



PBL Netherlands Environmental
Assessment Agency

National measures complementary to EU ETS

Assessment of unilateral and
multilateral options

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EU ETS post-2020 revision

- Revision EU ETS Directive:
 - faster annual decrease in overall number of allowances (cap)
 - strengthening of the MSR
 - › doubling of intake rate MSR until 2023
 - › from 2023, allowances in the reserve above the total number of allowances auctioned during the previous year no longer valid
- Nevertheless EU ETS not in alignment with Paris agreement
 - and impact on prices **not sufficiently** contributing to **national targets** and long-term ambitions of several member states ...
 - ... so continuation of debate on additional measures at national level



National measures complementary to EU ETS

- Inefficient and ineffective drawbacks at EU-scale
 - relocation of emissions as economic activities (e.g. power production) move to other countries
 - **'waterbed effect': as long as total number of permits within EU ETS is unchanged, emissions may still occur at any place/time**
- Generic competitiveness concerns (intra-EU and internationally)

Can these drawbacks be mitigated when taking complementary measures within a coalition of countries?

At the background: ETS

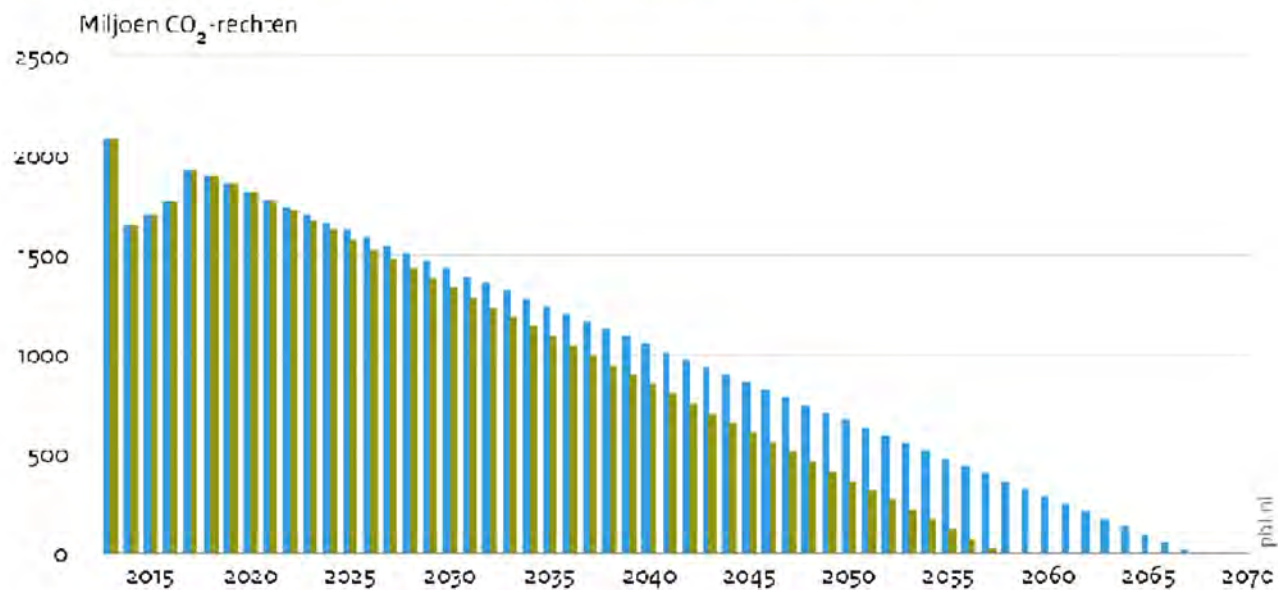
- EU ETS splits CO₂ emissions in ETS and non-ETS sectors
- In
- Use
- Int



I Linear reduction factor cap from 1,74 to 2,2%

Figuur 1

Jaarlijks aanbod van emissierechten in het EU ETS vanaf 2013



■ Lineaire reductiefactor 1,74%
■ Lineaire reductiefactor 2,2%

1,74% = 38 Mton/jr
2,2% = 48 Mton/jr

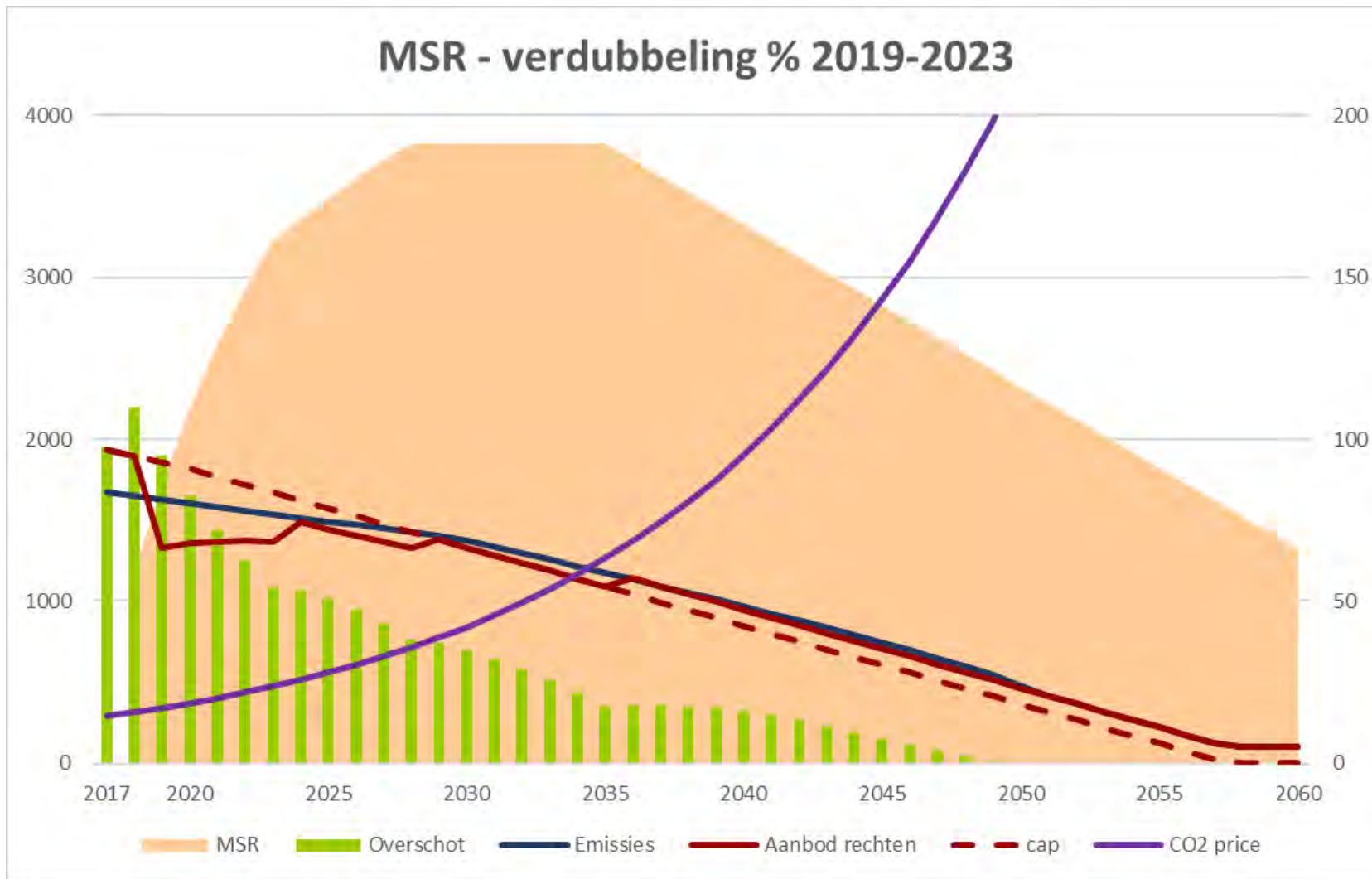


II The Market stability Reserve (MSR)

- Initial design MSR per 2019:
 - 12% of oversupply in market (if >833 mln) to MSR
 - If oversupply is <400 mln => 100 mln/yr auctioned from MSR
 - Market stability Reserve (MSR)
- Changes in design after EU ETS package dec 2017:
 - 2019-2023: 24% to MSR
 - As of 2023: MSR may not be larger than the amount of auctioned rights in previous year
- Impacts:
 - Higher % reduces bank much faster
 - Reducing MSR reduces waterbed effect until 2030

