EU-objectives on climate change and renewable energy for 2020 in Belgium

What is the impact of the renewable objective, given a climate policy, both in terms of cost and change in the energy system in 2020?
EU Climate action and renewable energy package for Belgium

ETS: “let the market work”

NON-ETS = mainly residential and transport
-15% CO$_2$eq in 2020 compared to 2005

RES: 13% of final energy consumption in 2020

Biofuels 10% in 2020

The Belgian renewable target

Proposed renewable target for 2020
(EU Impact Assessment)

Today: 2% RE
Assumptions and reference scenario

- Partial equilibrium model in TIMES
- Macroeconomic background for Belgium derived with GEM-E3
- Only CO₂ emissions
- Energy prices ~ POLES july 2007
- Discount rate 4%, time horizon 2050
- 12 time slices
- Reference:
  - no policy measures except Kyoto target
  - nuclear phase-out
  - economic agents use no regret options.

Policy scenarios setup

4 “IAEU” = based on conclusions EU Impact Assessment
= what politicians asked for

- ETS (~ all industry) 35 €/ton CO₂
  (value from PRIMES to reach EU ETS objective)
- Non ETS -15% CO₂ target
- After 2020: gradual increasing carbon value to 189 €/ton CO₂ in 2050 and non ETS -37%
- Biofuel target at least 10%
- RES target varying from 10% to 20%

2 “TAR” = same assumptions BUT overall CO₂ Target
= full cost efficiency and endogenous CO₂ price

1 “RENBIO” = no climate policy, only RE and biofuel
Overview of the scenario’s

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>2010</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ETS</td>
<td>non-ETS</td>
</tr>
<tr>
<td>REF_PRBASE</td>
<td>ref=2005</td>
<td>20 €/t</td>
</tr>
<tr>
<td>IAEU</td>
<td>18 €/t / -8%</td>
<td>-15% up to 35 €/t</td>
</tr>
<tr>
<td>IAEU_REN</td>
<td>18 €/t / -8%</td>
<td>-15% up to 35 €/t</td>
</tr>
<tr>
<td>IAEU_RENBIO</td>
<td>18 €/t / -8%</td>
<td>-15% up to 35 €/t</td>
</tr>
<tr>
<td>TARIAEU_RENBIO</td>
<td>18 €/t / -8%</td>
<td>10%</td>
</tr>
<tr>
<td>TARIAEU</td>
<td>18 €/t / -8%</td>
<td>10%</td>
</tr>
<tr>
<td>RENBIO</td>
<td>18 €/t / -8%</td>
<td>10%</td>
</tr>
</tbody>
</table>

**CO₂ TIMES result**

Result 1: CO₂

![Graph showing CO₂ emissions over time for different scenarios](image-url)

- REF_PRBASE_BE_2050
- IAEU_BE_2050
- IAEU_REN_BE_2050
- IAEU_RENBIO_BE_2050
- TARIAEU_RENBIO_BE_2050
- TARIAEU_BE_2050
- RENBIO_BE_2050

kton
Result 2: Share of renewables (compared to final energy)

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
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<tr>
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<td>1.1%</td>
<td>1.4%</td>
<td>1.3%</td>
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<td>6.5%</td>
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<tr>
<td>TARIAEU_RENBIO</td>
<td>1.2%</td>
<td>13.0%</td>
<td>13.7%</td>
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<td>1.2%</td>
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<td>13.0%</td>
<td>13.7%</td>
<td>14.4%</td>
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</tbody>
</table>

Result 3: Technology choice

- Biomass for heat and CHP.
- Emission reductions in the electricity sector:
  - through CCS without renewable target
  - With renewable target: full potential off shore is used from 2020
- Biofuels for transport are penetrating more rapidly first ethanol and then biodiesel
- Mixing bio fuels with oil fuels can be seen as a first step to a more generalised use
- No sensitivity on the potentials imposed on domestic production for biocrops and wood
The “cost” of a RE target

Cost = welfare loss compared to scenario without RE target
Cost can be lower when...

→ … focusing to later period
→ … CO2-price is endogenous
→ … there is international trade that makes buying/selling possible for the renewable target

Cost of the target = price of EU-green certificate x target
The “cost” of a RE target

Cost = welfare loss compared to scenario without RE target
Cost can be higher when...

→ assumed background climate policy is inadequate

Result 5: Shadow price of renewable targets

![Graph showing marginal costs and renewable energy targets](image-url)
Result 6: cost

<table>
<thead>
<tr>
<th></th>
<th>%DIF</th>
<th>%GDP2000</th>
<th>Annualised [M€]</th>
<th>Annualised %GDP2000</th>
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<td>7.9%</td>
<td>775</td>
<td>0.35%</td>
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</tbody>
</table>

Result 7: Total annual costs in 2020 compared to 13% RES target

![Graph showing total annual costs in 2020 compared to 13% RES target]
Main conclusions 1

The addition of a renewable energy and biofuel target above the climate target:

→ Increases the total additional cost in 2020 with 46% (additional cost compared to reference from 2.7% to 4%)

→ Increases the total additional cost over the entire horizon with 8% (additional cost compared to reference from 4.2% to 4.5%).

Main conclusions 2

The addition of a renewable energy and biofuel target above the climate target:

→ Does not impose an excessive cost for Belgium
→ Accelerates the reduction of CO2-emissions
→ Induces different technology choices compared to CO2 target only (CCS vs wind and biomass)
→ Marginal cost of renewable target decreases over time because of the assumed CO2 policy, except for a stringent target of more than 17%.
→ Although in two scenarios CO2 emissions and system cost are the same, having an endogenous CO2 price lowers the MAC of RE >> need for EU model
Main conclusions 3

→ 13% RE target is higher than the share of RE induced by the climate constraint only in 2020.
→ For 13% RE:
  - full potential of Wind off- and onshore: 12 and 4 GWh
  - cost efficient share of biofuels is > 10%

→ For RE target < 12%:
  - cost efficient BIO < 10%

→ Solar PV only with RE target >17%
→ Biofuels significant contribution in reducing non-ETS emissions.
→ A policy targeted only on RE alone is not enough for the climate target.