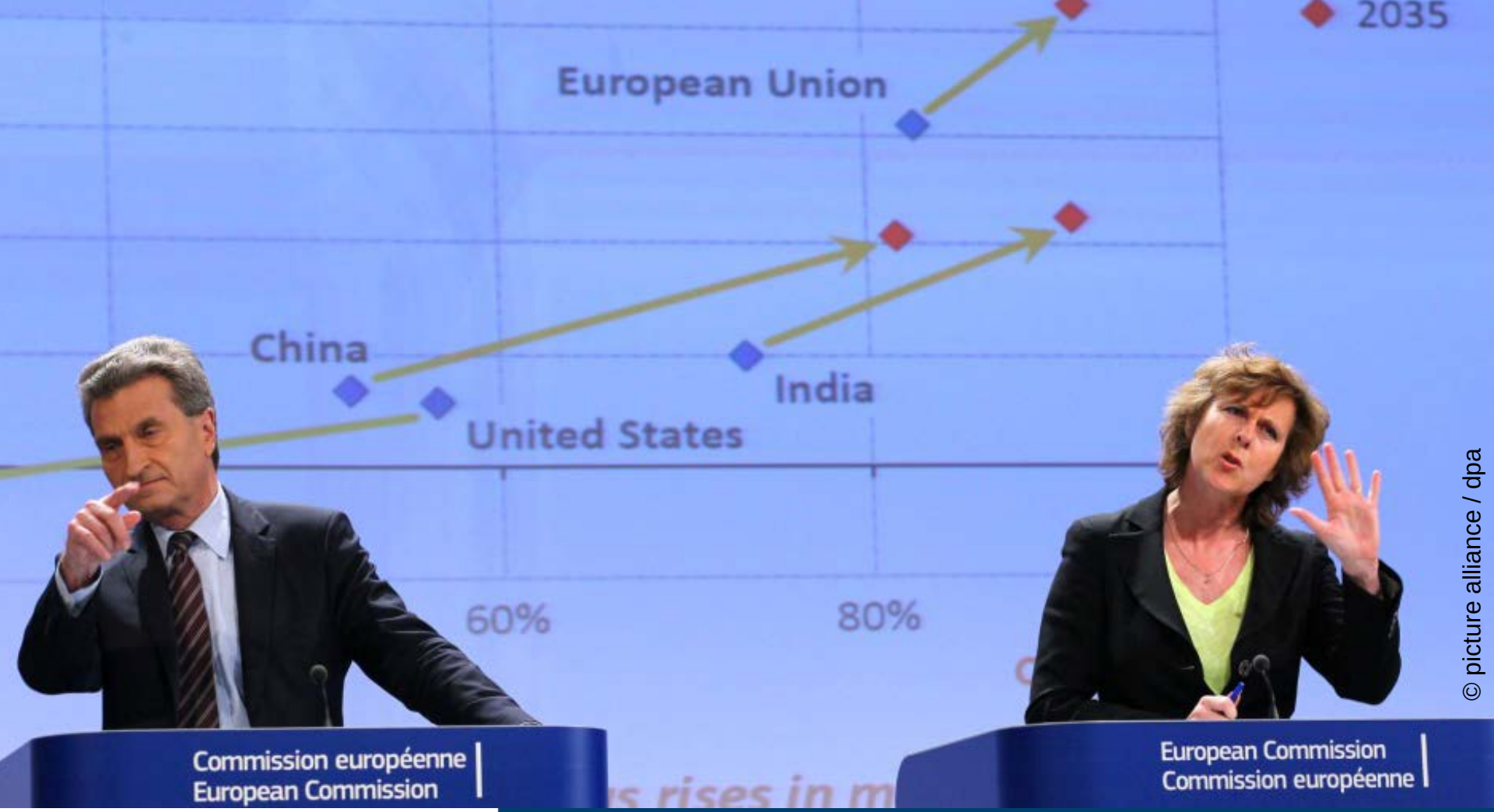

EU Climate and Energy Policy beyond 2020: How Many Targets and Instruments Are Necessary?

P. Lehmann, E. Gawel, S. Strunz (UFZ, Economics Dept)
J. Sijm (Energy Research Centre of the Netherlands, ECN)
U. Chewpreecha, H. Pollitt (Cambridge Econometrics, CE)

Strommarkttreffen, Berlin, 1. April 2014

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Outline

- Introduction
- Rationales for renewables targets
- Model
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EU Targets 2020 and 2030

	2020	2030 (COM proposal)
Greenhouse gas emissions (GHG) compared to 1990	- 20% allocated amongst Member States	- 40% allocated amongst Member States
Share of renewables energy sources (RES) in total energy consumption	+ 20% allocated amongst Member States	+ 27% 
Reduction in energy consumption compared to projections	- 20%	

➔ Justification: Additional targets impair the cost-effectiveness of GHG mitigation

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Contributions of our Paper

Literature …	Our paper …
… discusses the **welfare loss** of an additional RES policy in a **first-best** setting with a **GHG externality** only …	… discusses the **costs and benefits** of an additional RES policy in a **second-best** setting with **multiple market and policy failures** …
… for **2020** targets …	… for **2030** targets …
… using **optimization** models.	… using **theoretical** analysis and an **econometric** decision-making model.

