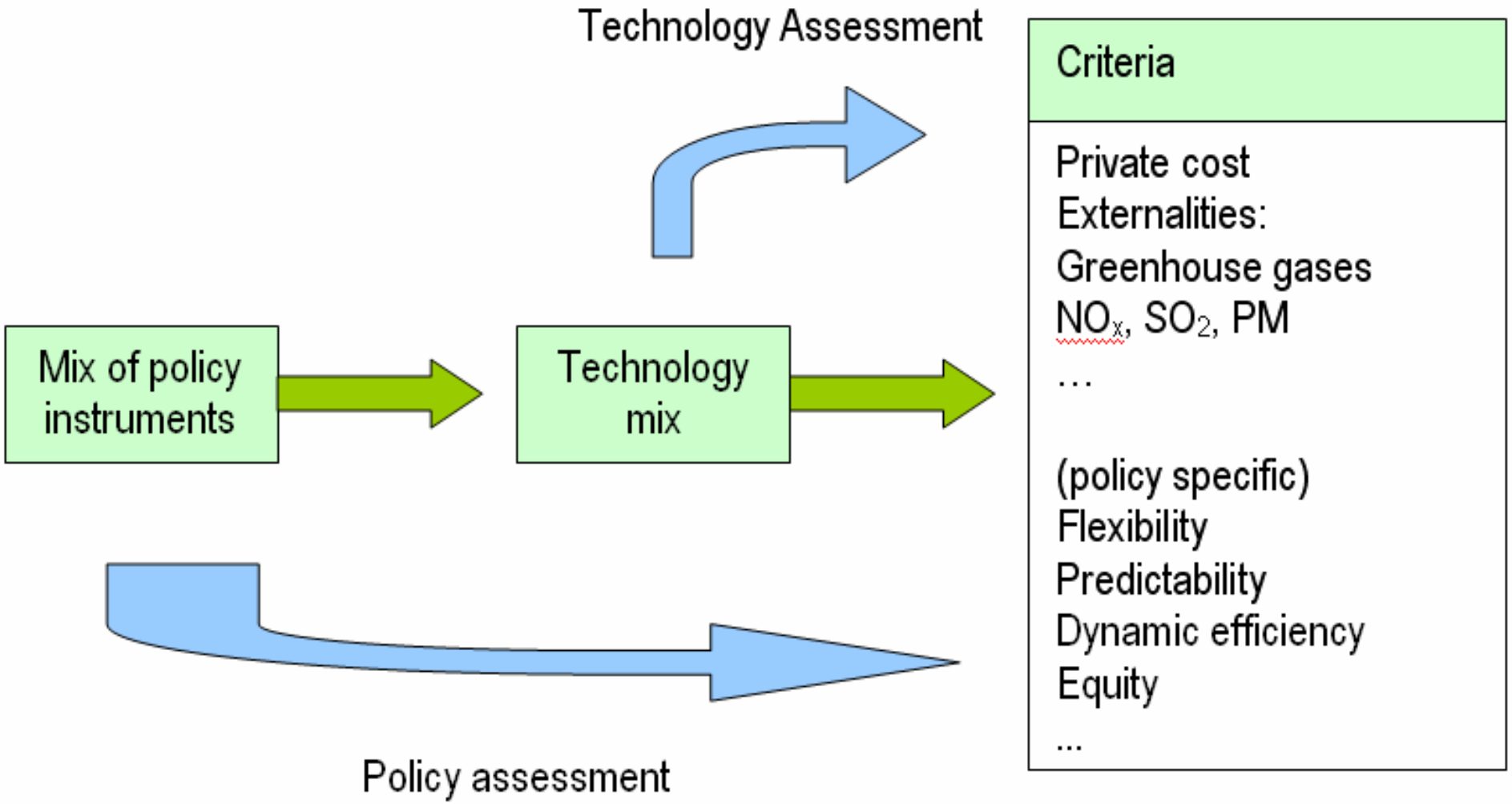
Conclusions social cost I

- Nuclear, wind and water are the electricity generating options with the least social costs. However, wind and water have a limited potential, wind needs back-up capacity, e.g. coal; for nuclear (EPR now, Generation IV in future) in some countries problems with the acceptance occur (risk aversion).
- Lignite will continue to play a major role, where available, followed by coal – with CCS, unless the costs for transport and storage are higher than anticipated and the level of ambition for climate protection is not too high (current aims).
- Using CHP (combined heat and power production), wherever density of heat demand is high enough, and additional biomass (that can not be used for food production) is useful, but has limited potential.

