

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

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## 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?



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## EU Climate action and renewable energy package for Belgium

- ETS: "let the market work"
- NON-ETS = mainly residential and transport  
-15% CO<sub>2eq</sub> in 2020 compared to 2005
- RES: 13% of final energy consumption in 2020
- Biofuels 10% in 2020



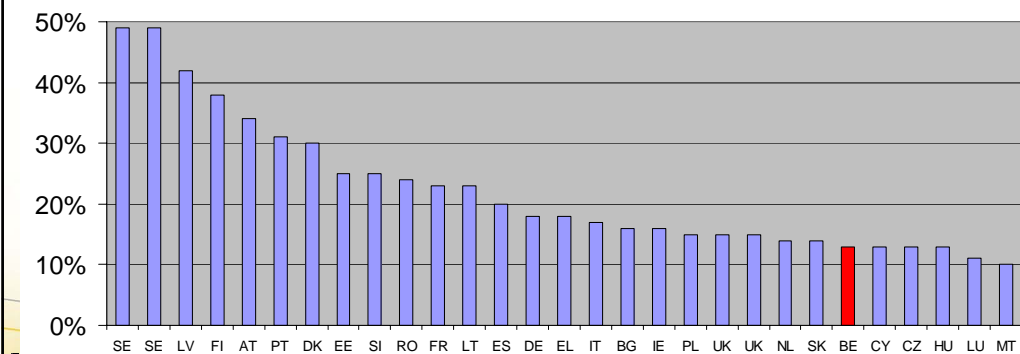
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## The Belgian renewable target

- Proposed renewable target for 2020  
(EU Impact Assessment)
- Today: 2% RE



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## Assumptions and reference scenario

- Partial equilibrium model in TIMES
- Macroeconomic background for Belgium derived with GEM-E3
- Only CO<sub>2</sub> 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.



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## Policy scenarios setup

- 4 "IAEU" = based on conclusions EU Impact Assessment  
= what politicians asked for
- ETS (~ all industry) 35 €/ton CO<sub>2</sub>  
(value from PRIMES to reach EU ETS objective)
  - Non ETS -15% CO<sub>2</sub> target
  - After 2020: gradual increasing carbon value to 189 €/ton CO<sub>2</sub>  
in 2050 and non ETS -37%
  - Biofuel target at least 10%
  - RES target varying from 10% to 20%
- 2 "TAR" = same assumptions BUT overall CO<sub>2</sub> Target  
= full cost efficiency and endogenous CO<sub>2</sub> price
- 1 "REN BIO" = no climate policy, only RE and biofuel



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## Overview of the scenario's

Assumptions	2010		2020			
	ETS CO2 Price, Target non ETS	CO2 Target non-ETS	CO2 Price ETS	BIOFUEL (REN in transport)	REN general	CO2 Target all
	ref=2005	ref = 2005				ref = 2005
REF_PRBASE	20 €/t		22 €/t			
IAEU	18 €/t / -8%	-15%	up to 35 €/t			
IAEU_BIO	18 €/t / -8%	-15%	up to 35 €/t	10%		
IAEU_REN	18 €/t / -8%	-15%	up to 35 €/t		13%	
IAEU_RENBIO	18 €/t / -8%	-15%	up to 35 €/t	10%	13%	
TARIAEU_RENBIO	18 €/t / -8%	-15%	up to 35 €/t	10%	13%	-15%
TARIAEU	18 €/t / -8%	-15%	up to 35 €/t			-15%
RENBIO	18 €/t / -8%			10%	13%	

