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Insights in a clean energy future for Belgium

Impact assessment of the 2030 Climate & Energy Framework

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Content

1. Introduction: context, scenarios, hypotheses

2. Some key results : GHG emissions-energy-cost figures

   → 5 dimensions of the Energy Union

   (1) Decarbonisation (GHG, RES)

   (2) Energy efficiency

   (3) Energy security

   (4) Internal energy market

   (5) Research, innovation and competitiveness

   + some economic impacts

1. Introduction

Context

- FPB's Long Term Energy Outlook (since 2001 & every 3 years)
  - ✓ Scenario analysis (REF, policy scenarios, sensitivities)
  - ✓ Complemented by Impact Assessment for BE of EU climate & energy strategies (since 2008)

- 2030 EU Climate and Energy Framework & Low carbon economy Roadmap (2011-2014)

- The Clean Energy Package (Nov 2016)

  → Governance Regulation → Integrated national energy and climate plans (NECP)

- Interfederal Energy Pact (Dec 2017)

  → Belgium's energy vision & strategy to 2050

NECP (NEKP-PNEC)

- In a nutshell
  - ✓ What? 5 dimensions: targets, policies & measures, projections (WEM & WAM), impact assessment, etc.
  - ✓ Who? 3 Regions and the Federal State
  - ✓ When? Draft by the end of 2018, final version by the end of 2019

- Federal Planning Bureau's involvement
  - ✓ Support and expertise for the analytical part of the plan (Part B)
  - ✓ Scenario analysis: projections and IA

"*benchmark*"

Scenarios

- Reference scenario (*REF*): "unchanged policy" + 2020 binding targets

  Published in Oct 2017

- Policy scenarios : compatible with the 2030 EU Climate and Energy framework and 2050 EU GHG reductions

  Working Paper 5-18

  → 3 *policy scenarios* compared to *REF*:

  Alt1, *Alt2* and *Alt3* which differ according to GHG reductions (in 2030 compared to 2005) in the Belgian non-ETS, reflecting flexibilities provided in the ESR

  Alt1: -27% < *EUCO30* (EC, 2016)

  Alt2: -32%

  Alt3: -35% = proposed target for BE

Assumptions

- *REF* and *policy scenarios*: same assumptions as to economic activity, demography, fossil fuel prices, …

  e.g. GDP grows by 1.4% per year on average between 2015 and 2030; population by 0.4% and the number of households by 0.6%

- *Policy scenarios*: designed to meet the 2030 targets at EU level

  GHG emission reductions: at least 40% (total); 43% (ETS); 30% (non-ETS)

  RES: at least 27% share in gross final energy consumption

  EE: 30% reduction compared to PRIMES REF2007

  and GHG reductions of 80% in 2050 (at EU level)

  Alt1: same approach as for *EUCO30*

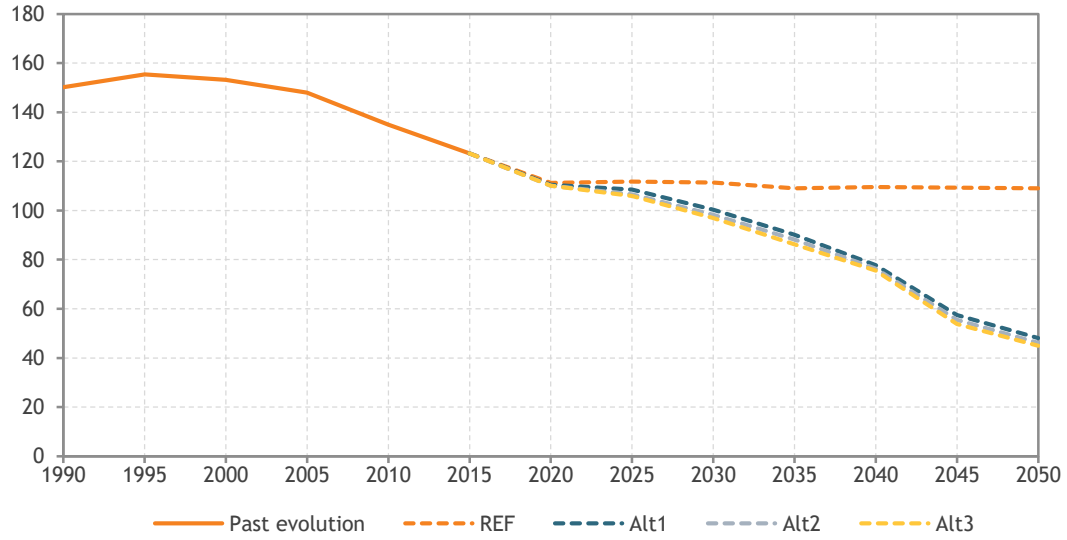
  Alt2 → *Alt3*: starting from *Alt1*, gradual increase in electrification of final uses (e.g. EVs, HP) → growing non-ETS reductions

2. Some key results

(focus on 2030 & 2040)

(1) Decarbonisation - GHG emissions (I)

Total GHG emissions (Mt CO_2-eq.) – reductions compared to 1990



Source: FPB (WP 05-18).