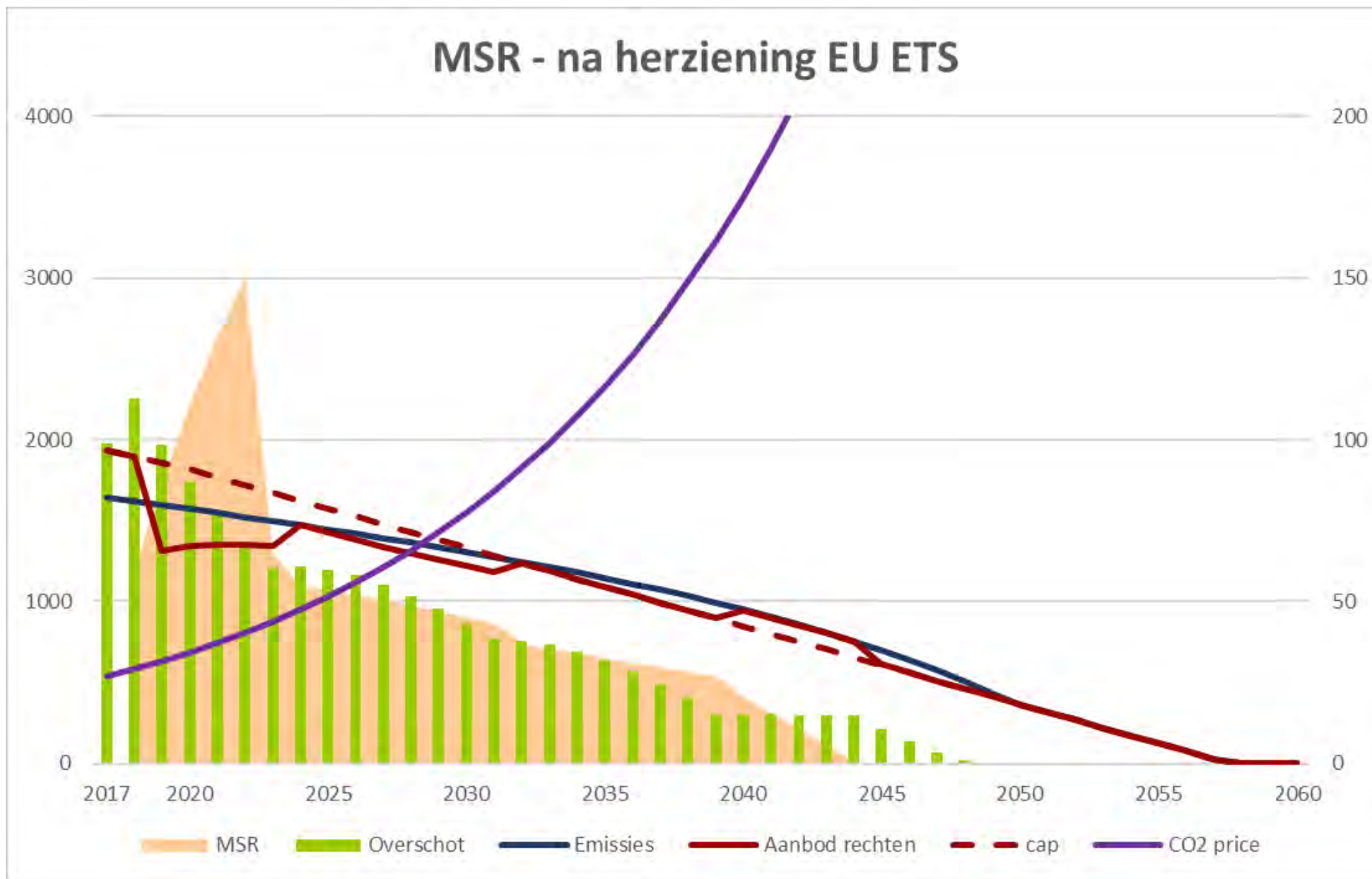


MSR - verdubbeling % 2019-2023





MSR - na herziening EU ETS





Complementary measures in the Netherlands

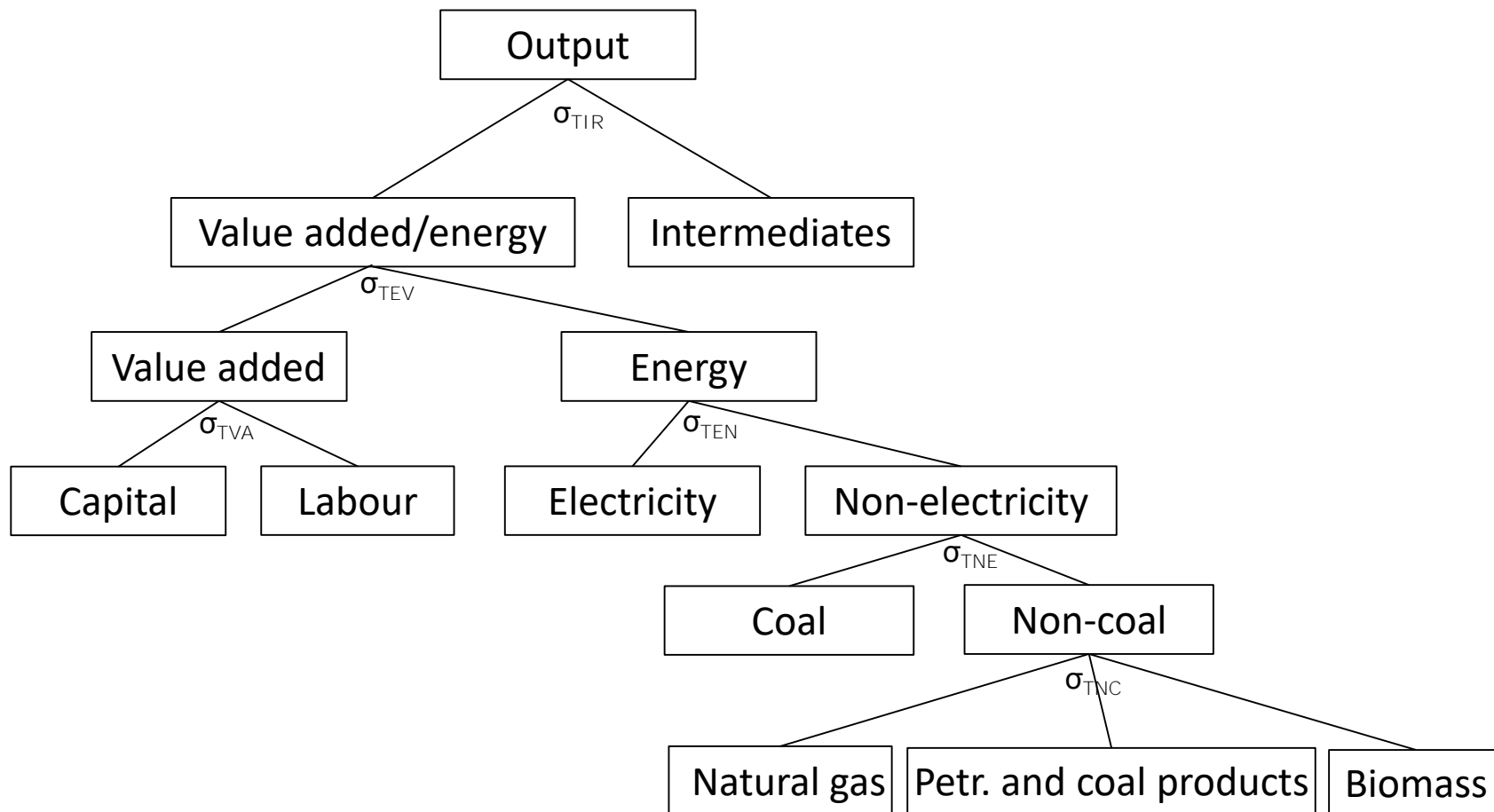
- Dutch government aims to raise the level of climate ambition
 - GHG emission reduction 2030: -49%
 - closure of five existing coal power plants by 2030 (5 GW)
 - carbon floor price for electricity sector:
increasing from €18 (2020) to €43/ton (2030)
- PBL studies
 - impacts on European electricity market (partial equilibrium model)
 - › emission reduction mainly because of coal shut-down
 - › relocation of generation and emissions to neighbouring countries
 - macro-economic impacts (general equilibrium model)
 - › carbon floor price also for industry within EU ETS
 - › alternative options to prevent increasing emissions elsewhere
 - › unilateral policy vs. coalition



Methodology

- Analysis by WorldScan:
 - Global computable general equilibrium (CGE) model to consider
 - › Indirect effects in the economy
 - › Impact on international trade
 - › **Domestic and international emissions (incl. 'emissions leakage')**
 - most relevant features of EU ETS included:
 - › supply of allowances over time and distribution over countries
 - › possibility of banking allowances, market stability reserve
- Reference scenario:
 - **Revised EU ETS Directive (LRF 2.2% and changes to MSR)...**
 - **... plus effect of 2030 energy targets**
 - › renewables (27%)
 - › energy efficiency (30%)

Production structure WorldScan



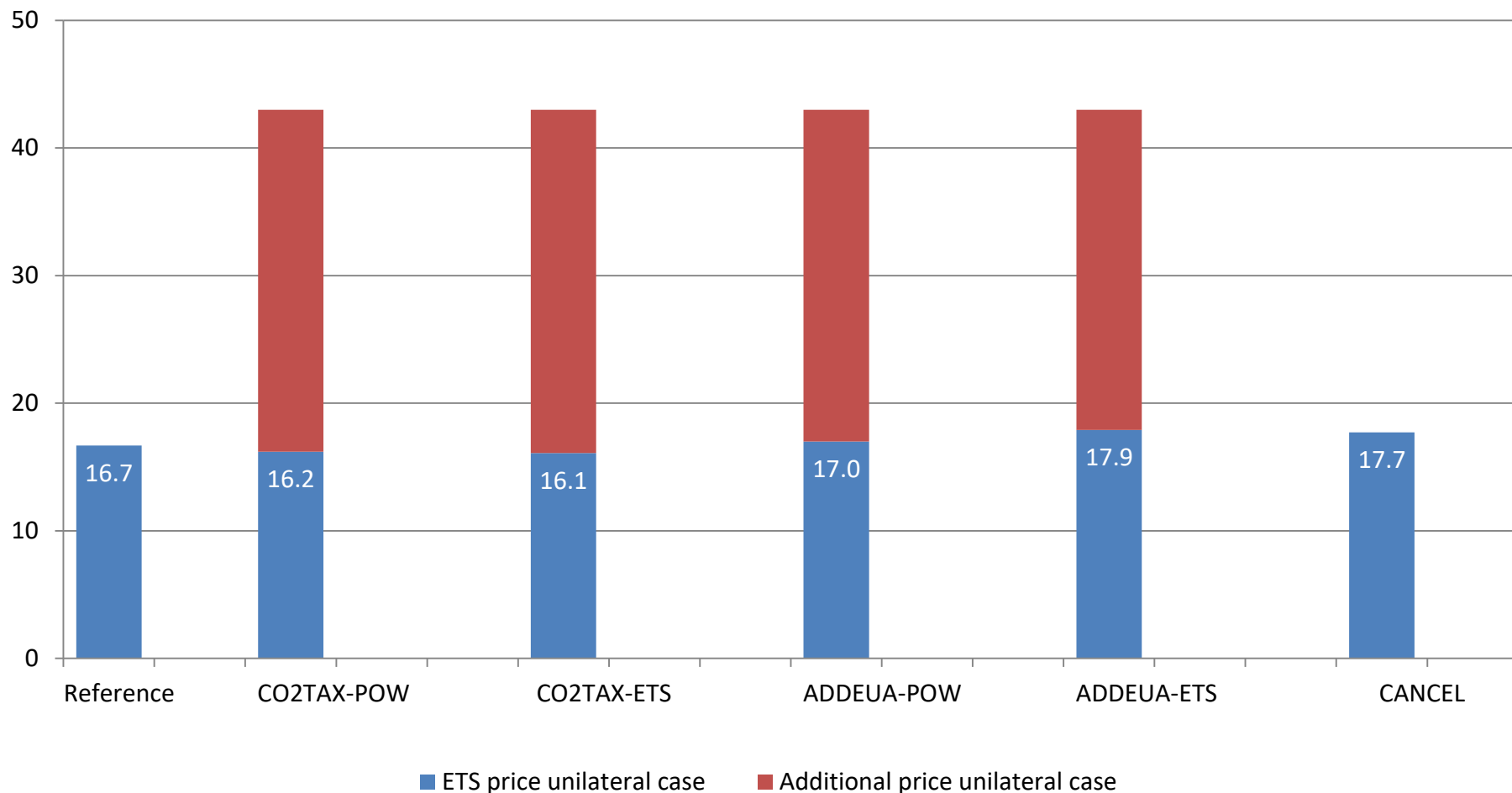


Complementary national measures

- **Carbon price floor increasing to €43/tCO₂ in 2030**
 - by **carbon tax** in addition to EU ETS price
 - › for **power sector** only – CO2TAX-POW
 - › for **all ETS sectors** – CO2TAX-ETS
 - by **additional permits** to be surrendered
 - › by **power sector** only – ADDEUA-POW
 - › by **all ETS sectors** – ADDEUA-ETS
- Buy and **cancel allowances** – CANCEL
- Unilateral or coalition of countries:
 - Netherlands only
 - Germany, France and Benelux