Conclusions social cost II

- Natural gas will only play a role replacing coal, if the price for gas and oil is expected to stay moderate, then however without CCS. In that case, small distributed fuel cells may become more advantageous as large plants.
- Electricity production with solar plants continue to have the highest social costs until 2030. After coal and gas fired plants, solar thermal systems in Mediterranean countries would be the next best option – especially, if the climate goals are very ambitious and CCS is not working efficiently or has a limited potential.
- For PV systems, not yet foreseen additional technical improvements have to be achieved to allow a reduction of social costs towards those of the other technologies.

Assessment of Policy Instruments with MCDA

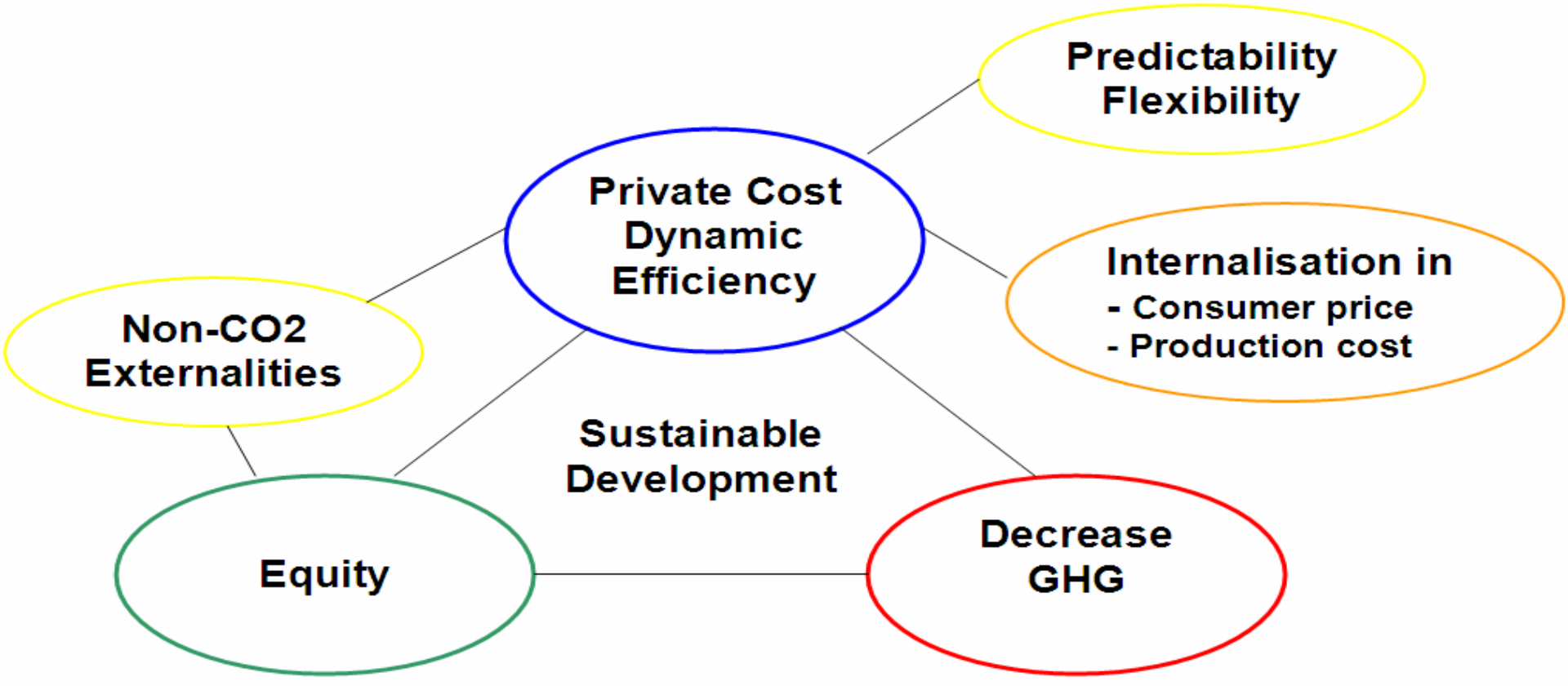


Policy instruments for policy assessment; as example "low carbon electricity"

- NULL scenario (existing energy related subsidies abolished)
- Performance base command and control
- Voluntary agreements
- Carbon tax
- Electricity tax
- EU-ETS; tradable permits

Base cases and variants

Criteria for policy assessment "low carbon electricity"



What is full internalisation ?