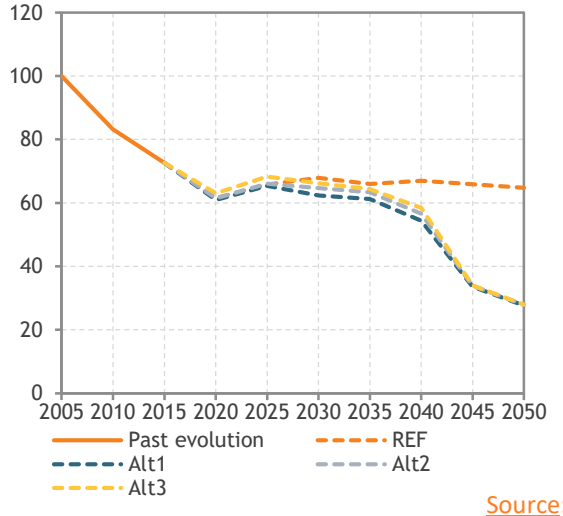
REF: decrease to 2020 (-26%) followed by a stabilisation 2020-2050

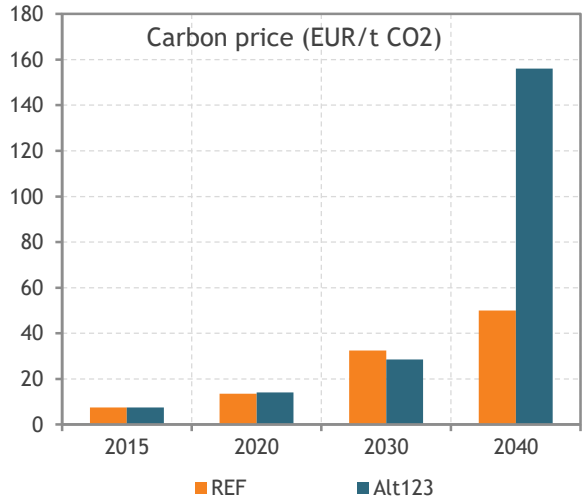
Policy scenarios: steady decrease; 2030: 1/3; 2040: ½; 2050: -70%

vs. -40% in 2030 and -80% in 2050 at EU level

(1) Decarbonisation – GHG emissions (II)

ETS GHG emissions (Index 100 = 2005)





Source: FPB (WP 05-18).

REF: decrease to 2020 (-38%) followed by an increase to 2030 and then a stabilisation 2030-2050 (-32%)

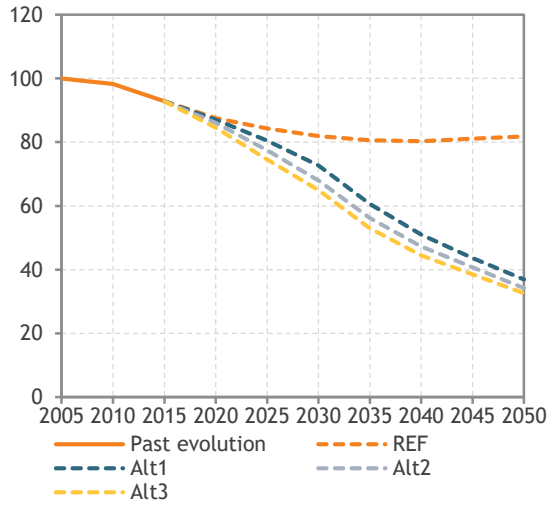
Policy scenarios: -34/38% in 2030; -42/46% in 2040; -72% in 2050

vs. -43% in 2030 and -90% in 2050 at EU level

Drivers: lower cap on EU ETS trajectory translates into different carbon prices compared to REF and increasing levels of electrification from Alt1 to Alt3 (power generation belongs to ETS)

(1) Decarbonisation – GHG emissions (III)

Non-ETS GHG emissions (Index 100 = 2005)



Source: FPB (WP 05-18).

REF: decrease to 2035 (-20%) followed by a stabilisation to 2050

Policy scenarios: steady decrease; 2030: -27/35%; 2040: -49/56%; 2050: -63/67%

vs. -30% in 2030 at EU level

Drivers: higher standards, EE values, lower behavioural discount rate compared to REF and different levels of electrification (e.g. EVs, HP)

(1) Decarbonisation – GHG emissions (IV)

Sectoral results: GHG = activity * energy/activity * GHG/energy

Energy intensity | Carbon intensity

- Power generation: decrease compared to REF which depends on the degree of electrification in the final demand sectors
- Industry (ETS & non-ETS) : similar to REF in 2030; slight decrease compared to REF in 2040 (< carbon intensity)
- Buildings (residential & tertiary): dramatic decrease compared to REF < energy and carbon intensity
- Transport (passenger & freight): decrease compared to REF < energy (2030) and carbon intensity (2040); pass. vs. freight

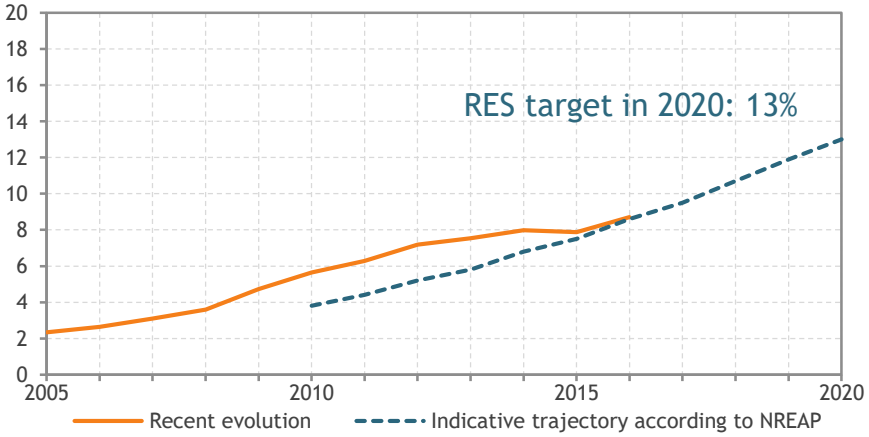
2030-Alt3	wrt to 2005	wrt to REF
Power sector	-35%	-8%
Energy branch	-22%	-3%
Industry	-35%	0%
Residential	-60%	-48%
Tertiary	-59%	-41%
Transport(*)	-20%	-11%
Others	-27%	0%

(*) excl. aviation

(1) Decarbonisation – RES (I)

RES in gross final energy consumption

- Recent development (source: NRP2018)