## CO<sub>2</sub> TIMES result

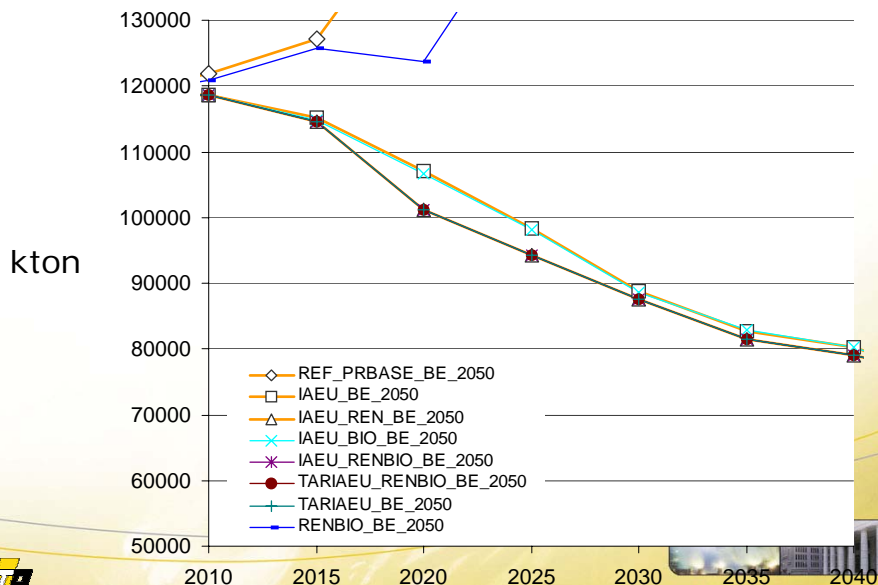


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## Result 1: CO<sub>2</sub>



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

	2010	2020	2030	2040
REF_PRBASE	1.1%	1.4%	1.3%	1.3%
IAEU	1.2%	4.3%	9.8%	12.7%
IAEU_REN	1.2%	13.0%	13.7%	14.4%
IAEU_BIO	1.2%	6.5%	10.8%	12.7%
IAEU_RENBIO	1.2%	13.0%	13.7%	14.4%
TARIAEU_RENBIO	1.2%	13.0%	13.7%	14.4%
TARIAEU	1.2%	4.7%	9.3%	12.8%
RENBIO	1.2%	13.0%	13.7%	14.4%



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## 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



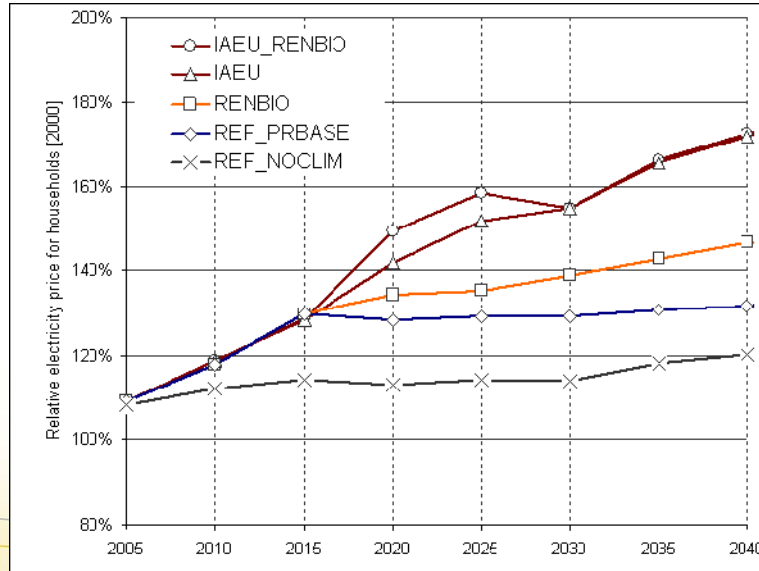
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## Result 4: Relative electricity price for households



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## The “cost” of a RE target

Cost = welfare loss compared to scenario without RE target

Cost can be lower when...

- ... focusing to later period
- ... CO<sub>2</sub>-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



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## 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

