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Interpreting cost-effectiveness: target definitions versus policy objectives

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Which option would be preferred?

	Technology A	Technology B
Support costs **(€/ton CO_2 reduced)**	72.3	94.8

Technology A needs the least support costs to get implemented, so would probably be preferred from a cost point of view.

Which option would be preferred?

	Technology C	Technology D
Support costs **(€/GJ final energy saved)**	6.0	11.7

Here, Technology C needs the least support costs to get implemented

What you should know

	Technology A	Technology B
Support costs (€/ton CO_2 reduced)	72.3	94.8

	Technology C	Technology D
Support costs (€/GJ final energy saved)	6.0	11.7

- Technology A (preferred) = Technology D (**not** preferred)
- Technology B (**not** preferred)= Technology C (preferred)

Topic & aim of this presentation

- Interpretation of cost-effectiveness
- Aim: contribute to knowledge on SMART target setting and policy design

Cost-effectiveness analysis..

- … provides a frame of reference for relating costs to the results of subsidy programmes
- … expresses cost-effectiveness in terms of the costs of achieving a given result

Context

- An important goal in ex-ante evaluation is budget allocation
- Knowing which technology offers the biggest pay-off per euro of support allows for a comparison and ranking of technologies

Question

- The choice of the denominator (e.g. kWh_e, GJ_p, CO_2) in cost-effectiveness calculations often links to the target definition of a subsidy programme…
- … does this influence the ranking of technologies?

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Denominator: final energy – primary energy – CO_2

- Answer: yes
- Example case: Dutch feed-in for Renewables

	SDE priority ranking	Priority ranking by substituted fossil primary energy	Priority ranking by avoided CO_2 emissions
Most cost effective	WWTP - green gas	Hydropower renovation	Hydropower renovation
	boiler fired by solid biomass ≥ 5 MWth	WWTP - green gas	WWTP - green gas
	Deep geothermal - low temperature	Onshore wind (stage 1)	Onshore wind (stage 1)
	boiler fired by solid biomass < 5 MWth	boiler fired by solid biomass < 5 MWth	boiler fired by solid biomass < 5 MWth
	Deep geothermal - high temperature	All feedstock digestion - heat	Onshore wind (stage 2)
	All feedstock digestion - heat	Onshore wind (stage 2)	Onshore wind >= 6 MW (stage 2)
	Hydropower renovation	Onshore wind >= 6 MW (stage 2)	WWTP thermal pressure hydrolysis
	All feedstock digestion - green gas	WWTP thermal pressure hydrolysis	All feedstock digestion - heat
	boiler fired by liquid biomass	boiler fired by solid biomass ≥ 5 MWth	onshore wind >= 6 MW (stage 3)
	Manure co-digestion - heat	Deep geothermal - low temperature	onshore wind (stage 3)
	thermal conversion (>10 MWe)	onshore wind >= 6 MW (stage 3)	boiler fired by solid biomass ≥ 5 MWth
	Manure co-digestion - green gas	onshore wind (stage 3)	Deep geothermal - low temperature
	All feedstock digestion (extended life) - CHP	onshore wind >= 6 MW (stage 4)	onshore wind >= 6 MW (stage 4)
	Onshore wind (stage 1)	Deep geothermal - high temperature	Deep geothermal - high temperature
	Deep geothermal energy - CHP	boiler fired by liquid biomass	boiler fired by liquid biomass
	All feedstock digestion - CHP	Manure co-digestion - heat	Solar PV >15 kWp
	WWTP thermal pressure hydrolysis	All feedstock digestion - green gas	Wind in lake
	Onshore wind (stage 2)	Solar PV >15 kWp	Manure co-digestion - heat
	Onshore wind >= 6 MW (stage 2)	Wind in lake	All feedstock digestion - green gas
	Agricultural digester - CHP	All feedstock digestion (extended life) - CHP	Hydro power new
	onshore wind >= 6 MW (stage 3)	Hydro power new	All feedstock digestion (extended life) - CHP
	onshore wind (stage 3)	All feedstock digestion - CHP	Offshore wind
	Manure co-digestion - CHP	thermal conversion (>10 MWe)	All feedstock digestion - CHP
	Manure mono-digestion - green gas	Agricultural digester - CHP	thermal conversion (>10 MWe)
	onshore wind >= 6 MW (stage 4)	Manure co-digestion - green gas	Agricultural digester - CHP
	Solar thermal >100m2	Offshore wind	Manure co-digestion - green gas
	Gasification - green gas	Deep geothermal energy - CHP	Deep geothermal energy - CHP
	Solar PV >15 kWp	Manure co-digestion - CHP	Manure co-digestion - CHP
	Thermal conversion (<10 MWe)	Solar thermal >100m2	Solar thermal >100m2
	Wind in lake	Manure mono-digestion - green gas	free tidal current energy
	Hydro power new	free tidal current energy	Manure mono-digestion - electricity
	Offshore wind	Thermal conversion (<10 MWe)	Manure mono-digestion - green gas
	free tidal current energy	Manure mono-digestion - electricity	Thermal conversion (<10 MWe)
	Manure mono-digestion - electricity	Gasification - green gas	Gasification - green gas
Least cost effective	Osmosis	Osmosis	Osmosis

What does it mean?

- Cost-effectiveness using final energy as denominator penalizes RES electricity and favors RES heat
- For cost-effective achievement of a final RES target, this makes sense
- But does it, when the overarching RES target is *improving security of supply* or *mitigating climate change*?

Just theory or a real-life issue?

	Annual production 2012 RE projects [PJ]	Annual production 2013 RE projects [PJ]	Total production in 2012 [PJ]	Projected production in 2020 according to NREAP [PJ]
Onshore wind	>0	3.1	15.0	48.1
Offshore wind	0	0	2.8	68.5 (27)
Deep geothermal energy	8.1	3.2	0.5	10.8

NREAP = national renewable energy action plan

It is a r*eal-life* issue in case technologies:

- compete for the same budget
- this budget is limited

Relevance for energy efficiency?

- Same issue
- Cost-effectiveness based on final energy penalizes electricity and favors heat
- If the overarching objective of an EE policy is security of supply, cost-effectiveness based on primary energy better reflects the costs for meeting that objective

General implications

- If budgets are tight and need to be shared by different type of technologies, cost-effectiveness calculations should have an eye for the overarching objectives of a policy rather than sticking to the way the target is (coincidentally) defined.

- SMART targets – targeting different type of technologies - should preferably be aligned to the overarching objectives to avoid sending out the wrong signals to program managers / policy makers

Thanks for your attention

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