- Projections

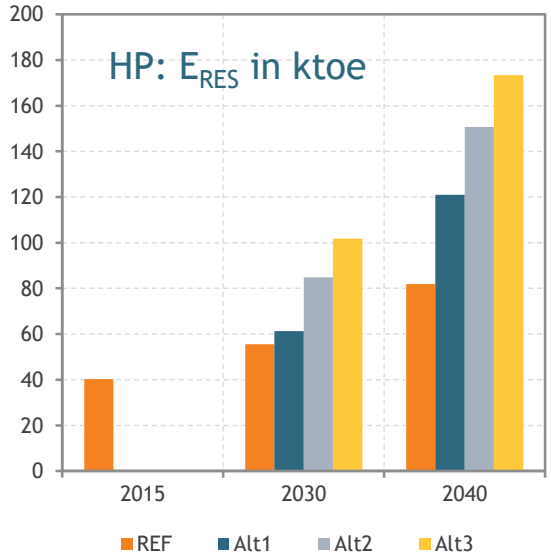
	2015	2030				2040		
		REF	Alt1	Alt2	Alt3	REF	Alt1	Alt2	Alt3
Overall RES	8	15	18	19	20	17	30	31	32
RES-H&C	8	14	14	15	15	16	24	24	25
RES-E	15	28	37	37	38	30	44	44	44
RES-T	3	12	15	16	17	14	70	72	74

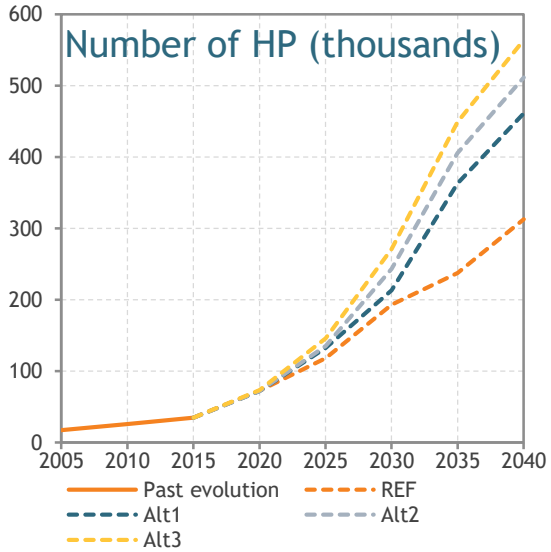
(1) Decarbonisation - RES (II)

RES-H&C

	2015		2030				2040		
		REF	Alt1	Alt2	Alt3	REF	Alt1	Alt2	Alt3
RES-H&C	8	14	14	15	15	16	24	24	25

Industry + building; Biomass + solar thermal + heat pumps (HP); FED





Source: FPB (WP 05-18).

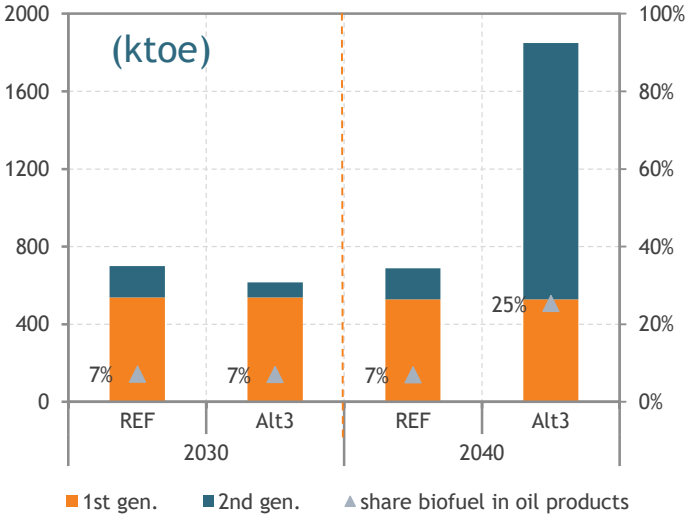
(1) Decarbonisation – RES (III)

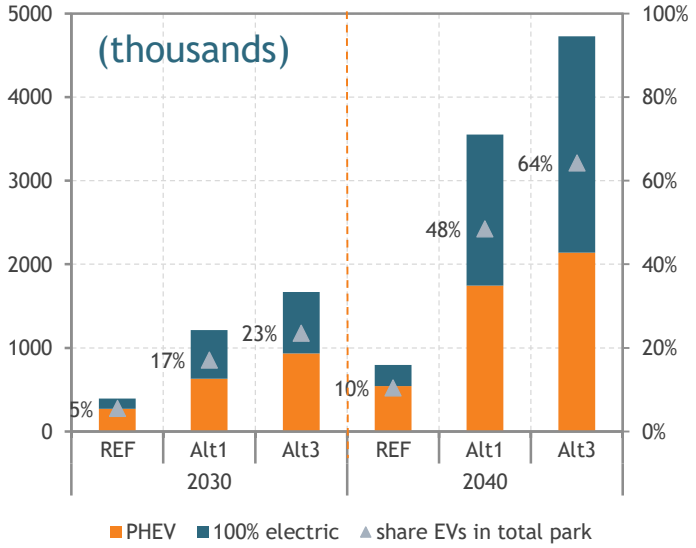
RES-T

Accounting rules for 2nd gen. & EVs

	2015	2030				2040			
		REF	Alt1	Alt2	Alt3	REF	Alt1	Alt2	Alt3
RES-T	3	12	15	16	17	14	70	72	74