(Bernard and Vielle, 2009; Boeters and Koornneef, 2011; Böhringer et al., 2009a,b; Capros et al., 2008; Kretschmer et al., 2009; Tol, 2012)

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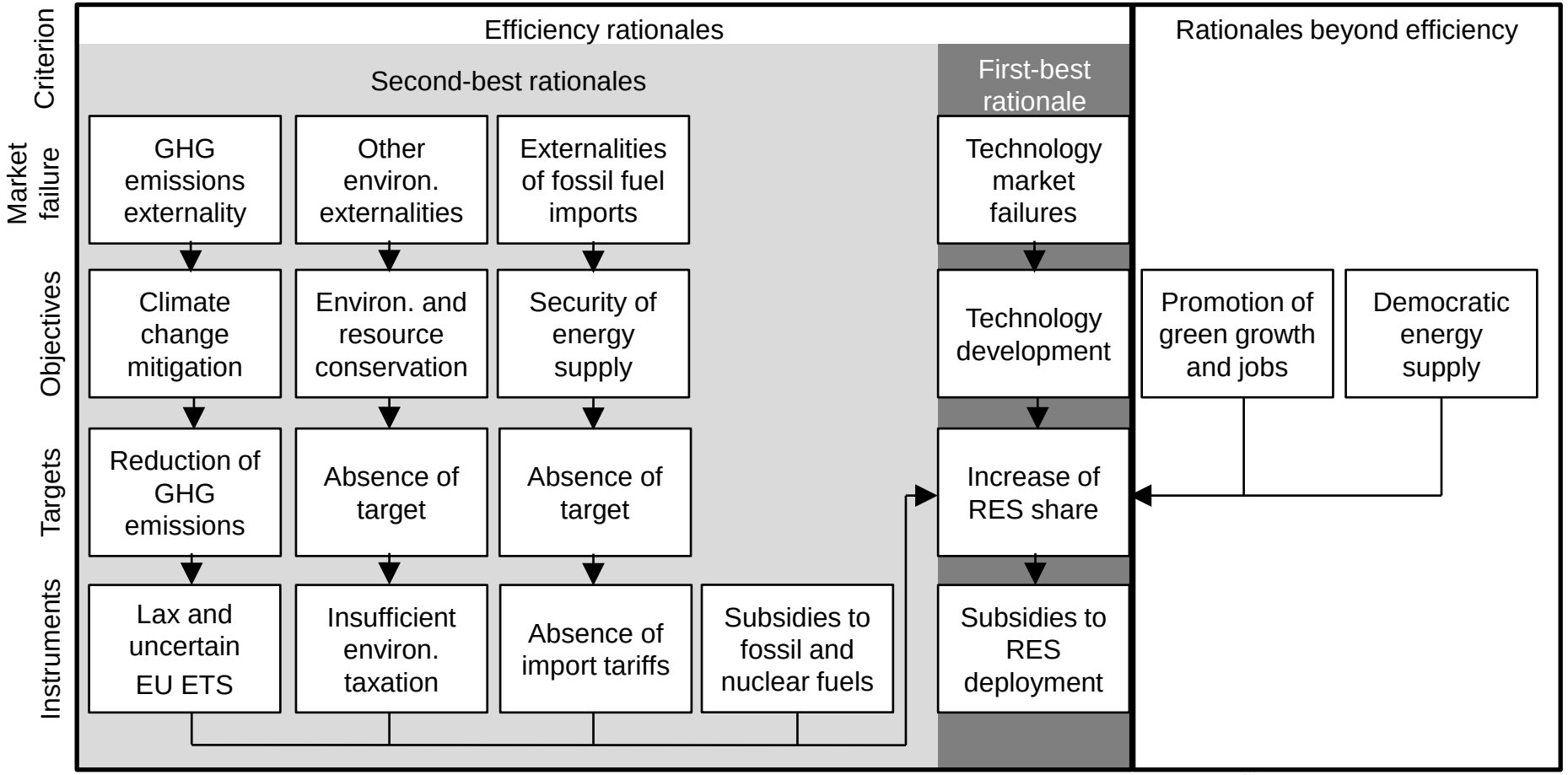
Rationales for Renewables Targets and Instruments in the Electricity Sector



➔ Rationales strengthened by path dependencies and lock-ins (Unruh 2000, Kalkuhl et al. 2012)