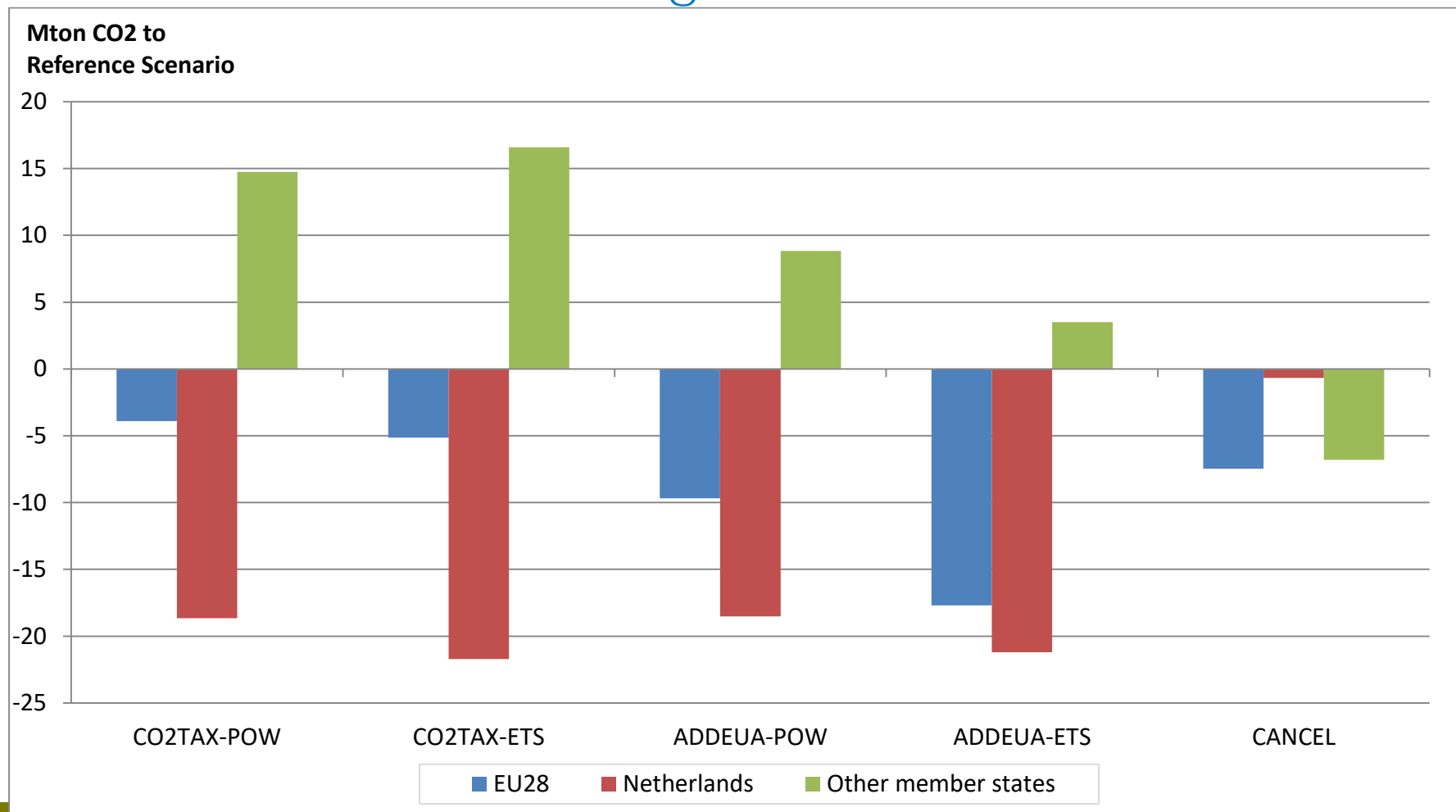


Unilateral case – CO₂ prices 2030



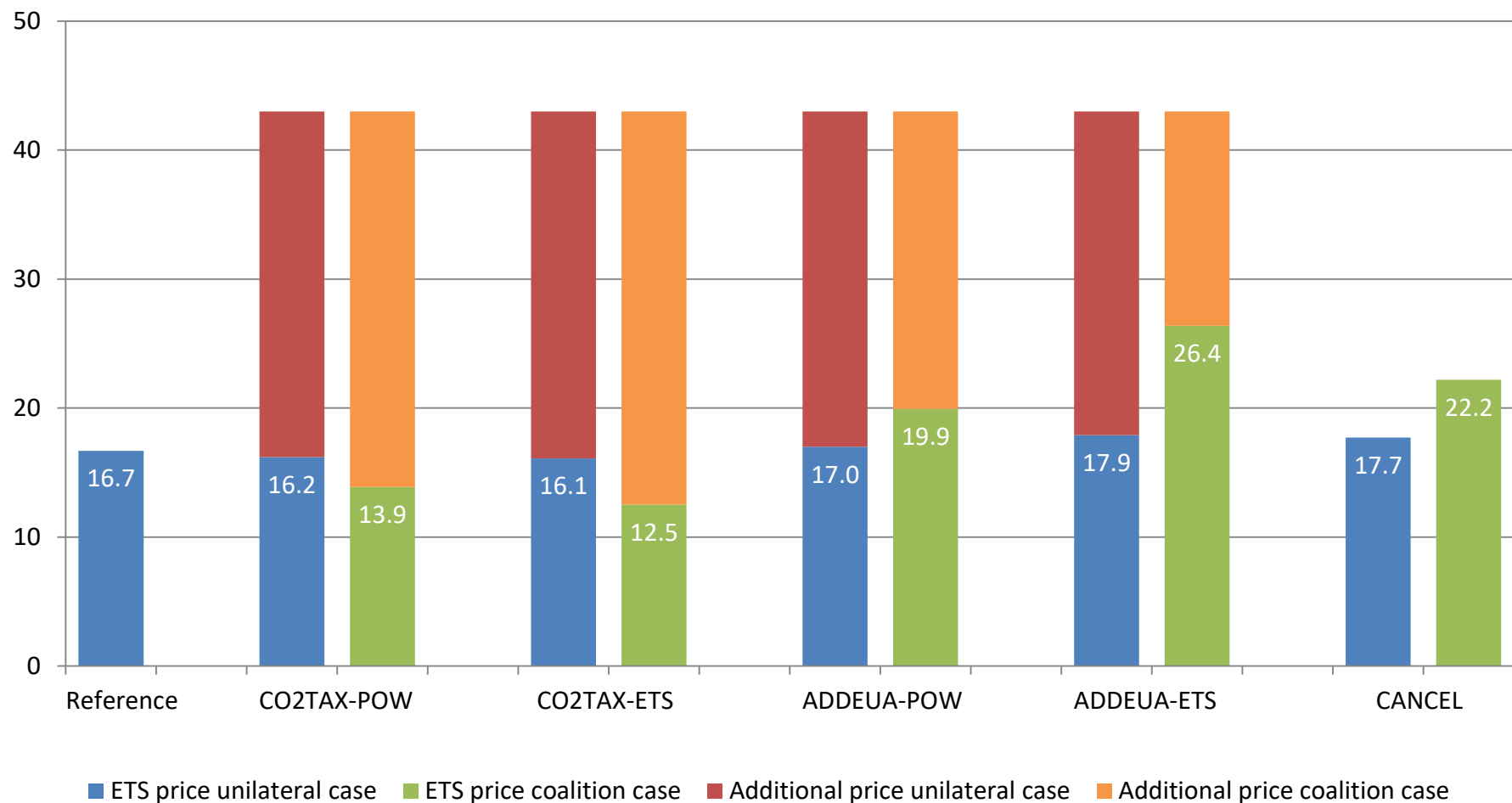


Unilateral case – change in GHG emissions 2030



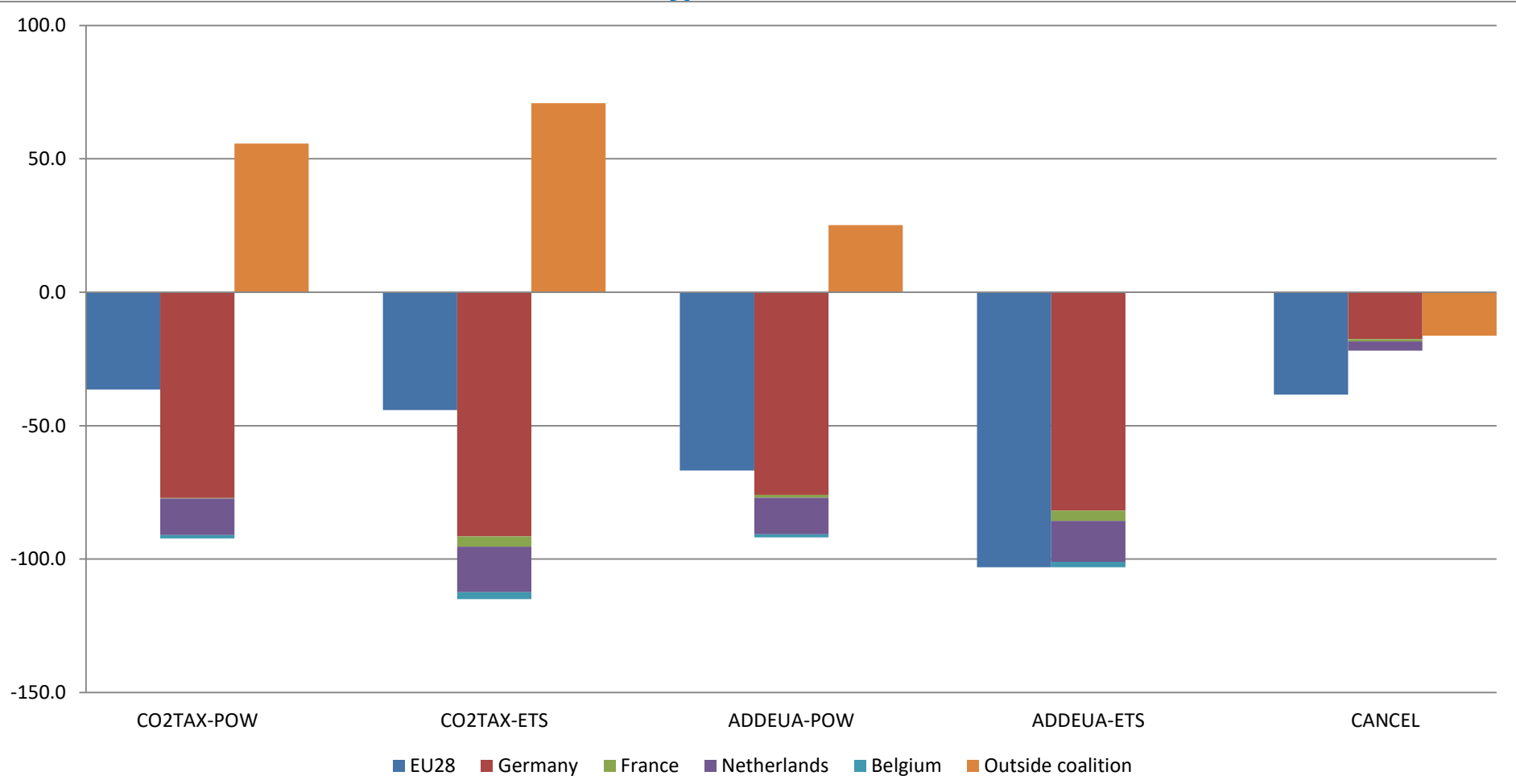