Biofuels (1st & 2nd generation) + electricity from RES; FED





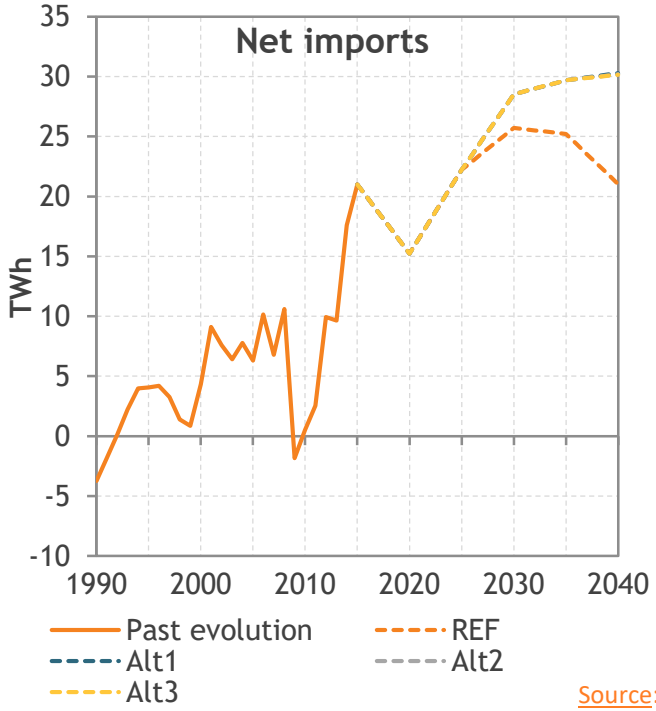
Source: FPB (WP 05-18).

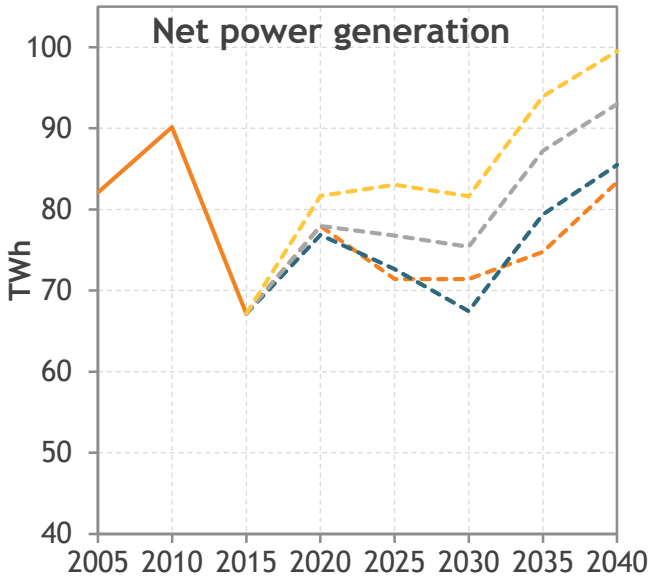
(1) Decarbonisation - RES (IV)

RES-E

	2015		2030				2040		
		REF	Alt1	Alt2	Alt3	REF	Alt1	Alt2	Alt3
RES-E	15	28	37	37	38	30	44	44	44

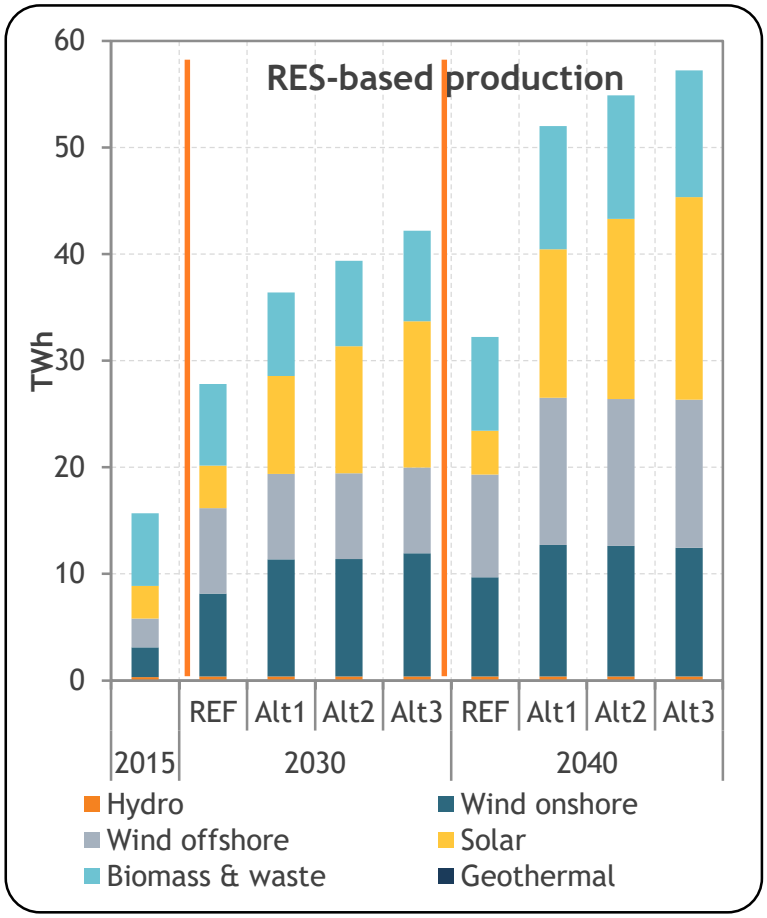
Electricity imports + domestic generation of electricity