"Make all external costs private";

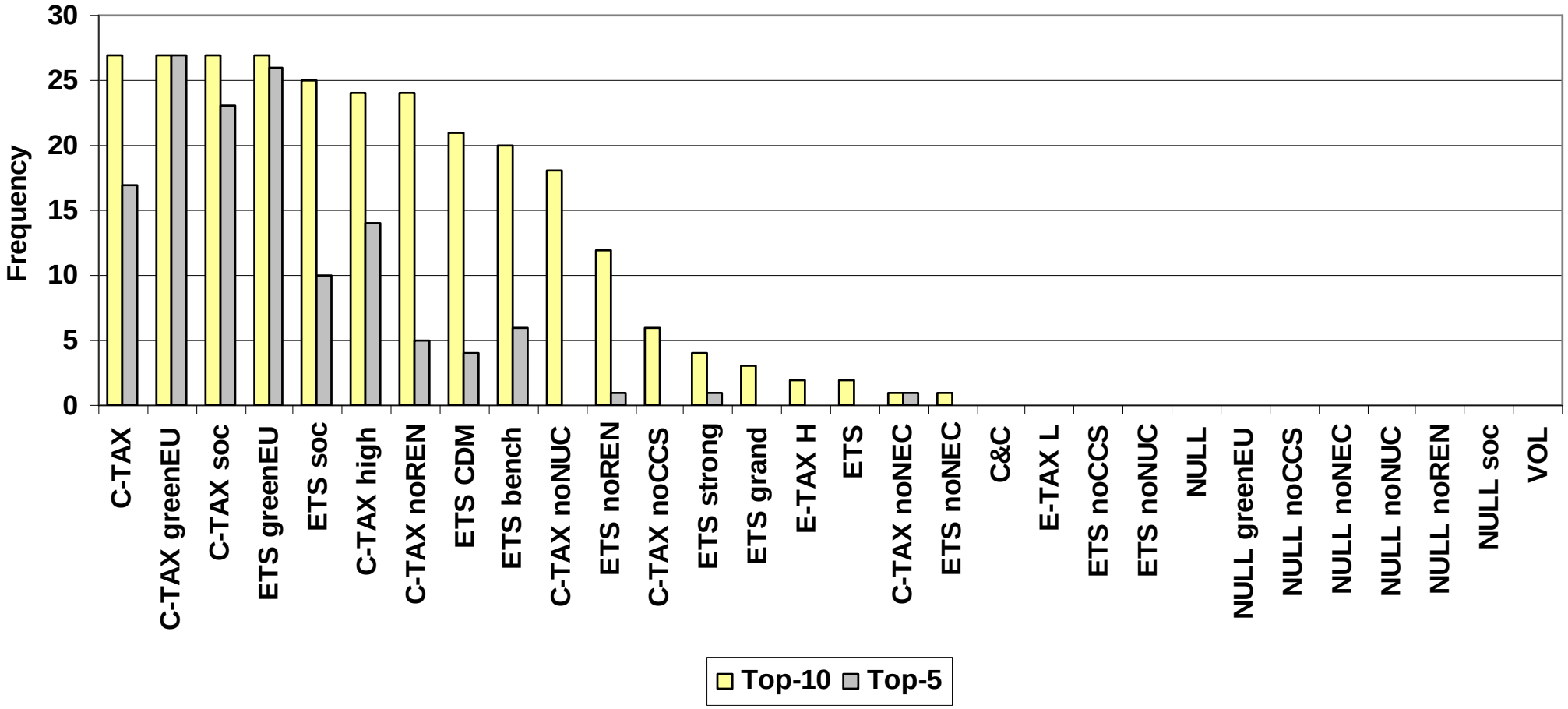
- ⇢ Only system of taxes or tradable permits fully internalise
- ⇢ Promotion can be a very effective policy for targeting… but "Full internalisation" ≠ "stimulating technologies with a lower total social cost"

What technologies to promote ?

In comparison to "worst", every technology has a net benefit for social costs. Promote every technology that is better than worst ?

Consensus of stakeholders

Number of appearances in the top 10 and top 5 places



Conclusions policy assessment (1)

For the example "sustainable low carbon electricity":

- PolicyEU-ETS and the CO_2 Tax are the best performing options, especially with their combinations with Green Certificate systems and social tariffs.
- As from 2030, an assumed *strict* climate policy induces renewables by the high carbon price (REN price = 0) >> enhancing renewables is justified even for climate reasons alone.
- …but green promotion is not enough for reducing CO_2 emissions;

Conclusions policy assessment (2)

General:

- Up to now, external costs are decreasing, but are not internalized. Few tax systems are coupled to environmental performances;
- Full internalization is more than stimulating technologies with a lower total social cost and certainly more than stimulating technologies with a lower external cost.
- A transparant cost optimization model is necessary that includes risk, substitution on both supply and demand.

Thank you for your attention.

For more information please visit the dedicated web site:

http://www.feem-project.net/cases/

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