Unilateral vs Coalition case – CO₂ prices 2030



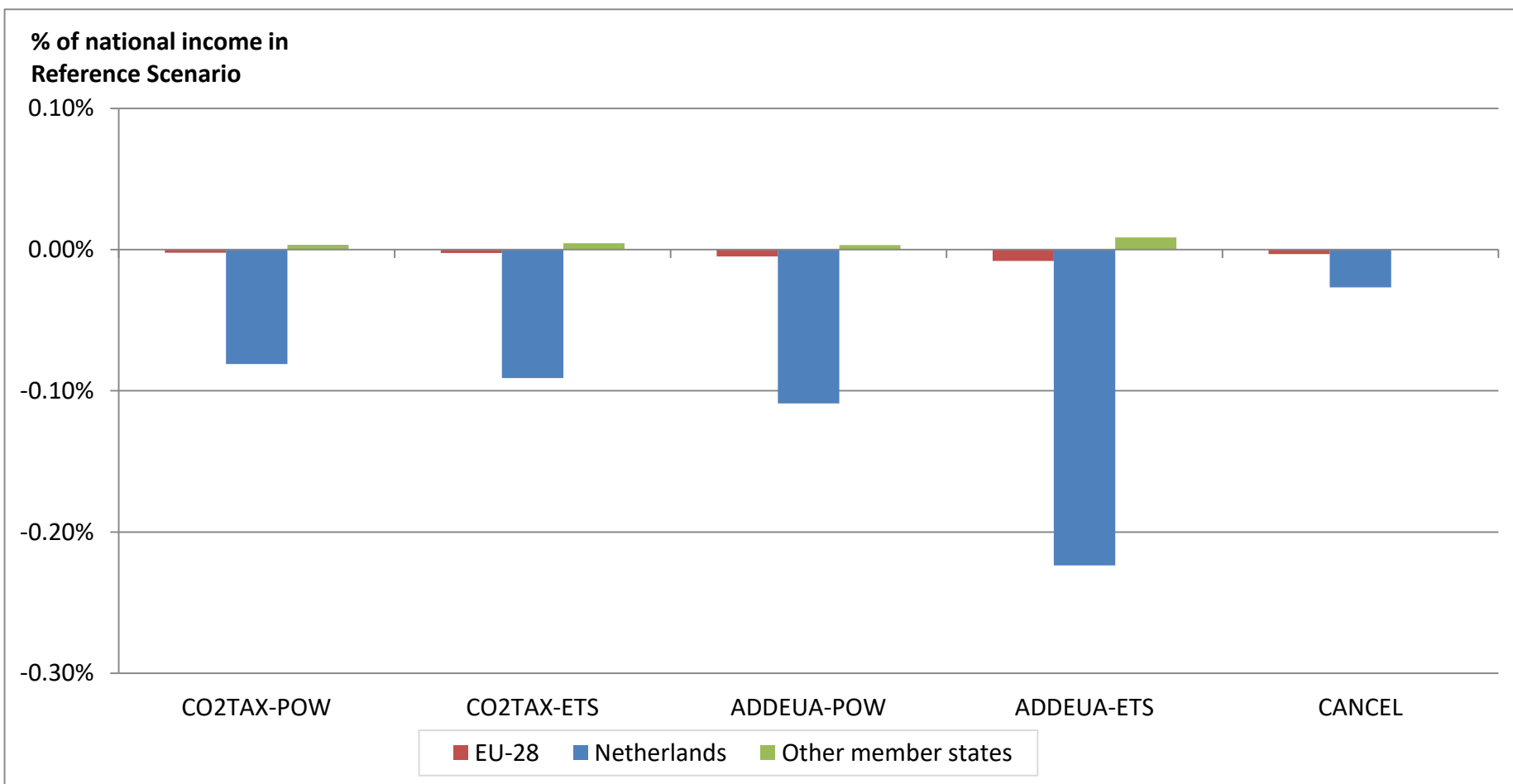


Coalition case – change in GHG emissions 2030





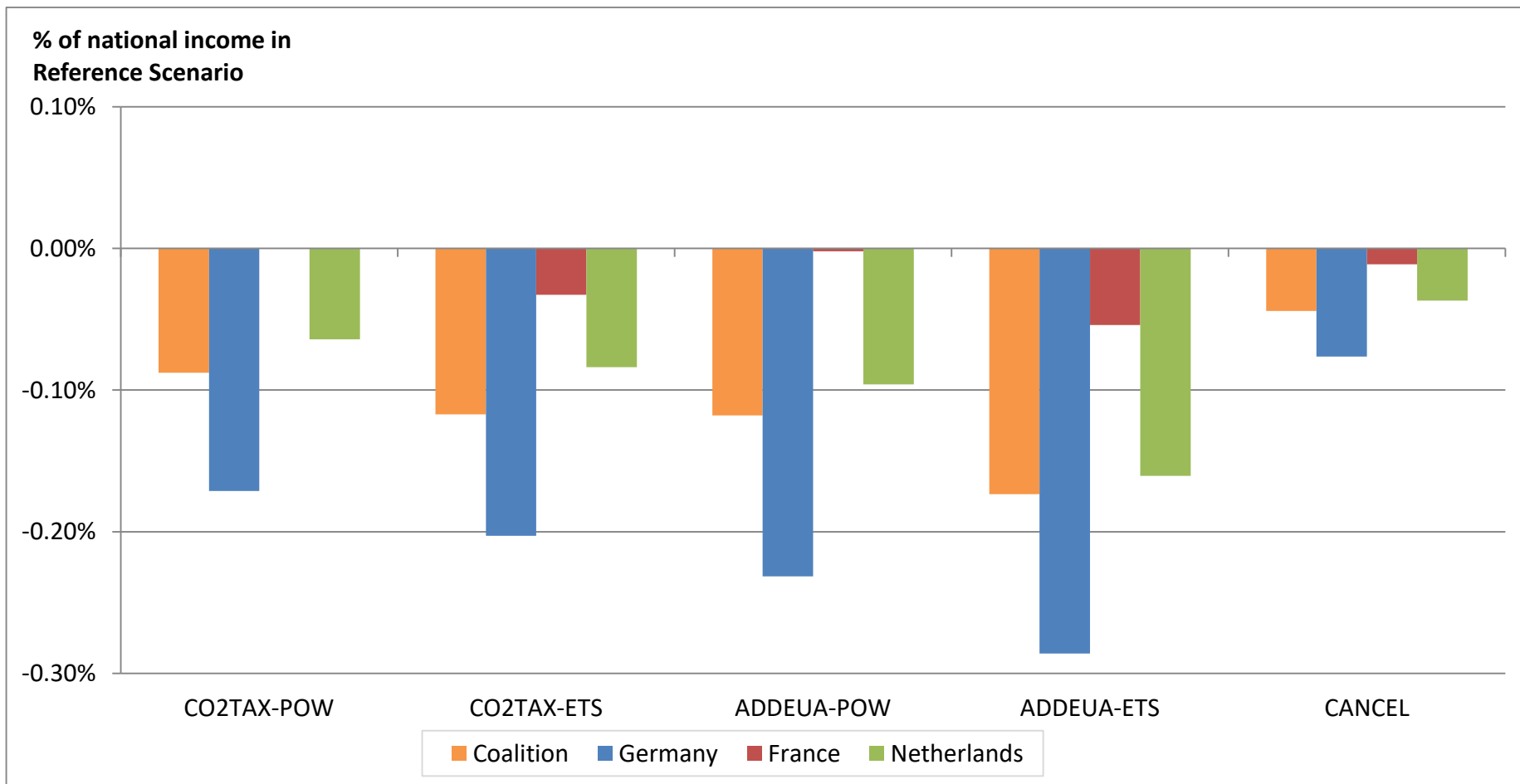
Unilateral case – compliance costs 2030*