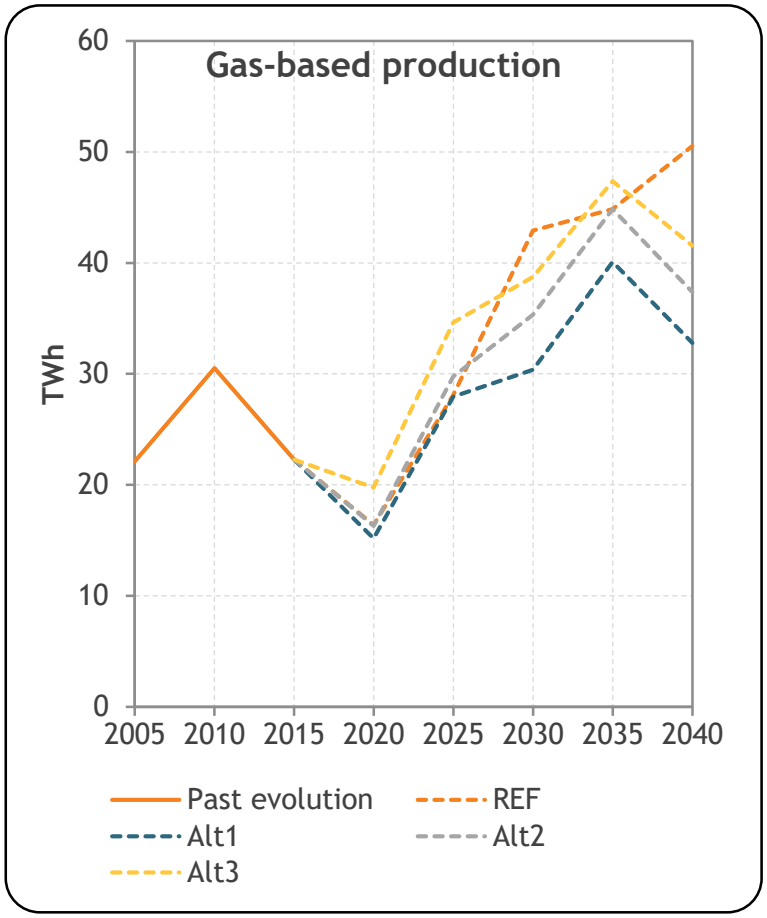




Source: FPB (WP 05-18).

(1) Decarbonisation - RES (V)

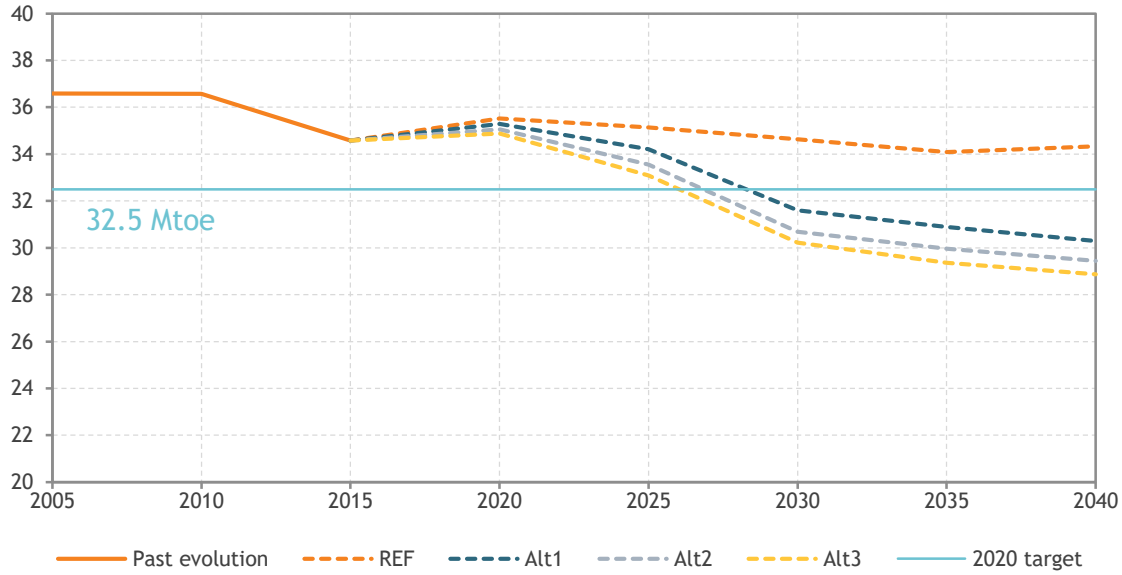




Source: FPB (WP 05-18).

(2) Energy efficiency (I)

Final energy demand (Mtoe): REF and policy scenarios



REF

compared to 2005

-5% in 2030

-6% in 2040

Source: FPB (WP 05-18).

Policy scenarios

compared to 2005: -14 to -17% in 2030; -17 to -21% in 2040

compared to REF: -9 to -13% in 2030; -12 to -16% in 2040

(2) Energy efficiency (II)

Final energy demand: sectoral analysis

	2015		2030				2040		
(Mtoe)		REF	Alt1	Alt2	Alt3	REF	Alt1	Alt2	Alt3
Industry	10.7	10.2	10.1	10.1	10.1	9.4	9.4	9.4	9.4
Residential	8.1	8.6	7.1	6.6	6.3	8.6	7.2	6.7	6.4
Tertiary	5.3	5.5	4.7	4.3	4.2	5.8	4.8	4.4	4.3
Transport	10.4	10.3	9.6	9.6	9.5	10.5	9.0	8.9	8.8