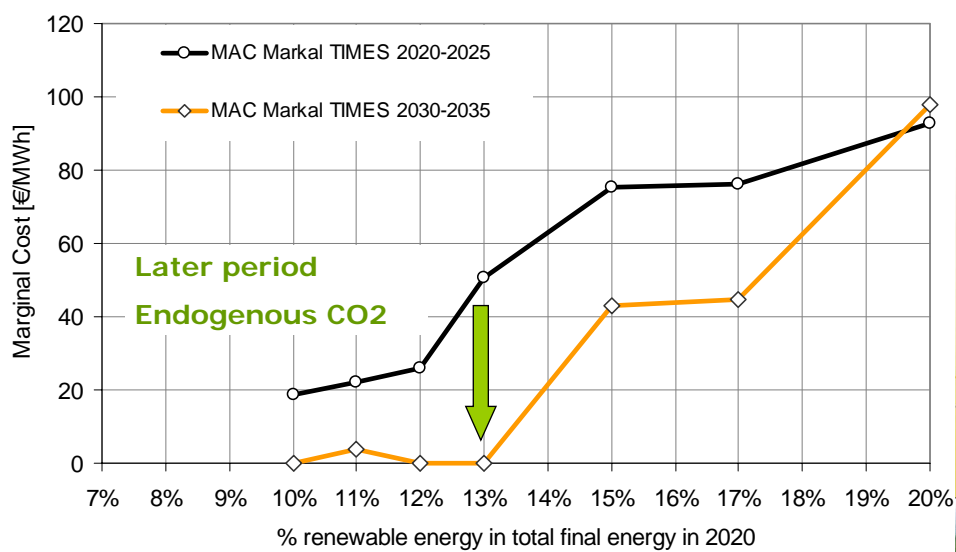


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## Result 5: Shadow price of renewable targets



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## Result 6: cost

	%DIF	%GDP2000	Annualised [M€]	Annualised %GDP2000
IAEU	4.2%	23.3%	2289	1.04%
IAEU_REN	4.5%	25.1%	2472	1.12%
IAEU_BIO	4.3%	23.7%	2333	1.06%
IAEU_RENBIO	4.5%	25.1%	2472	1.12%
TARIAEU_RENBIO	4.5%	25.1%	2469	1.12%
TARIAEU	4.3%	24.0%	2364	1.08%
RENBIO	1.4%	7.9%	775	0.35%

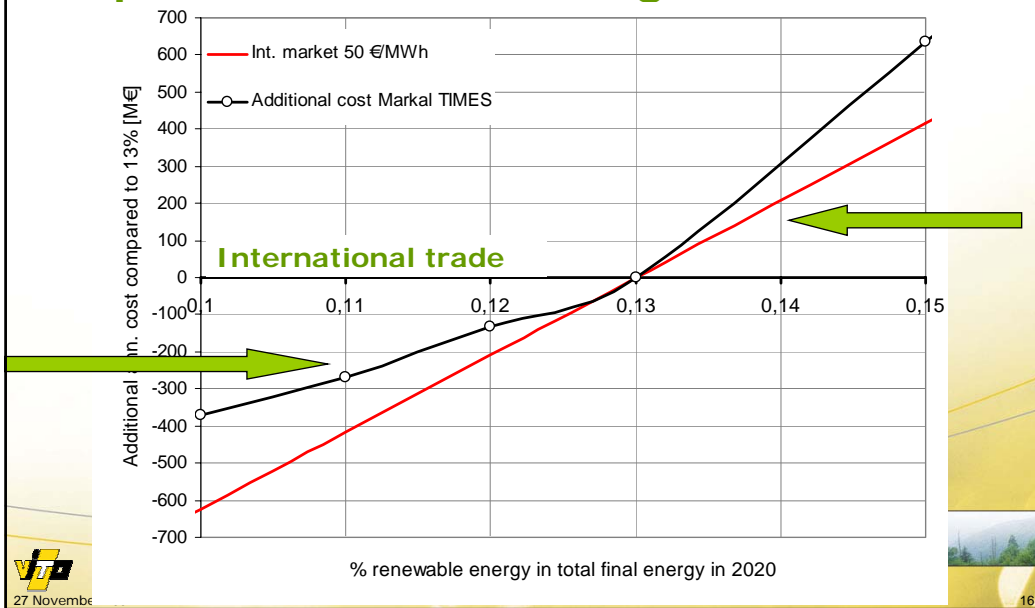


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## Result 7: Total annual costs in 2020 compared to 13% RES target



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% renewable energy in total final energy in 2020

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## 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%).



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## 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 CO<sub>2</sub>-emissions
- Induces different technology choices compared to CO<sub>2</sub> target only (CCS vs wind and biomass)
- Marginal cost of renewable target decreases over time because of the assumed CO<sub>2</sub> policy, except for a stringent target of more than 17%.
- Although in two scenarios CO<sub>2</sub> emissions and system cost are the same, having an endogenous CO<sub>2</sub> price lowers the MAC of RE >> need for EU model



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## 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.



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