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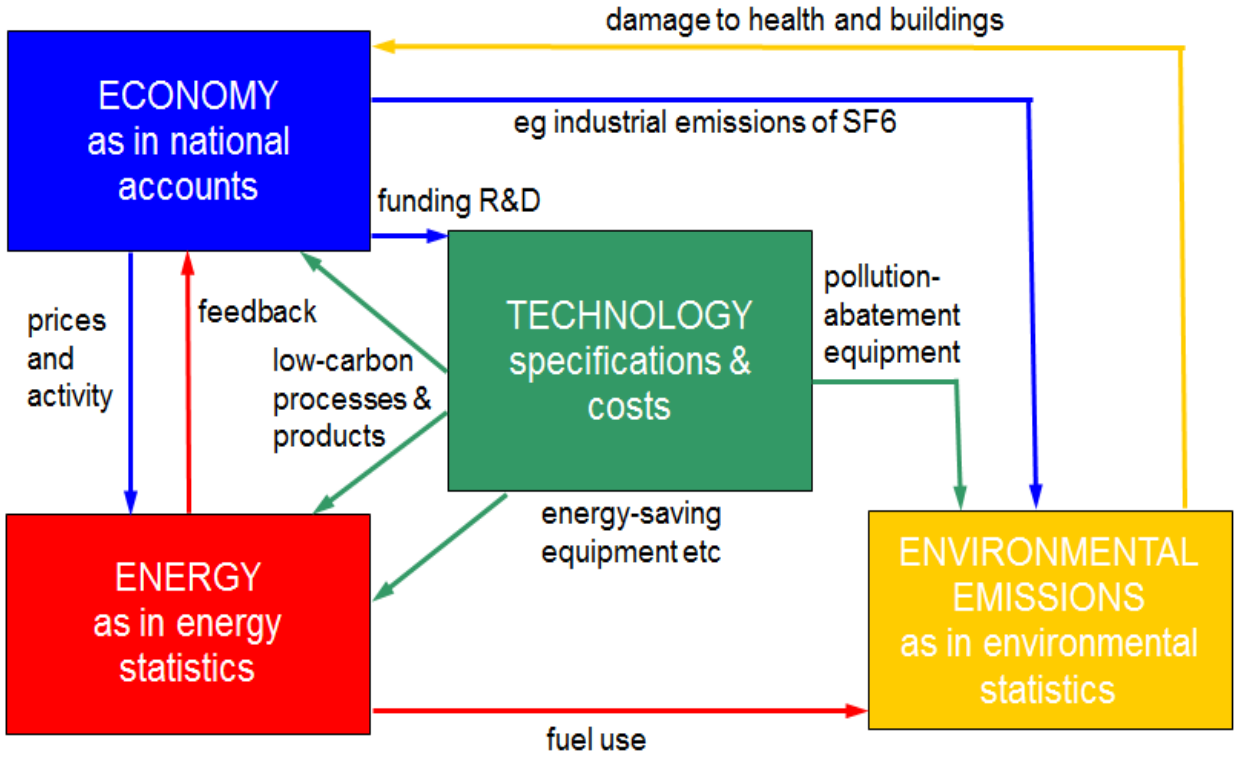
Energy-Environment-Economy Model at the Global level (E3MG)



- Econometric model
- 22 world regions (focus here on EU)
- 42 economic sectors
- Endogenous tech. change

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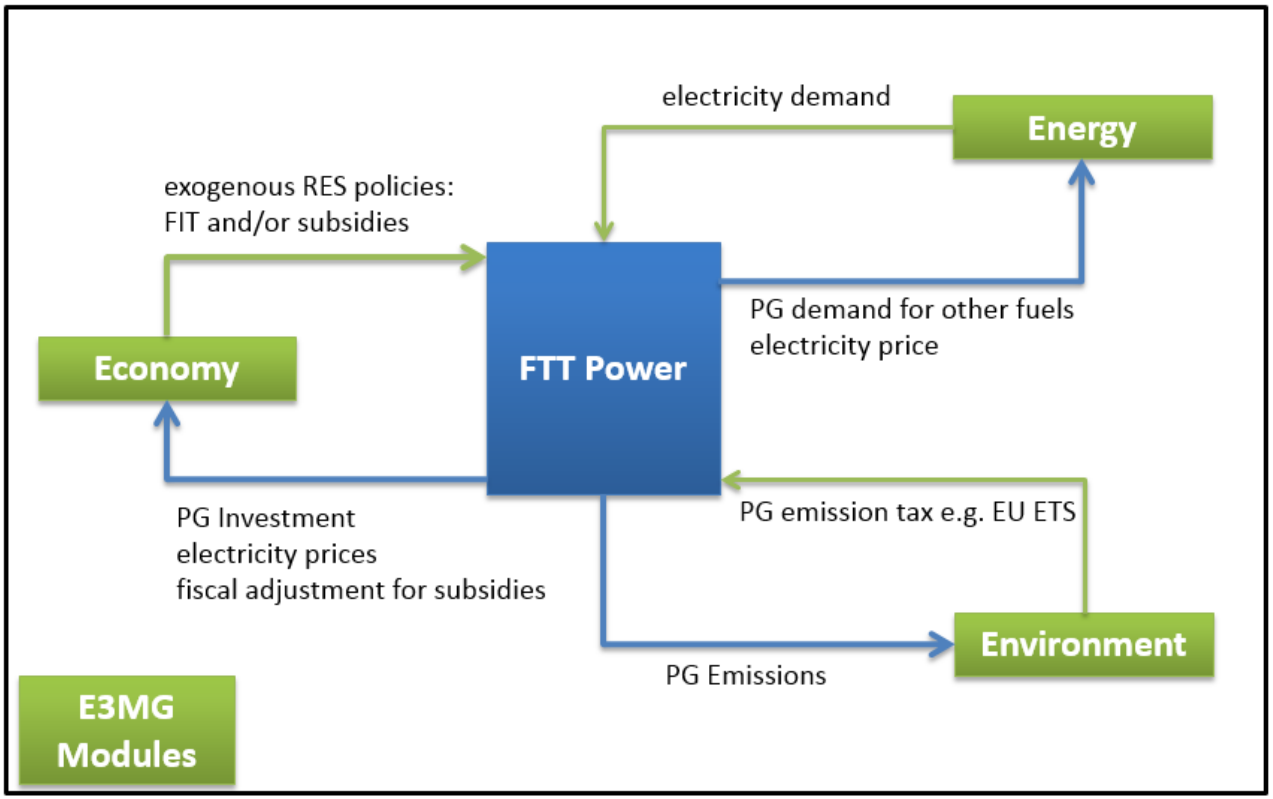
FTT:Power Model

Integration of FTT:Power with E3MG model



- Simulation model of tech. diffusion
- 24 technologies
- 21 E3MG regions
- Dynamics: LBD, costs of natural resources, etc.