* Hicksian equivalent variation measured as a percentage income change relative to the Reference Scenario (see Brink et al., 2016, Energy Policy 97)



Coalition case – compliance costs 2030*





Unilateral case – average cost per ton CO₂

Compliance cost to domestic emission reduction (euro per ton CO₂)

	CO2TAX- POW	CO2TAX- ETS	ADDEUA- POW	ADDEUA- ETS	CANCEL
Netherlands	45	43	60	108	413

Coalition case – average cost per ton CO₂

Compliance cost to domestic emission reduction (euro per ton CO₂)

	CO2TAX- POW	CO2TAX- ETS	ADDEUA- POW	ADDEUA- ETS	CANCEL
Coalition	92	98	124	162	192
Germany	93	93	128	147	183
France	16	305	76	505	460
Netherlands	48	50	72	107	109



Average cost per ton CO₂ – domestic vs EU-wide reduction

Compliance cost to domestic emission reduction (euro per ton CO₂)

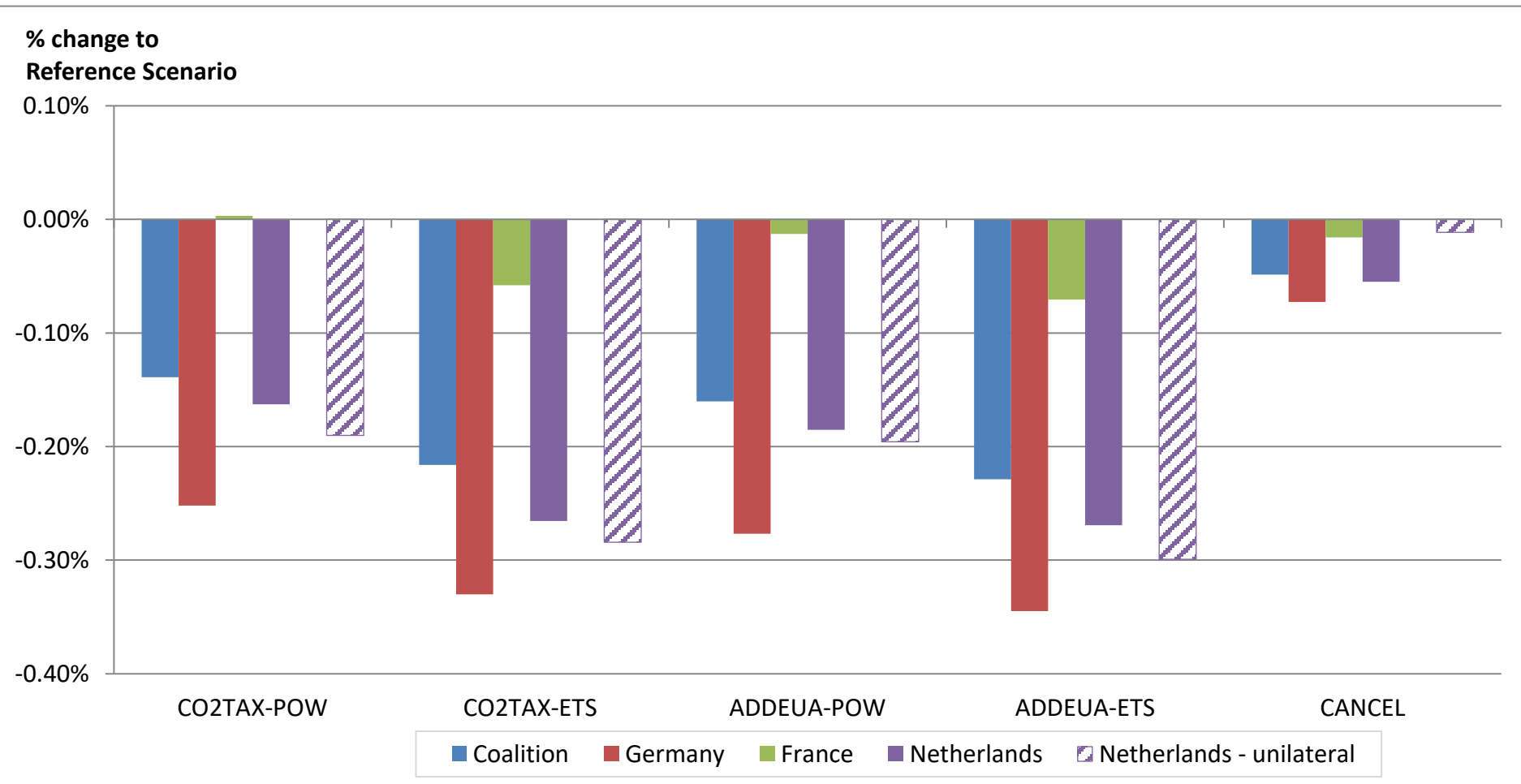
	CO2TAX- POW	CO2TAX- ETS	ADDEUA- POW	ADDEUA- ETS	CANCEL
Netherlands - unilateral	45	43	60	108	413
Netherlands - coalition	48	50	72	107	109

Compliance cost related to EU28 emission reduction (euro per ton CO₂)

	CO2TAX- POW	CO2TAX- ETS	ADDEUA- POW	ADDEUA- ETS	CANCEL
Netherlands - unilateral	213	182	116	130	37
Coalition overall	232	256	170	162	111