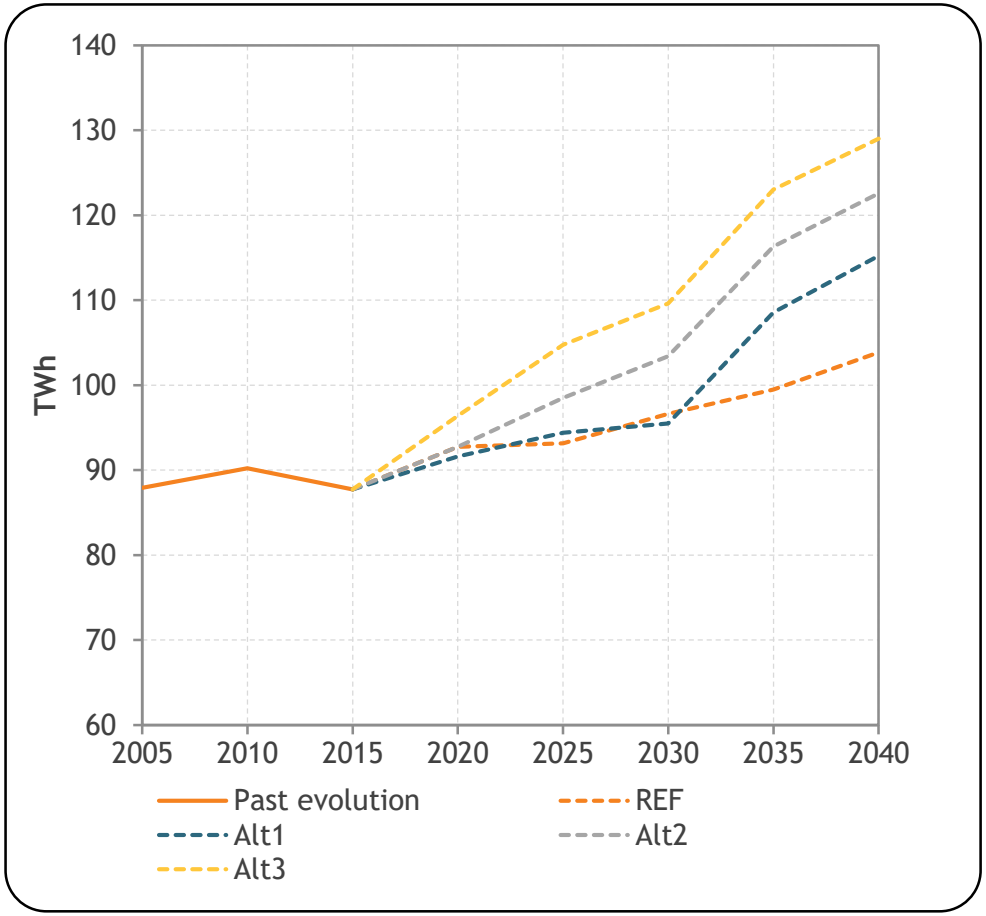
- Industry: decrease wrt 2015; similar consumption level REF/policy scenarios
- Residential & tertiary: increase in REF wrt 2015; decrease in policy scenarios compared to REF (better insulation, more efficient equipment (e.g. HP))

  ⟹ 200 kWh/sqm in 2015 → 102 kWh/sqm in 2040 (Alt3)

- Transport: almost stable in REF; decrease in policy scenarios compared to REF (more stringent CO_2 standards cars/vans, EVs)

(2) Energy efficiency (III)

- Called-up electrical power
  - Volume <> energy efficiency
- AAGR
  - 2005-2015
    - 0.0%
  - 2015-2040
    - REF: 0.5%
    - Alt: 0.8%-1.1%



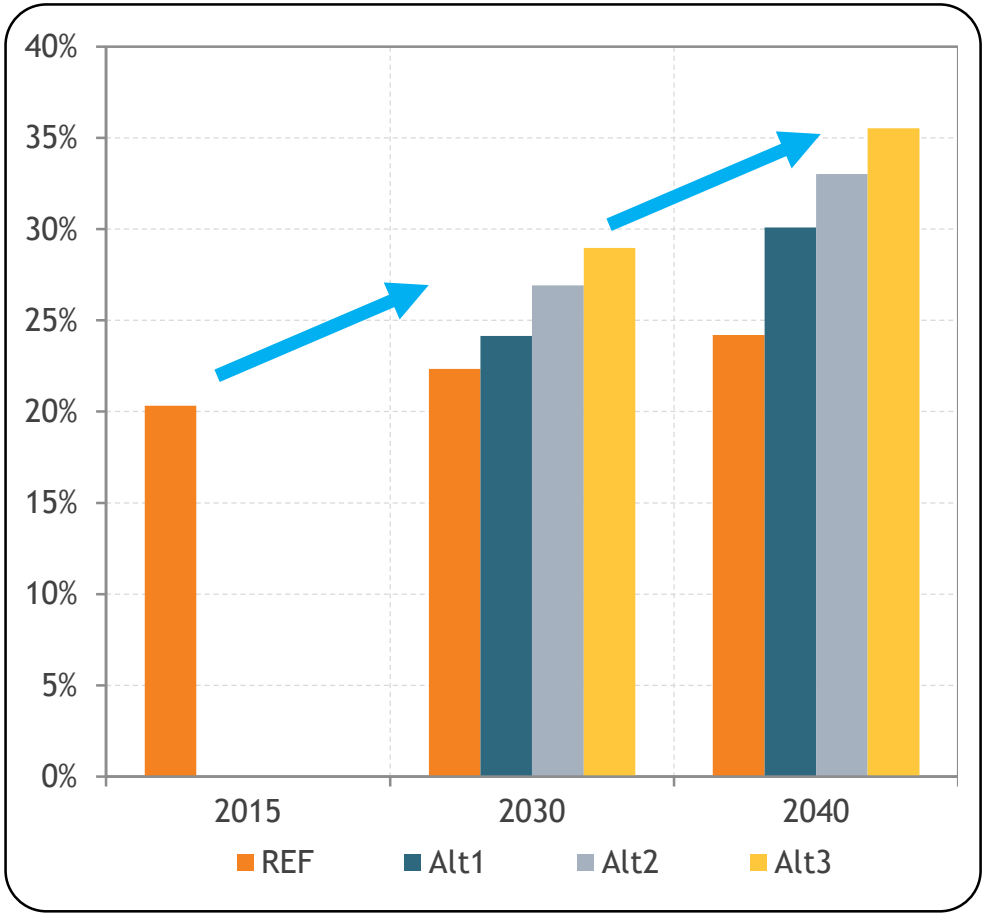
Source: FPB (WP 05-18).