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Basic Assumptions and Inputs

- GDP/sectoral growth rates up to 2030: PRIMES 2009 projections (EU), IEA World Energy Outlook 2012 „Current Policies Scenario“ (non-EU)
- Fuel prices: IEA World Energy Outlook 2012 „Current Policies Scenario“
- Climate policies non-EU: no action beyond existing policies
- EU ETS
  - Allowance allocation: Auctioning (electricity sector), free of charge (otherwise)
  - No borrowing, but banking
  - Revenue recycling: lump-sum to households (increases wealth but not direct consumption levels, sensitivitiy analysis available)
  - Offsets (CDM/JI) allowed to certain extent
  - Coverage: as of 2009, excluding aiviation

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Policy Scenarios

- Baseline scenario S0: PRIMES 2009 projections + IEA World Energy Outlook
- Targets under consideration derived from Knopf et al. (2013)

		S1	S2	S3	S4
Targets	GHG target	Yes	Yes	Yes	Yes
	ETS cap ($MtCO_2$)	1136	626	1136	1136
	RES target	No	Yes	Yes	Yes
	RES-E share	32	40	40	40
Instruments	EU ETS	Yes	Yes	Yes	Yes
	CO_2 price (€/CO_2)	100	440	53	41
	RES-E support	No	No	Tech. neutral	Tech. specific
	Average RES subsidy (€/MWh)	-	-	16.00	24.50

Exogenously set values

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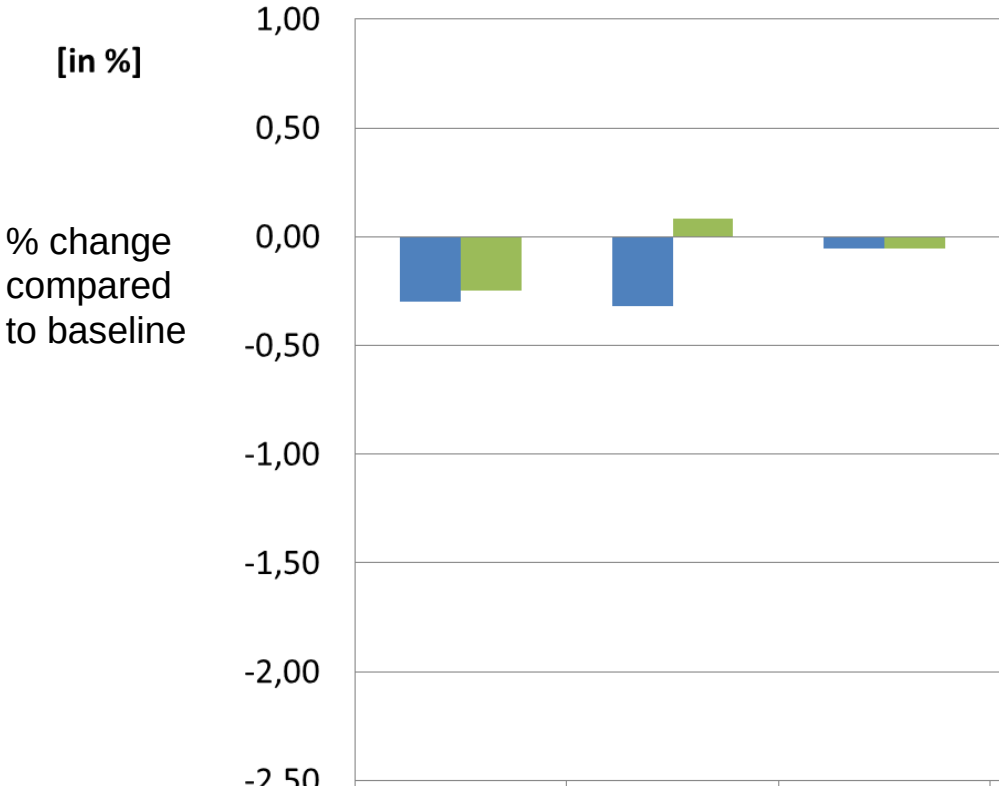
Costs of an Additional RES Target