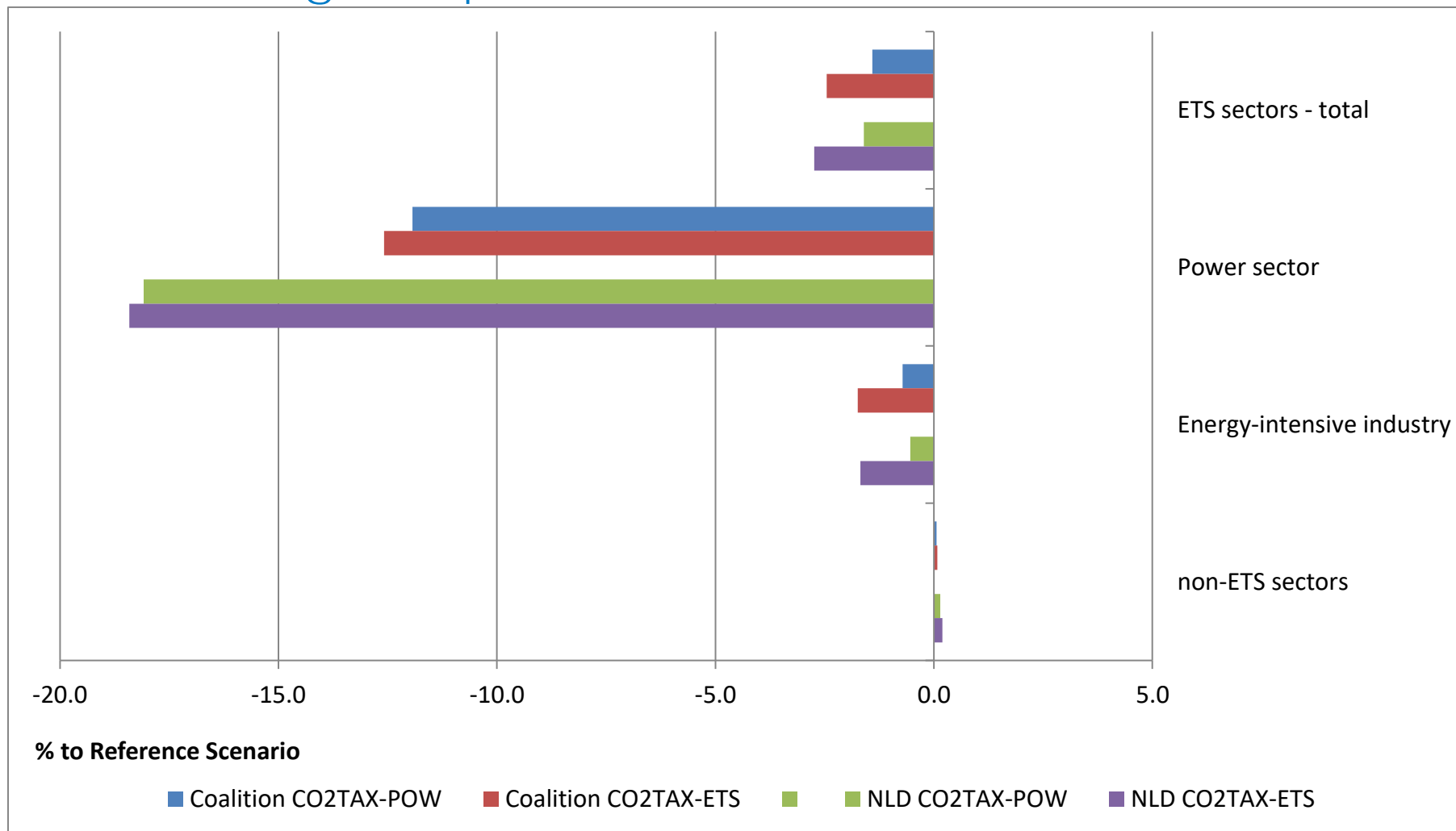


Change in GDP 2030





Change in production Dutch sectors 2030

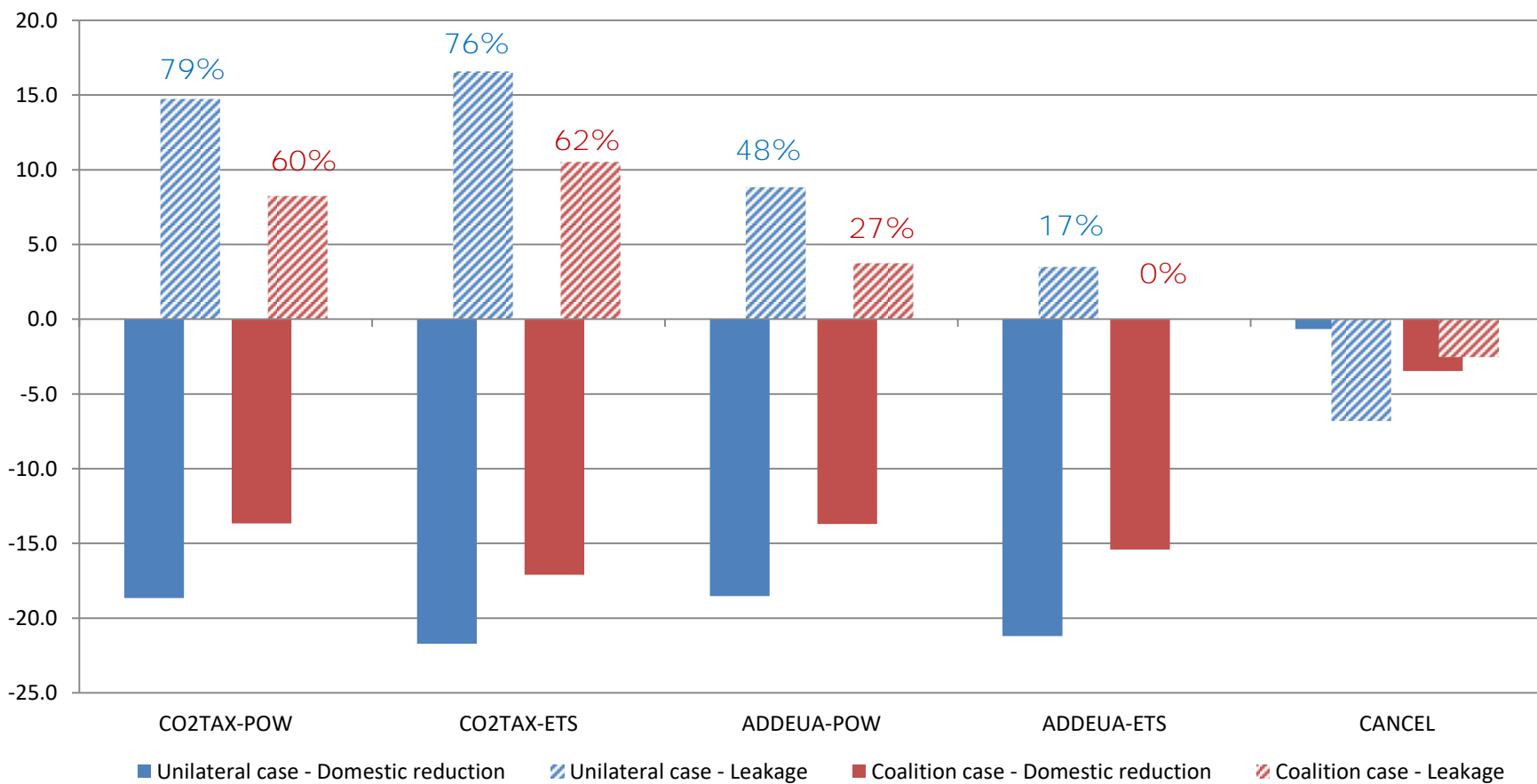




Compare various options for the Netherlands

Change in GHG emissions NL 2030

Mton CO2





Findings

- **not one unambiguous 'most cost effective' option**
but trade-offs:
 - emission reduction vs costs
 - domestic reduction vs reduction EU wide
- including industry:
 - larger emission reductions, larger economic impact
- unilateral vs coalition:
 - less domestic emission reduction...
 - ...but smaller leakage rates and lower cost
- relatively high costs in Germany
 - CO₂-intensive power sector compared to France
 - lower existing energy taxes compared to the Netherlands

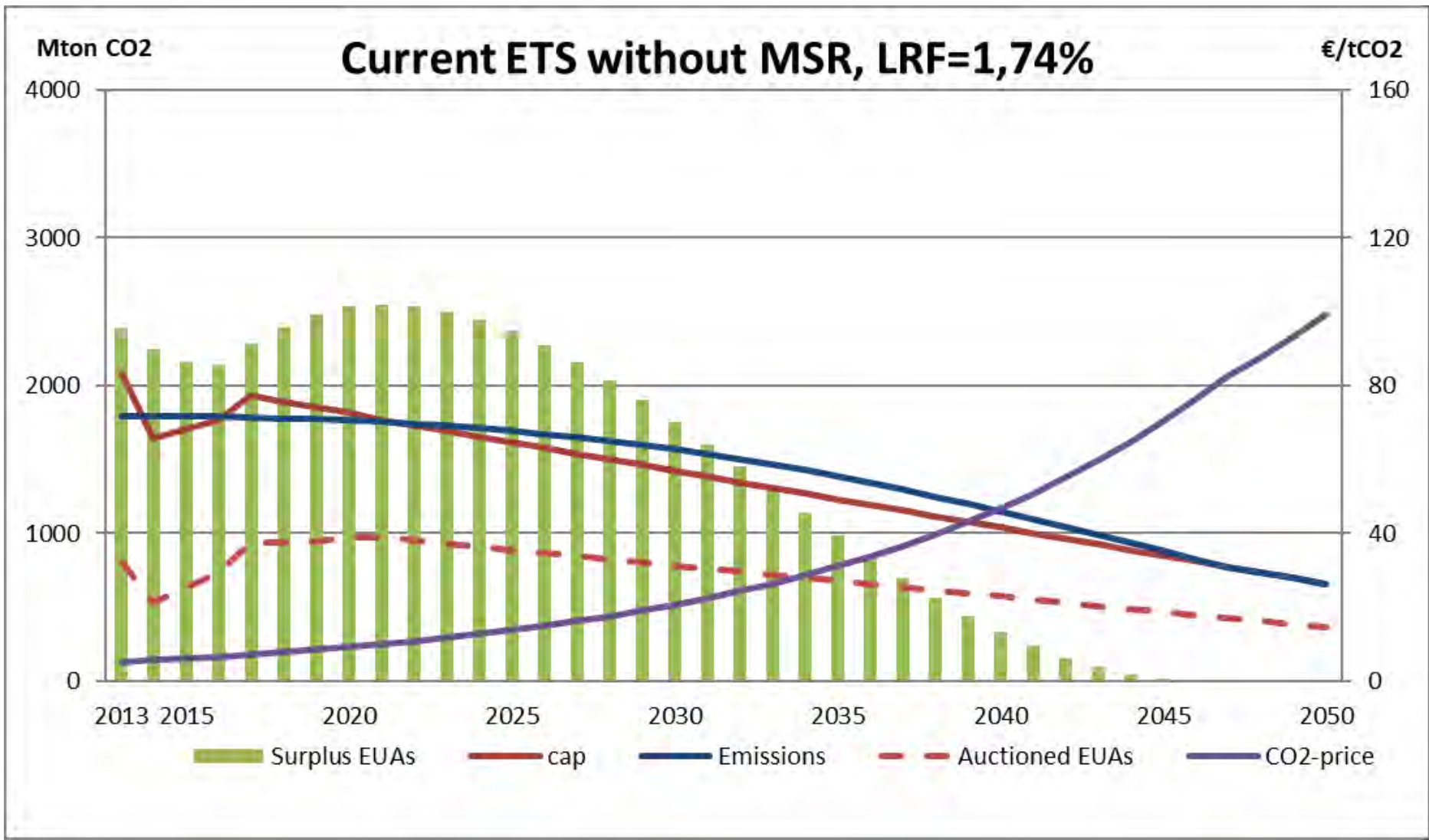


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<https://www.tilburguniversity.edu/webwijs/show/h.r.j.vollebergh.htm>