(2) Energy efficiency (IV)

- From 1/5th …

… to 1/4th-1/3th of Final Energy Demand in 2040

- Electrification
- Impact 2030 Framework on
  - Electricity Demand
  - Import level
  - Domestic generation
  - Investments



Source: FPB (WP 05-18).

(3) Energy security (I)

Primary energy mix: share in REF and policy scenarios

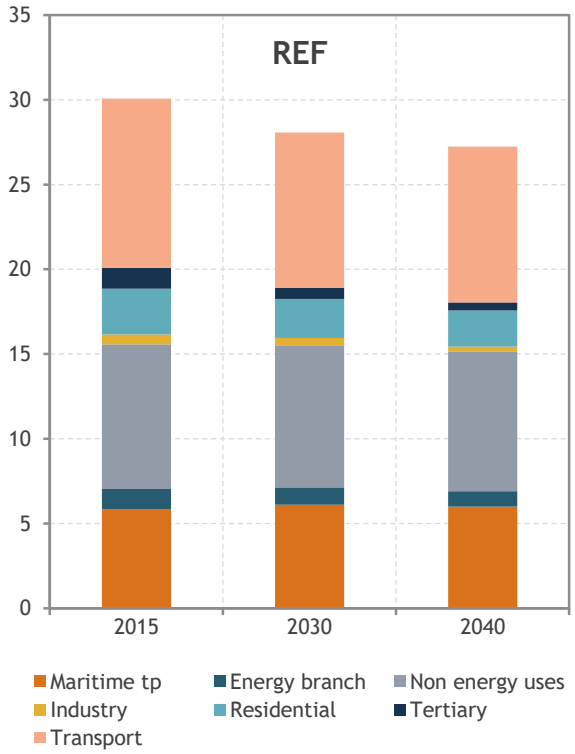
	2015		2030				2040		
(%)		REF	Alt1	Alt2	Alt3	REF	Alt1	Alt2	Alt3
Solid fuels	7	4	4	5	5	3	3	3	3
Oil	35	34	32	31	30	32	20	20	19
Natural gas	29	41	38	38	38	43	38	38	39
Nuclear	15	0	0	0	0	0	0	0	0
Electricity	4	6	7	7	7	5	7	8	8
RES	10	16	19	20	20	17	31	31	31

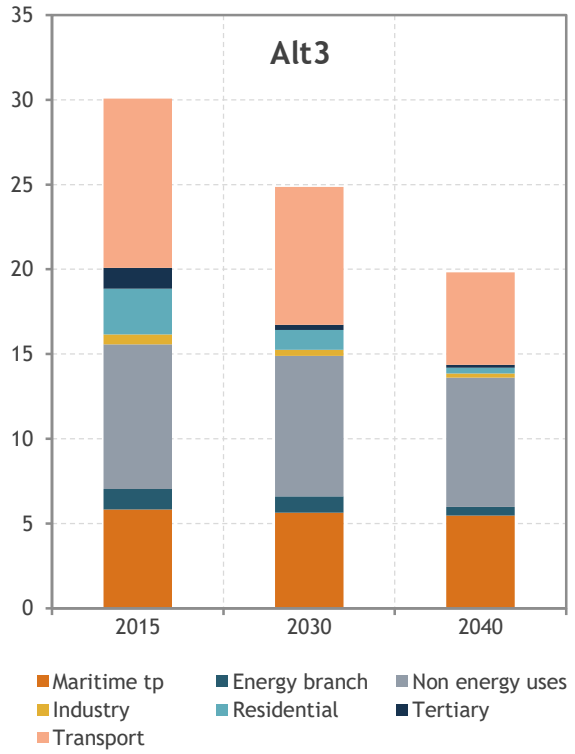
REF: coal (nuclear) decreases; oil stable; natural gas, electricity and RES increase

Policy scenarios compared to REF: coal stable; oil decreases especially after 2030; natural gas decreases slightly; RES increases dramatically (2nd energy form in 2040)

(3) Energy security (II)