Macro-Economic Outcomes



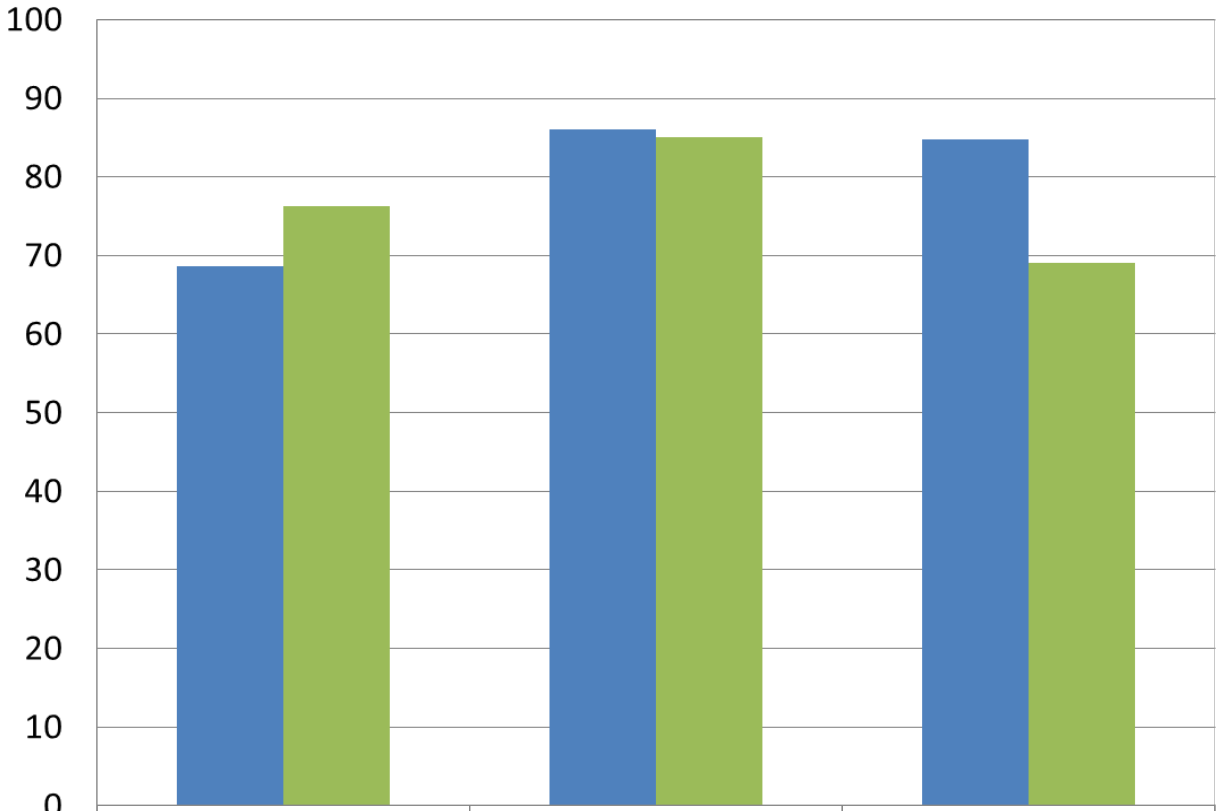
	GDP	Investment	Employ-ment
S1 (CO2/ETS only)	-0,30	-0,32	-0,06
S3 (CO2 and RES-E1)	-0,25	0,08	-0,06

- Effects generally small and even positive
- Reasons:
  - Small share of ETS sectors in GDP
  - Small share of energy and CO_2 costs in total costs of manufacturers
  - Unemployed resources

Costs of an Additional RES Target

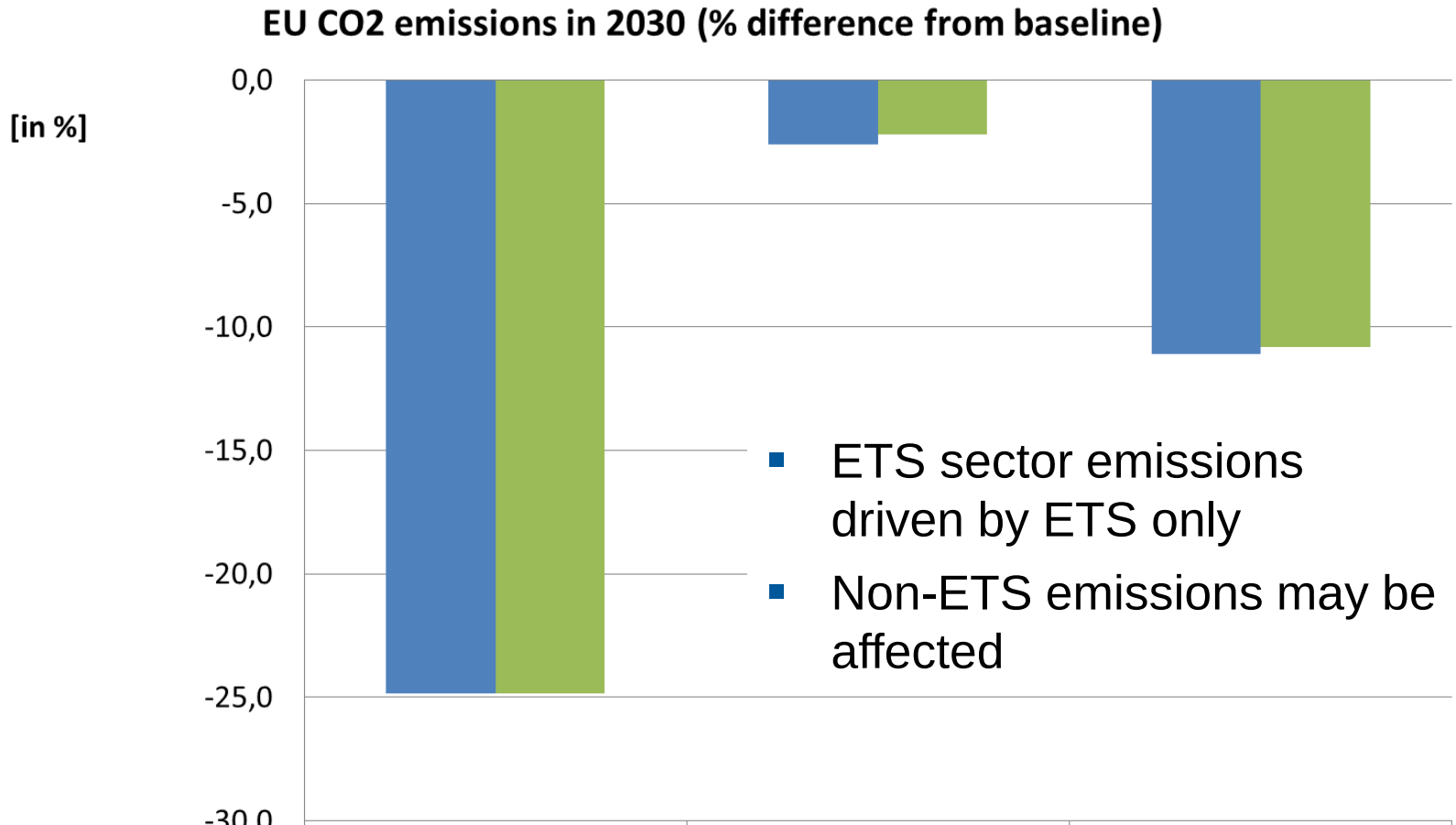
Average Levelized Costs of Electricity

[in €/MWh, 2010 prices]



	Average LCOE, excluding carbon costs and RES-E subsidies	Average LCOE, including carbon costs	Average LCOE, including carbon costs and RES-E subsidies
S1 (CO2/ETS only)	69	86	85
S3 (CO2 and RES-E1)	76	85	69

Benefits of an Additional RES Target
Second-Best Means for CO_2 Mitigation?