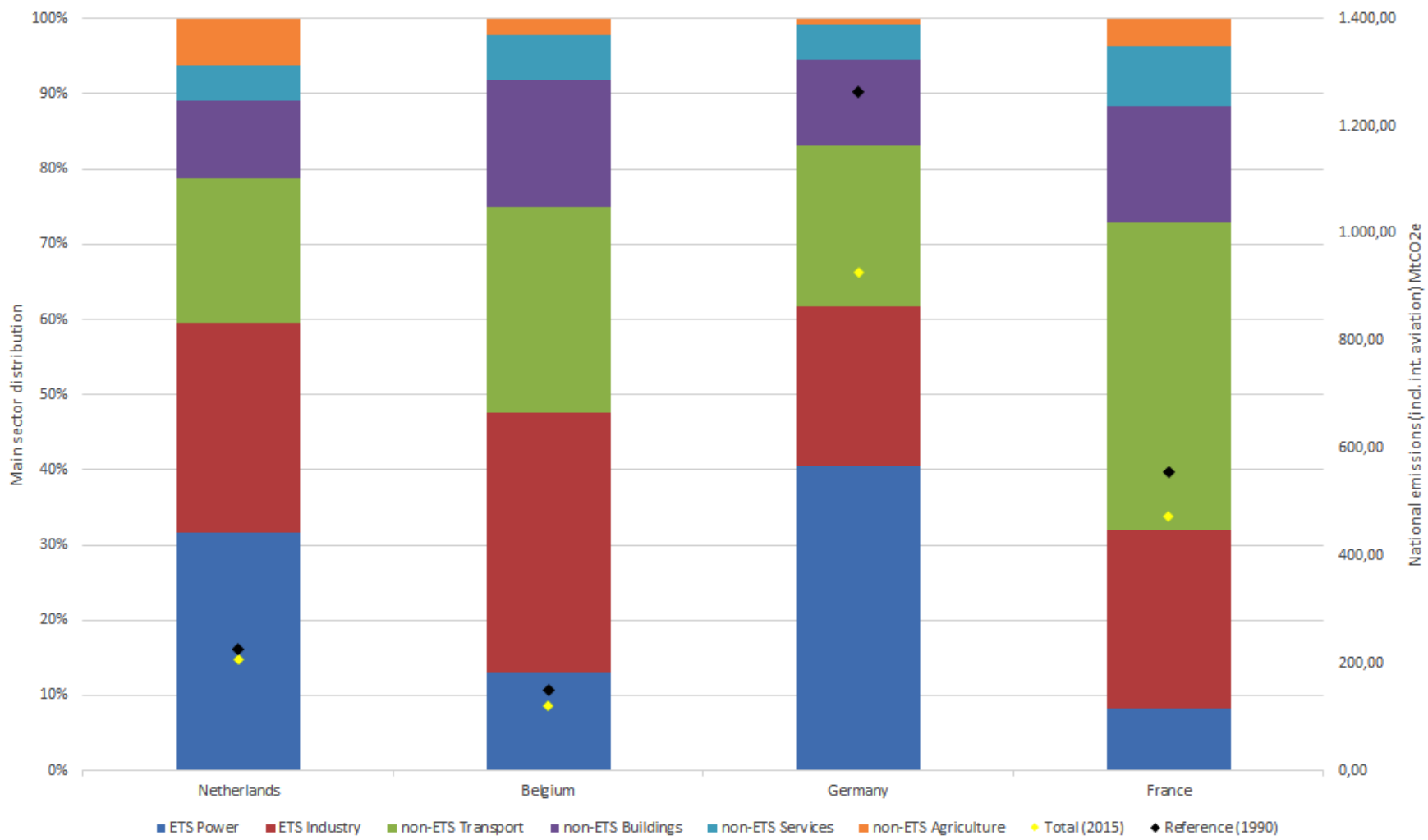


Discussion

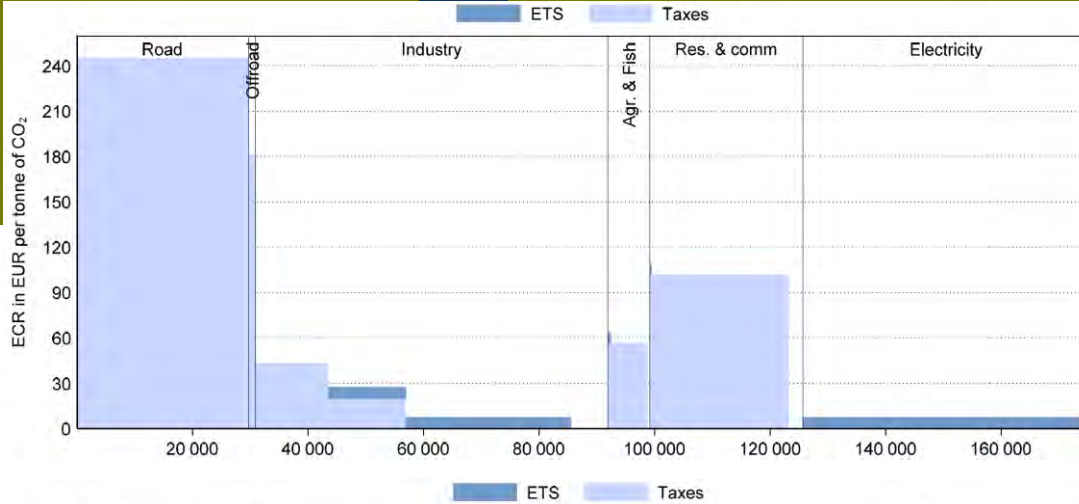
- model used: WorldScan
- strengths
 - indirect effects => other sectors and household consumption
 - impact on international trade => relocation of economic activities
 - emissions trading => waterbed effect, banking
 - closed accounts => different impact of taxes and permits
- weaknesses
 - representation of electricity market
 - **abatement through substitution, no 'technical measures'**
- further research
 - sensitivity analysis -> higher price ETS in Reference Scenario
 - more in-depth analysis of sector impacts in the Netherlands



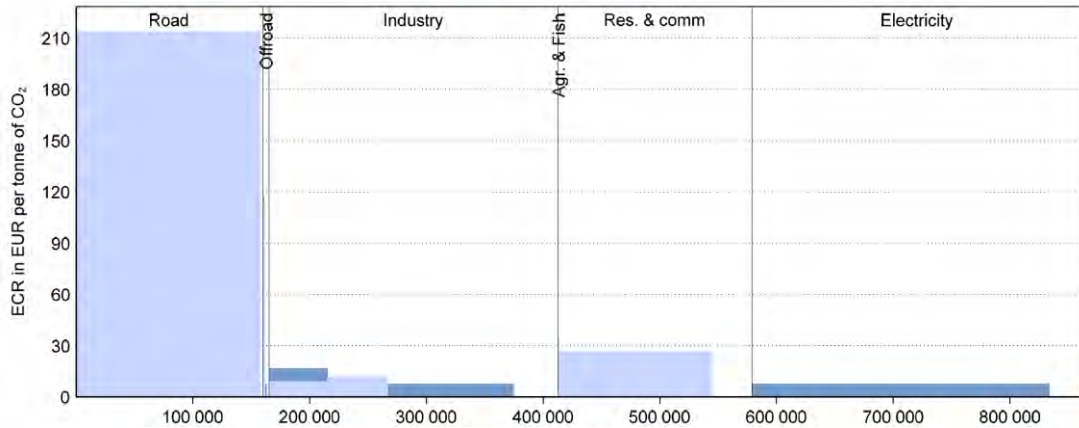
Greenhouse gas emissions 2015



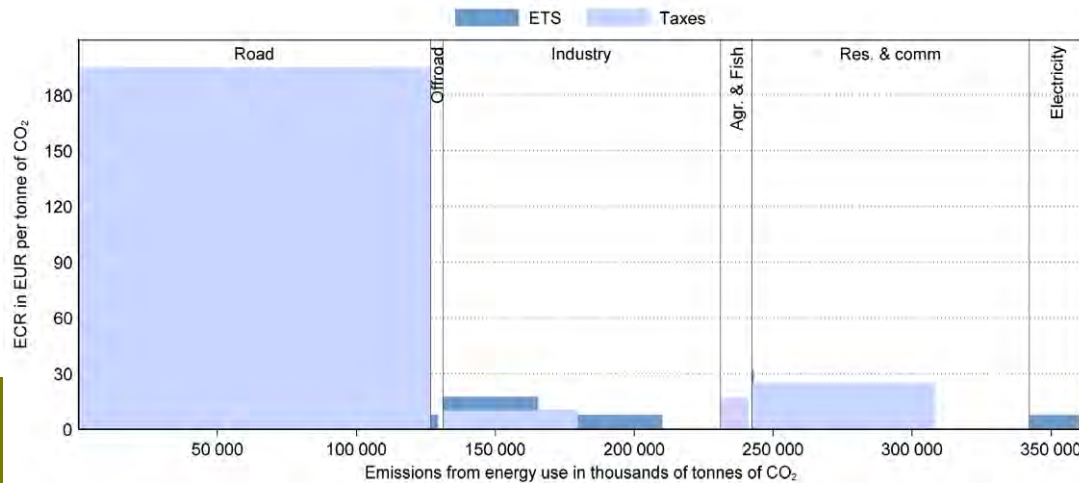
Netherlands



Germany



France





Effects electricity sector – unilateral case

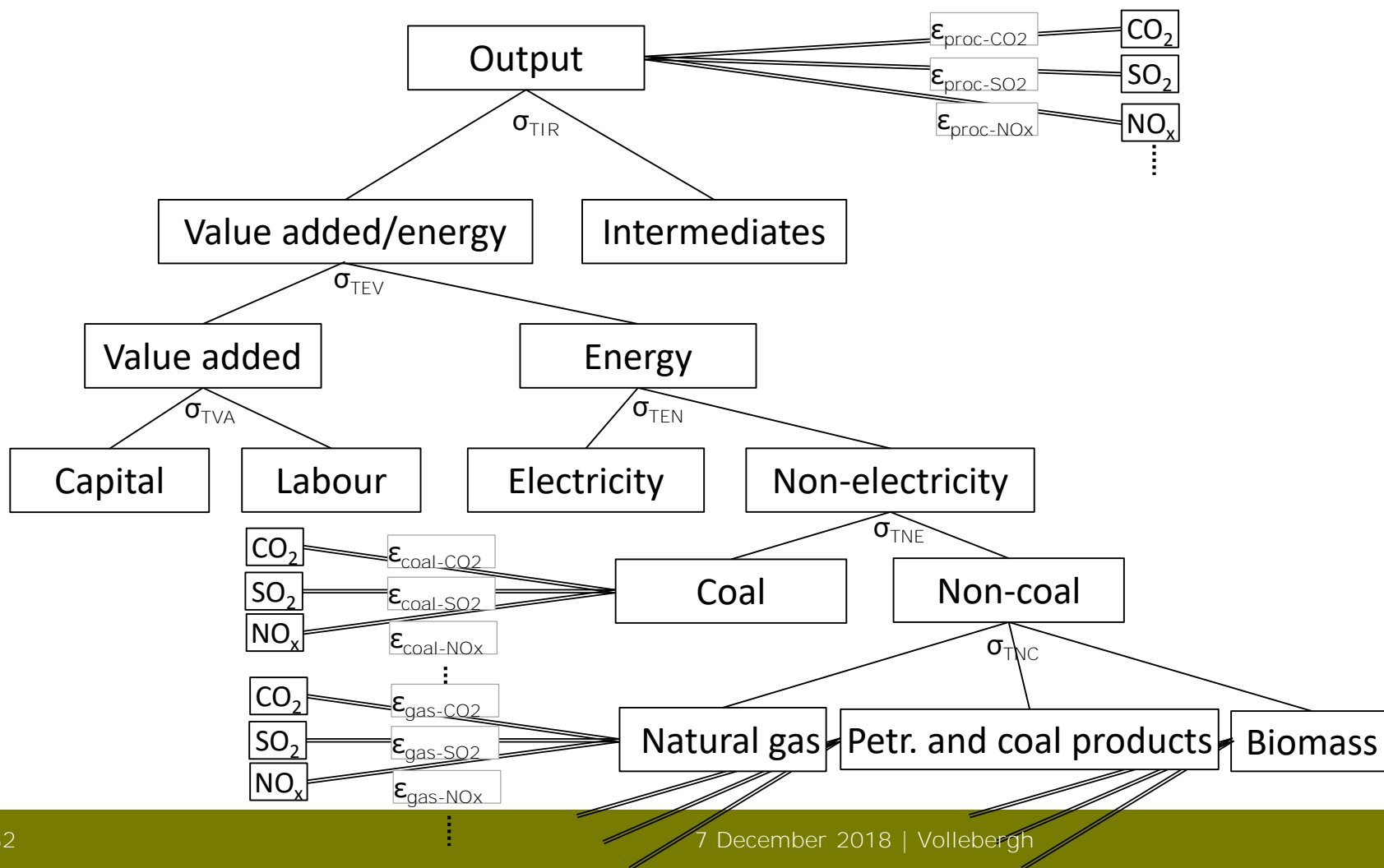
Analysis of changes in power sector NL		Unilateral case:				
	Reference scenario	CO2TAX-POW	CO2TAX-ETS	ADDEUA-POW	ADDEUA-ETS	CANCEL
Δ demand - firms		-3.8%	-4.5%	-3.8%	-4.5%	-0.2%
Δ demand - households		-5.3%	-5.2%	-5.4%	-5.6%	-0.3%
Δ demand - total		-4.0%	-4.6%	-4.0%	-4.7%	-0.2%
Δ production NL		-18.1%	-18.4%	-17.8%	-17.7%	-0.4%
Δ production D		1.5%	1.5%	1.1%	0.6%	-0.5%
Δ production F		0.0%	0.0%	0.0%	-0.1%	0.0%
Δ production UK		0.9%	0.9%	0.7%	0.5%	-0.2%
Δ import		35.2%	34.2%	33.8%	31.3%	0.0%
Δ export		-33.2%	-33.0%	-32.6%	-31.8%	-0.7%
Renewables share	18.6%	21.4%	21.7%	21.4%	21.5%	18.6%
Δ price electricity NL		6.2%	6.1%	6.2%	6.2%	0.3%
Δ price electricity D		0.0%	0.0%	0.3%	0.5%	0.3%



