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    › from 2023, allowances in the reserve above the total number of allowances auctioned during the previous year no longer valid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
- Used
- Int
I Linear reduction factor cap from 1,74 to 2,2%

Figuur 1
Jaarlijks aanbod van emissierechten in het EU ETS vanaf 2013

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
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

Output

Value added/energy

Value added

Capital

Labour

Intermediates

Energy

Electricity

Non-electricity

Coal

Non-coal

Natural gas

Petr. and coal products

Biomass
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

<table>
<thead>
<tr>
<th></th>
<th>ETS price unilateral case</th>
<th>Additional price unilateral case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>16.7</td>
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<tr>
<td>CO2TAX-POW</td>
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<tr>
<td>CO2TAX-ETS</td>
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<tr>
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<tr>
<td>ADDEUA-ETS</td>
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</tr>
<tr>
<td>CANCEL</td>
<td>17.7</td>
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</tr>
</tbody>
</table>
Unilateral case – change in GHG emissions 2030

Mton CO2 to Reference Scenario

CO2TAX-POW
CO2TAX-ETS
ADDEUA-POW
ADDEUA-ETS
CANCEL

EU28
Netherlands
Other member states
Unilateral vs Coalition case – CO₂ prices 2030

[Bar chart showing CO₂ prices for different cases: Reference, CO2TAX-POW, CO2TAX-ETS, ADDEUA-POWER, ADDEUA-ETS, and CANCEL. The chart indicates the ETS price unilateral case, ETS price coalition case, Additional price unilateral case, and Additional price coalition case.]
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*

% of national income in Reference Scenario

<table>
<thead>
<tr>
<th></th>
<th>Coalition</th>
<th>Germany</th>
<th>France</th>
<th>Netherlands</th>
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</thead>
<tbody>
<tr>
<td>CO2TAX-POW</td>
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</table>

*Reference Scenario
### Unilateral case – average cost per ton CO$_2$

<table>
<thead>
<tr>
<th>Compliance cost to domestic emission reduction (euro per ton CO2)</th>
</tr>
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<tbody>
<tr>
<td>CO2TAX-POW</td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>Netherlands</td>
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### Coalition case – average cost per ton CO$_2$

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<td>France</td>
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<tr>
<td>Netherlands</td>
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</table>
## Average cost per ton CO₂ – domestic vs EU-wide reduction

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

<table>
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<tr>
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<th>ADDEUA-POW</th>
<th>ADDEUA-ETS</th>
<th>CANCEL</th>
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</thead>
<tbody>
<tr>
<td>Netherlands - unilateral</td>
<td>45</td>
<td>43</td>
<td>60</td>
<td>108</td>
<td>413</td>
</tr>
<tr>
<td>Netherlands - coalition</td>
<td>48</td>
<td>50</td>
<td>72</td>
<td>107</td>
<td>109</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
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<th>CANCEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Netherlands - unilateral</td>
<td>213</td>
<td>182</td>
<td>116</td>
<td>130</td>
<td>37</td>
</tr>
<tr>
<td>Coalition overall</td>
<td>232</td>
<td>256</td>
<td>170</td>
<td>162</td>
<td>111</td>
</tr>
</tbody>
</table>
Change in GDP 2030

% change to Reference Scenario

-0.40%  -0.30%  -0.20%  -0.10%  0.00%  0.10%

CO2TAX-POWER  CO2TAX-ETS  ADDEUA-POWER  ADDEUA-ETS  CANCEL

Coalition  Germany  France  Netherlands  Netherlands - unilateral
Change in production Dutch sectors 2030

% to Reference Scenario

-20.0 -15.0 -10.0 -5.0 0.0 5.0

ETS sectors - total
Power sector
Energy-intensive industry
non-ETS sectors
Compare various options for the Netherlands

Change in GHG emissions NL 2030

- CO2TAX-POW: 79%
- CO2TAX-ETS: 76%
- ADDEUA-POW: 62%
- ADDEUA-ETS: 48%
- CANCEL: 27%

- Unilateral case - Domestic reduction: 60%
- Unilateral case - Leakage: 62%
- Coalition case - Domestic reduction: 27%
- Coalition case - Leakage: 0%
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
Current ETS without MSR, LRF=1.74%
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
# Effects electricity sector – unilateral case