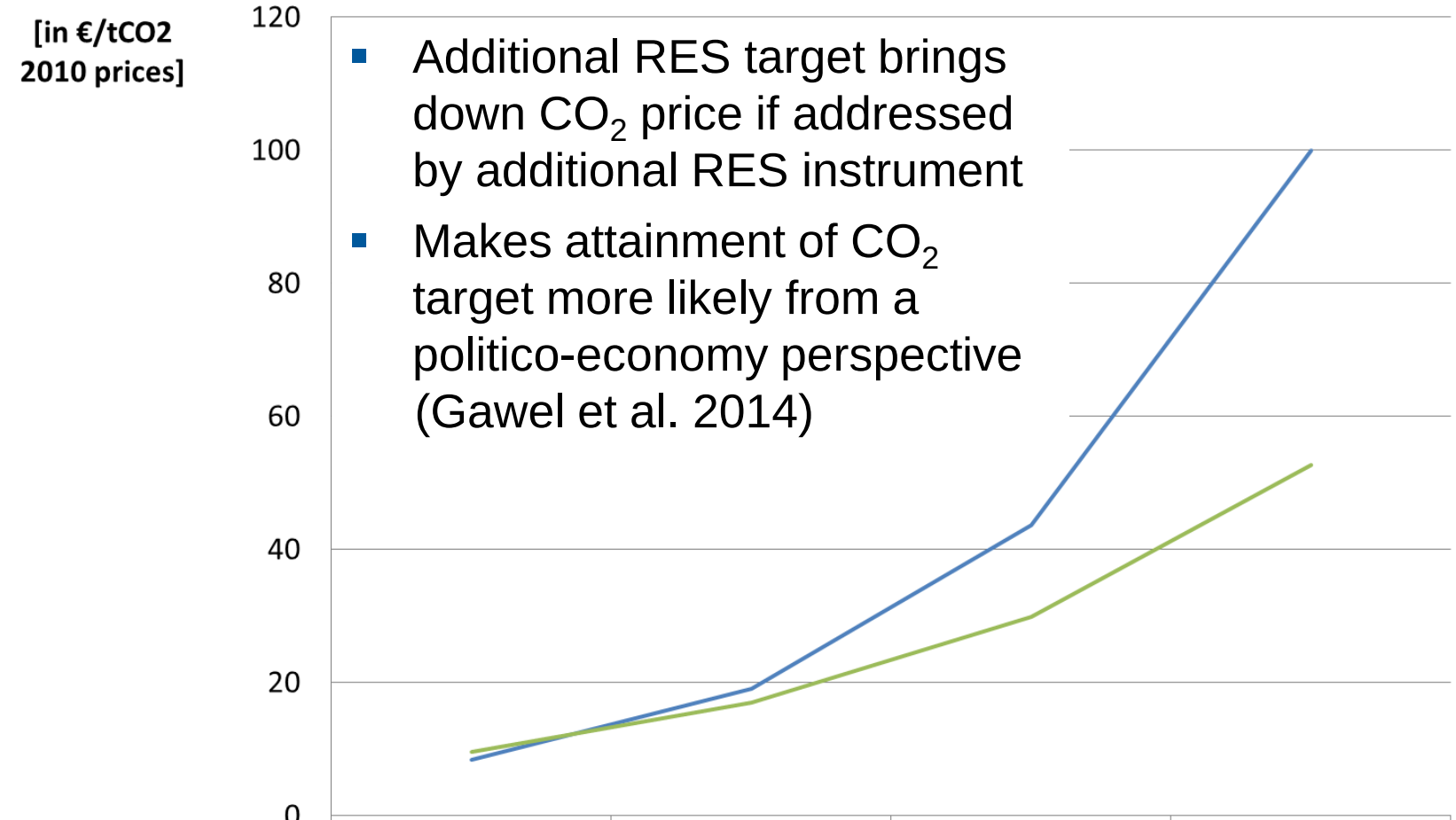


	EU ETS	Non-EU ETS	Total
S1 (CO2/ETS only)	-24,9	-2,6	-11,1
S3 (CO2 and RES-E1)	-24,9	-2,2	-10,8

Benefits of an Additional RES Target

Second-Best Means for CO_2 Mitigation?