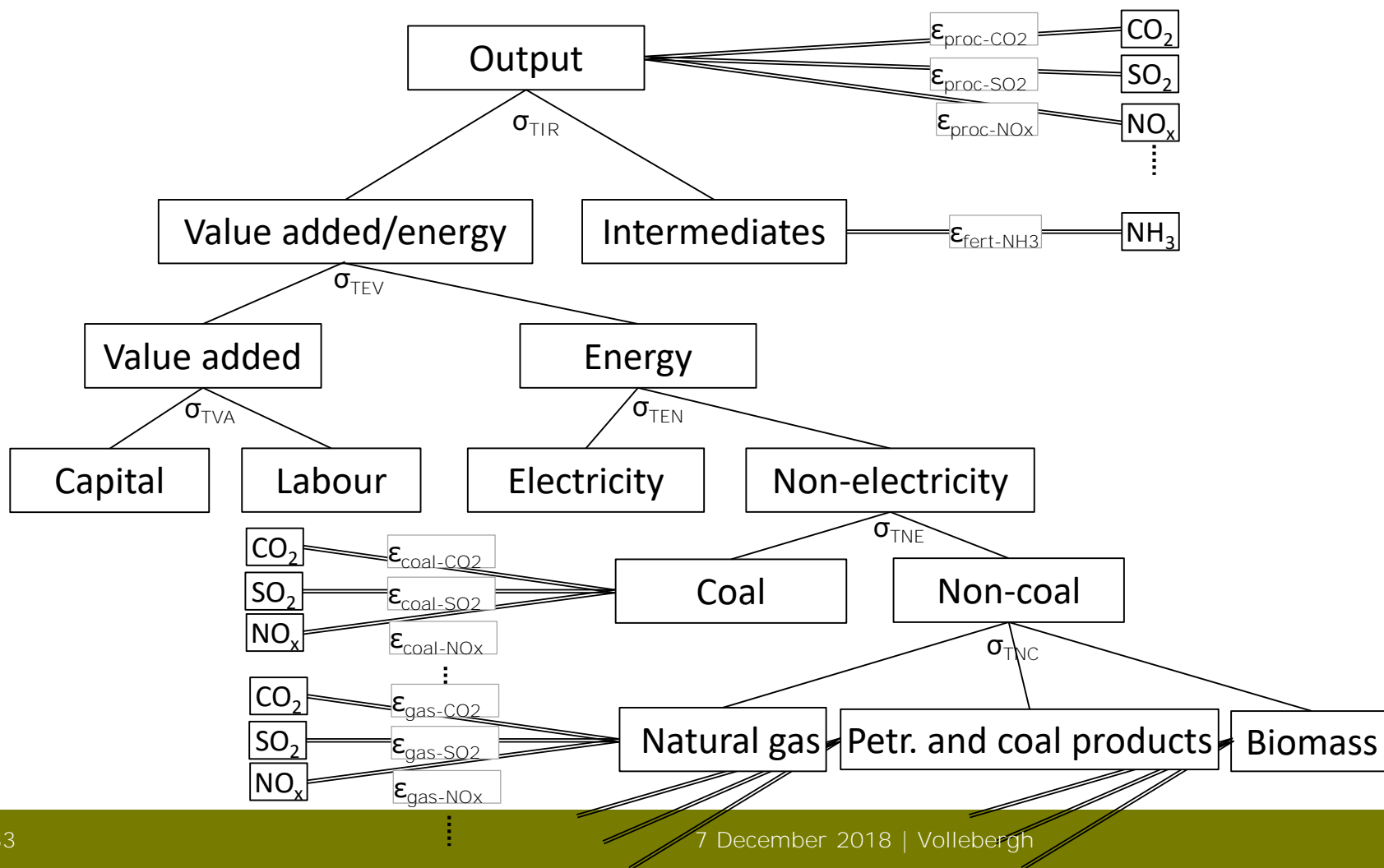
Effects electricity sector – coalition case

Analysis of changes in power sector NL		Coalition case:				
	Reference scenario	CO2TAX-POW	CO2TAX-ETS	ADDEUA-POW	ADDEUA-ETS	CANCEL
Δ demand - firms		-4.2%	-4.8%	-4.3%	-4.7%	-1.1%
Δ demand - households		-6.0%	-5.9%	-6.3%	-6.5%	-1.6%
Δ demand - total		-4.5%	-5.0%	-4.6%	-5.0%	-1.2%
Δ production NL		-11.9%	-12.6%	-11.2%	-10.6%	-2.1%
Δ production D		-14.9%	-15.3%	-13.9%	-13.0%	-2.4%
Δ production F		-0.1%	-0.1%	-0.2%	-0.3%	-0.1%
Δ production UK		2.6%	2.9%	1.1%	-0.4%	-0.9%
Δ import		11.4%	11.5%	8.7%	5.8%	0.1%
Δ export		-20.8%	-21.5%	-19.4%	-18.0%	-3.5%
Renewables share	18.6%	20.1%	20.4%	20.0%	20.0%	18.8%
Δ price electricity NL		7.1%	7.0%	7.2%	7.3%	1.7%
Δ price electricity D		6.8%	6.6%	6.9%	7.1%	1.7%

Production structure WorldScan

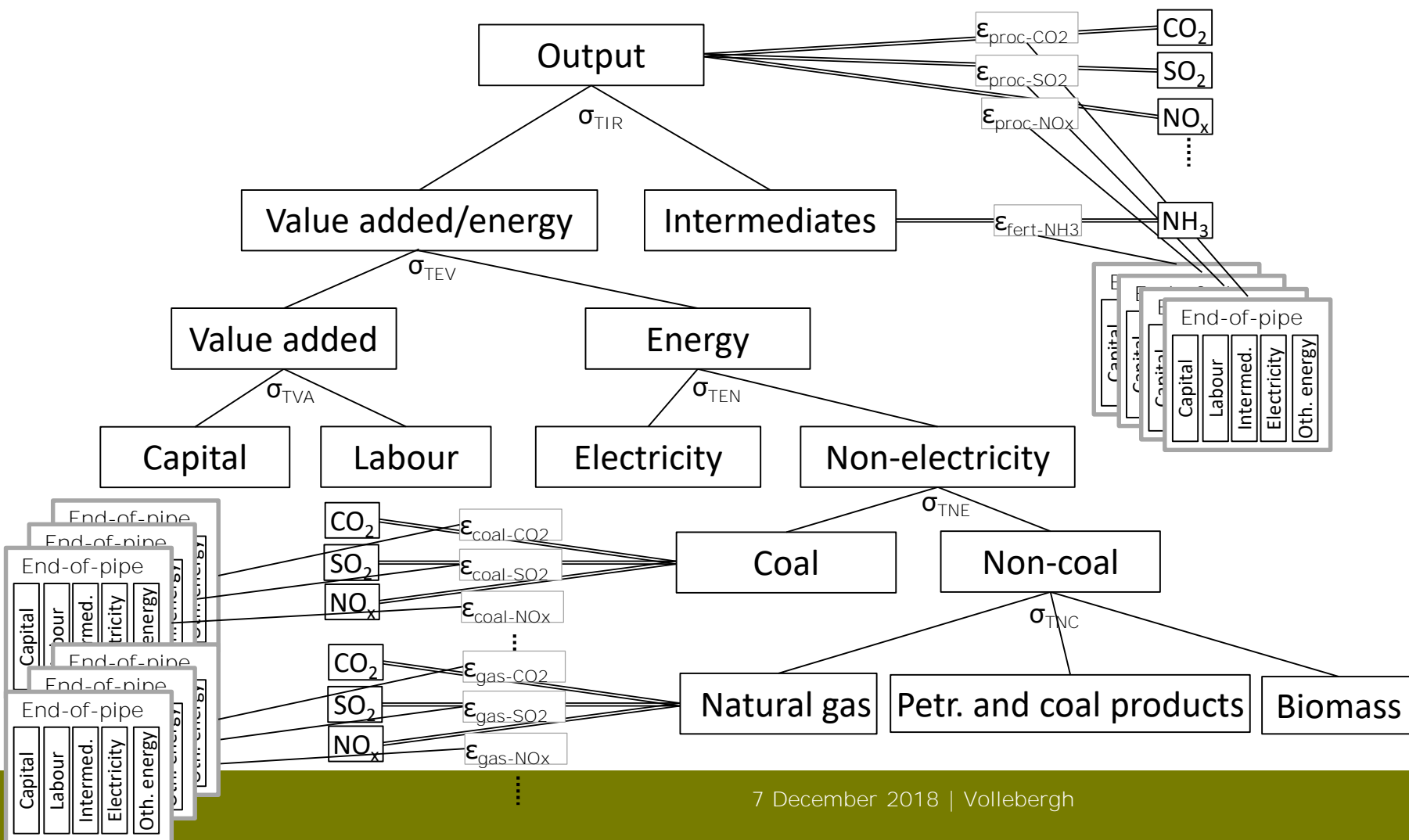


Production structure WorldScan





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Production structure WorldScan

