



National policies complementary to EU ETS

Assessment of unilateral and multilateral options

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Introduction

- The new Dutch coalition 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 in the electricity sector reaching to €43/ton in 2030
- Study on impacts for electricity market (partial equilibrium model)
 - Coal shut-down vs. carbon floor price
 - Unilateral approach vs. coalition
 - Impacts on the Netherlands and the neighbouring countries
 - > generation-mix, imports/exports, CO₂ emissions, market prices
- Macro-economic impacts (general equilibrium model)
 - Carbon floor price also for industry within EU ETS
 - Alternative options to prevent increasing emissions elsewhere



Background scenario 2030

- National Energy Outlook 2017
 - Existing policies (2017)
 - Strong growth of renewables in Europe
 - > ENTSO-E scenario (Vision 4)
 - Electricity consumption: BAU
 - > No demand response or electrification
 - Transmission network:
 - > ENTSO-E TYNDP 2016
 - Fuel prices: WEO2016 NPS
 - > Coal before gas
 - ETS-price: 17€/tCO2 in 2030
 - Netherlands is a net exporter of electricity in 2030



Generation Capacity (GW)

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Scenario variants for electricity market analysis

- Closure of coal power plants in the Netherlands
- A National floor price rising to 43 €/ton in
 2030
- Carbon floor price and closure of coal power plants in the Netherlands
 - Unilateral policy: carbon floor price in NL
 - Coalition: carbon floor price in NL, DE, FR, and BE





2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030



Hourly demand in NL

COMPETES Model

- a network constrained model of the European electricity market
- EU countries explicitly included
- Cross-border transmission
 - Net Transfer Capacities (NTC) between countries
- Wide-range of RES and conventional generation technologies
- Operation of daily storage
- Hourly resolution per node
 - Hourly profiles of demand
 - Hourly profiles for wind, solar, and hydro
- Optimization model cost minimisation
 - Generation expansion model (LP)
 - > Unit Commitment model (MIP)



Actual — Forecast

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IMPACT ON ELECTRICITY GENERATION (TWH)





IMPACT ON ELECTRICITY GENERATION IN OTHER COUNTRIES (TWH)

■ Other RES ■ Coal+Lignite ■ Gas



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Change in annual Net Imports w.r.t. Reference scenario

[TWh]	Coal-phase out	National CFP	Coal Phase-out & national CFP	Coalition	
The Netherlands	20	15	21	20	
Germany	-7	-6	-7	107	
Belgium	-2	-1	-2	1	
France	-1	-1	-1	5	
Other EU (excl. above)	-10	-7	-11	-133	



Impact on CO₂emissions

Difference in CO ₂ emissions w.r.t. NEV 2017 VV [Mton/year]	NL	DE	BE	FR	Outside Coalition area	Total
Coal Phase-out	-15	3	1	0	5	-6
National CFP	-11	3	0	0	5	-3
Coal Phase-out with national CFP	-16	3	1	0	6	-5
Coalition	-15	-76	-1	-5	82	-15

Unilateral policy:

- Emissions in the Netherlands decrease while emissions in rest of Europe increases
- Higher emission reduction is achieved by coal phase-out then national CFP
- In the hybrid scenario, the contribution of national CFP on emission reduction is small Coalition
- yields greater emission reduction in whole Europe
- the reduction in emissions in the Netherlands is similar to unilateral case



Macro-economic analysis - methodology

- Analysis by Global computable general equilibrium (CGE) model WorldScan:
 - Indirect effects in the economy
 - Impact on international trade
 - most relevant features of EU ETS included:
 - > supply of allowances over time and distribution over countries
 - > possibility of banking allowances
 - > MSR
- Additional assumptions Reference scenario:
 - Revised EU ETS Directive (LRF 2.2% and changes to MSR)
 - Including effect of 2030 energy targets currently being negotiated
 - > renewables (27%)
 - > energy efficiency (30%)
 - ETS-price: 22.6€/tCO2 in 2030



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
 - total annual budget 40% of auction revenues in Reference scenario
- Unilateral or coalition of countries:
 - Netherlands only
 - Germany, France and Benelux



Unilateral vs Coalition case – CO₂ prices 2030





Unilateral case – change in GHG emissions 2030



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Coalition case – change in GHG emissions 2030



Complementary national measures to the EU EIS



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	84	88	148	242	2227

Coalition case – average cost per ton CO_2

Compliance cost to domestic emission reduction (euro per ton CO2)							
	CO2TAX- POW	CO2TAX- ETS	ADDEUA- POW	ADDEUA- ETS	CANCEL		
Coalition	105	119	146	187	252		
Germany	110	117	157	180	265		
France	-	581	-	-	-		
Netherlands	93	97	143	214	339		

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Unilateral vs 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			
Netherlands - unilateral	84	88	148	242	2227			
Netherlands - coalition	93	97	143	214	339			

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

	CO2TAX- POW	CO2TAX-ETS	ADDEUA- POW	ADDEUA- ETS	CANCEL
Netherlands - unilateral	350	420	128	236	56
Coalition overall	233	287	222	206	81



Findings

- national policies result in relocation of production and emissions which can be reduced by
 - alternative design of policies
 - forming a coalition
- not one unambiguous `most cost effective' option but trade-offs:
 - emission reduction vs costs
 - domestic reduction vs reduction EU wide
- including industry: small effect on emissions, costs increase => increased cost per ton CO₂
- relatively high costs in Germany
 - CO2-intensive power sector compared to France
 - relatively low existing energy taxes compared to the Netherlands