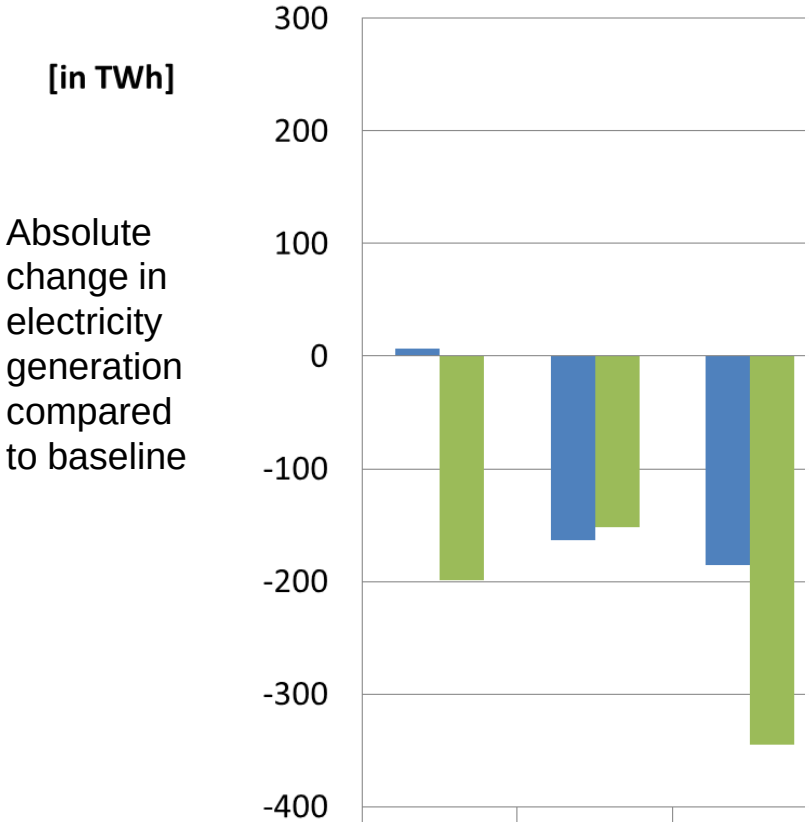
- Additional RES target brings down CO_2 price if addressed by additional RES instrument
- Makes attainment of CO_2 target more likely from a politico-economy perspective (Gawel et al. 2014)



	2015	2020	2025	2030
S1 (CO2/ETS only)	8	19	44	100
S3 (CO2 and RES-E1)	10	17	30	53

Benefits of an Additional RES Target

Second-Best Means for Environmental Protection?

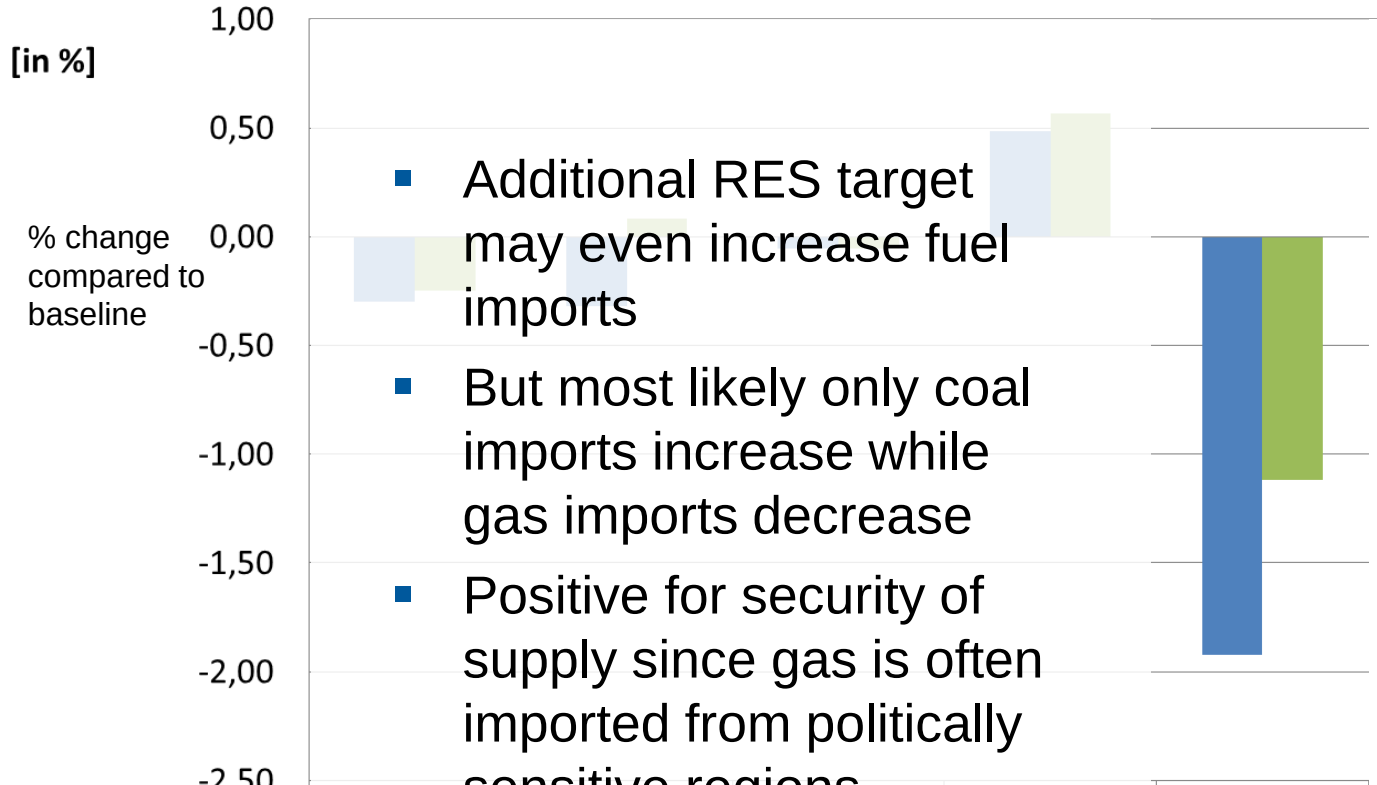


	Nuclear	Coal	CCGT
S1 (CO2/ETS only)	7	-163	-186
S3 (CO2 and RES-E1)	-199	-152	-346

- Ambiguous effects
  - Nuclear is further reduced
  - Coal increases, gas decreases
- Explanations:
  - Reduced elec. consumption
  - „Green serves the dirtiest“

Benefits of an Additional RES Target

Second-Best Means for Energy Security?