Analysis of changes in power sector NL

<table>
<thead>
<tr>
<th>Reference scenario</th>
<th>CO2TAX-POW</th>
<th>CO2TAX-ETS</th>
<th>ADDEUA-POW</th>
<th>ADDEUA-ETS</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Δ demand - firms</td>
<td>-3.8%</td>
<td>-4.5%</td>
<td>-3.8%</td>
<td>-4.5%</td>
<td>-0.2%</td>
</tr>
<tr>
<td>Δ demand - households</td>
<td>-5.3%</td>
<td>-5.2%</td>
<td>-5.4%</td>
<td>-5.6%</td>
<td>-0.3%</td>
</tr>
<tr>
<td>Δ demand - total</td>
<td>-4.0%</td>
<td>-4.6%</td>
<td>-4.0%</td>
<td>-4.7%</td>
<td>-0.2%</td>
</tr>
<tr>
<td>Δ production NL</td>
<td>-18.1%</td>
<td>-18.4%</td>
<td>-17.8%</td>
<td>-17.7%</td>
<td>-0.4%</td>
</tr>
<tr>
<td>Δ production D</td>
<td>1.5%</td>
<td>1.5%</td>
<td>1.1%</td>
<td>0.6%</td>
<td>-0.5%</td>
</tr>
<tr>
<td>Δ production F</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>-0.1%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Δ production UK</td>
<td>0.9%</td>
<td>0.9%</td>
<td>0.7%</td>
<td>0.5%</td>
<td>-0.2%</td>
</tr>
<tr>
<td>Δ import</td>
<td>35.2%</td>
<td>34.2%</td>
<td>33.8%</td>
<td>31.3%</td>
<td>0.0%</td>
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<tr>
<td>Δ export</td>
<td>-33.2%</td>
<td>-33.0%</td>
<td>-32.6%</td>
<td>-31.8%</td>
<td>-0.7%</td>
</tr>
<tr>
<td>Renewables share</td>
<td>18.6%</td>
<td>21.4%</td>
<td>21.7%</td>
<td>21.4%</td>
<td>21.5%</td>
</tr>
<tr>
<td>Δ price electricity NL</td>
<td>6.2%</td>
<td>6.1%</td>
<td>6.2%</td>
<td>6.2%</td>
<td>0.3%</td>
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## Effects electricity sector – coalition case

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<tr>
<td>Δ demand - households</td>
<td>-6.0%</td>
<td>-5.9%</td>
<td>-6.3%</td>
<td>-6.5%</td>
<td>-1.6%</td>
</tr>
<tr>
<td>Δ demand - total</td>
<td>-4.5%</td>
<td>-5.0%</td>
<td>-4.6%</td>
<td>-5.0%</td>
<td>-1.2%</td>
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<tr>
<td>Δ production NL</td>
<td>-11.9%</td>
<td>-12.6%</td>
<td>-11.2%</td>
<td>-10.6%</td>
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<tr>
<td>Δ production D</td>
<td>-14.9%</td>
<td>-15.3%</td>
<td>-13.9%</td>
<td>-13.0%</td>
<td>-2.4%</td>
</tr>
<tr>
<td>Δ production F</td>
<td>-0.1%</td>
<td>-0.1%</td>
<td>-0.2%</td>
<td>-0.3%</td>
<td>-0.1%</td>
</tr>
<tr>
<td>Δ production UK</td>
<td>2.6%</td>
<td>2.9%</td>
<td>1.1%</td>
<td>-0.4%</td>
<td>-0.9%</td>
</tr>
<tr>
<td>Δ import</td>
<td>11.4%</td>
<td>11.5%</td>
<td>8.7%</td>
<td>5.8%</td>
<td>0.1%</td>
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<tr>
<td>Δ export</td>
<td>-20.8%</td>
<td>-21.5%</td>
<td>-19.4%</td>
<td>-18.0%</td>
<td>-3.5%</td>
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<tr>
<td>Δ price electricity NL</td>
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<td>1.7%</td>
</tr>
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Production structure WorldScan

Output

Value added/energy

Value added

Intermediates

Energy

Value added

Capital

Labour

Electricity

Non-electricity

CO₂

SO₂

NOₓ

CO₂

SO₂

NOₓ

CO₂

SO₂

NOₓ

CO₂

SO₂

NOₓ

CO₂

SO₂

NOₓ

CO₂

SO₂

NOₓ

CO₂

SO₂

NOₓ

CO₂

SO₂

NOₓ

CO₂

SO₂

NOₓ
Production structure WorldScan

Output

Value added/energy
- Value added
  - Capital
  - Labour

Intermediates
- Energy
  - Electricity
  - Non-electricity
- Intermediates
  - Capital
  - Labour
  - Electricity
  - Non-electricity

Value added/energy
- Capital
- Labour

Energy
- Electricity
- Non-electricity

Intermediates
- Capital
- Labour
- Electricity
- Non-electricity