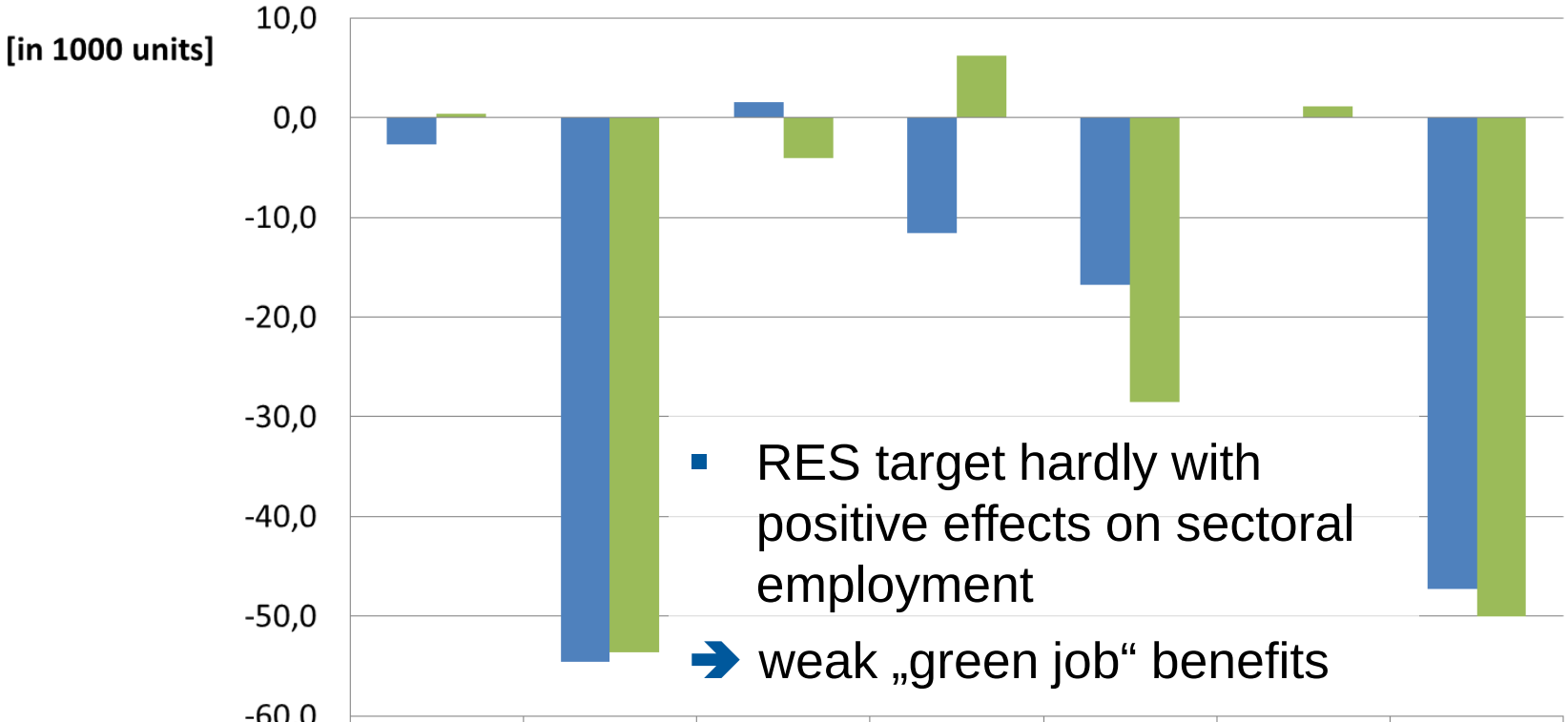
- Additional RES target may even increase fuel imports
- But most likely only coal imports increase while gas imports decrease
- Positive for security of supply since gas is often imported from politically sensitive regions

	GDP	Investment	Employ-ment	Consumer prices	EU imports of fossil fuels
S1 (CO2/ETS only)	-0,30	-0,32	-0,06	0,48	-1,92
S3 (CO2 and RES-E1)	-0,25	0,08	-0,06	0,57	-1,12

Benefits of an Additional RES Target

Beyond Efficiency: Changes in Employment

EU sectoral employment 2030 (absolute differences from baseline)



	Agri-culture	Utilities mining	Manuf. industry	Const-ruction	Distrib. and retails	Trans-port	Busin. services
S1 (CO2/ETS only)	-2,7	-54,6	1,6	-11,6	-16,8	0,1	-47,3
S3 (CO2 and RES-E1)	0,4	-53,6	-4,1	6,2	-28,5	1,1	-50,0

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Conclusions

- There are **multiple possible rationales** for implementing RES targets and instruments in addition to GHG targets and instruments in the EU.
- Quantitative assessment confirms several but not all **second-best benefits**.
- The economic assessment is constrained by **uncertainties** und hinges on **individual preferences** of the decision maker.
- Therefore, the **eventual decision** can only be **taken politically**.

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Thank you!

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