Oil requirements: Alt3 vs. REF

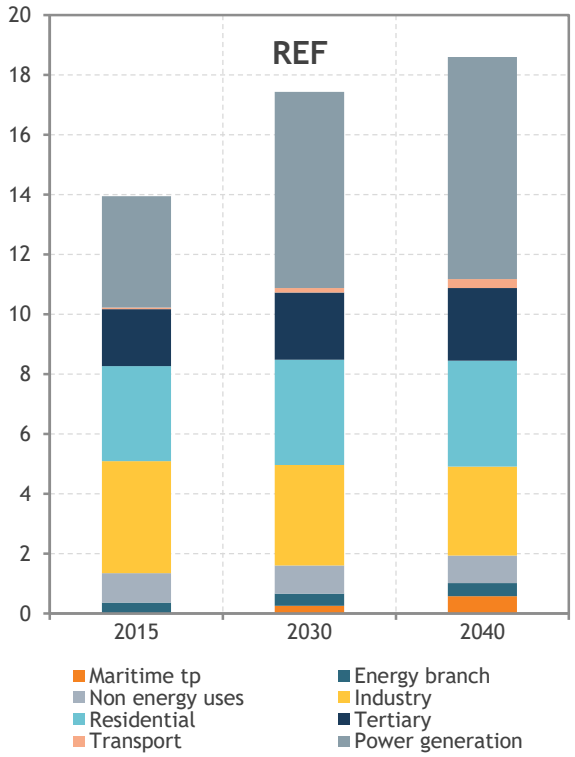


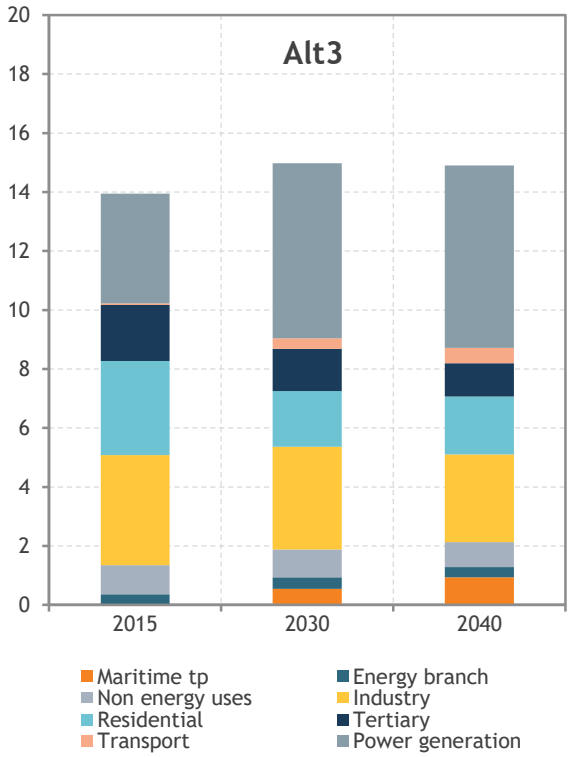


Source: FPB (WP 05-18).

(3) Energy security (III)

Natural gas requirements: Alt3 vs. REF

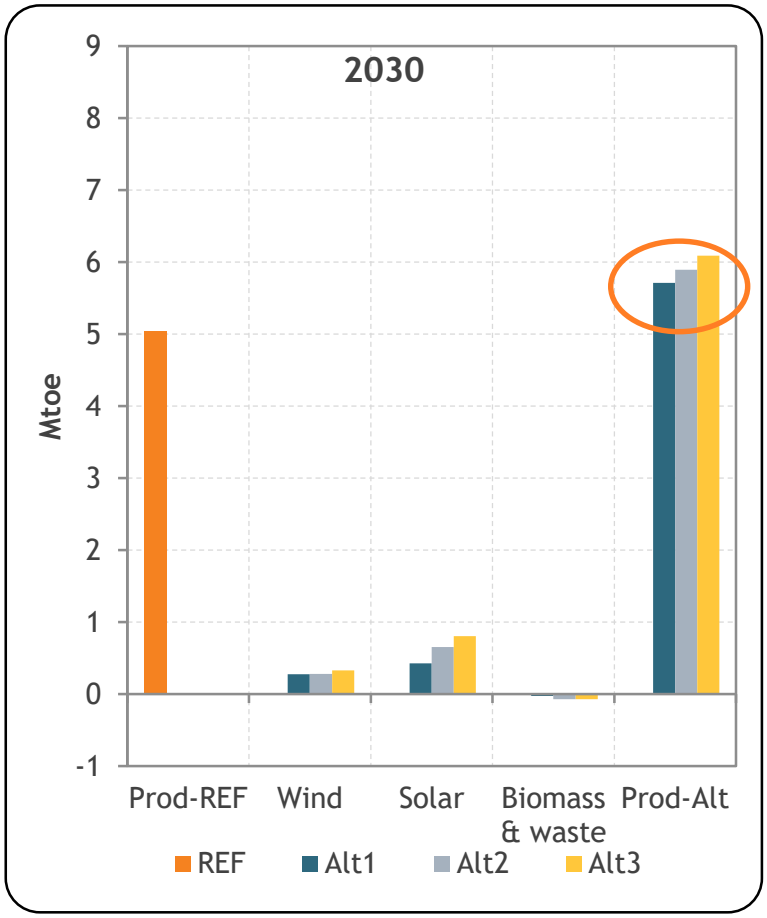


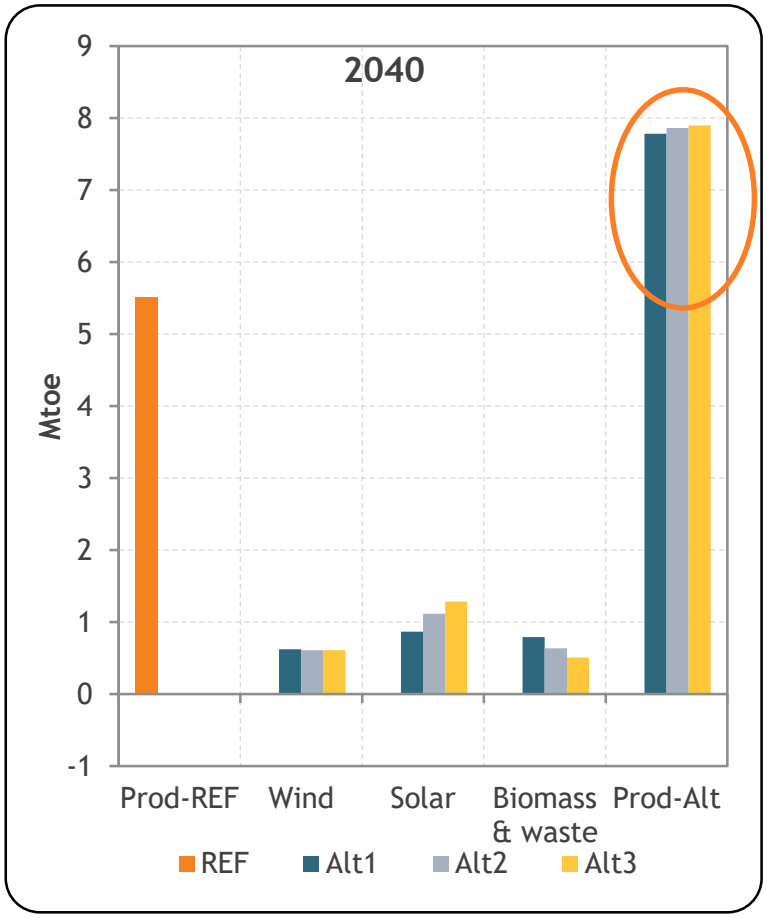


Source: FPB (WP 05-18).

(3) Energy security (IV)

Domestic energy production

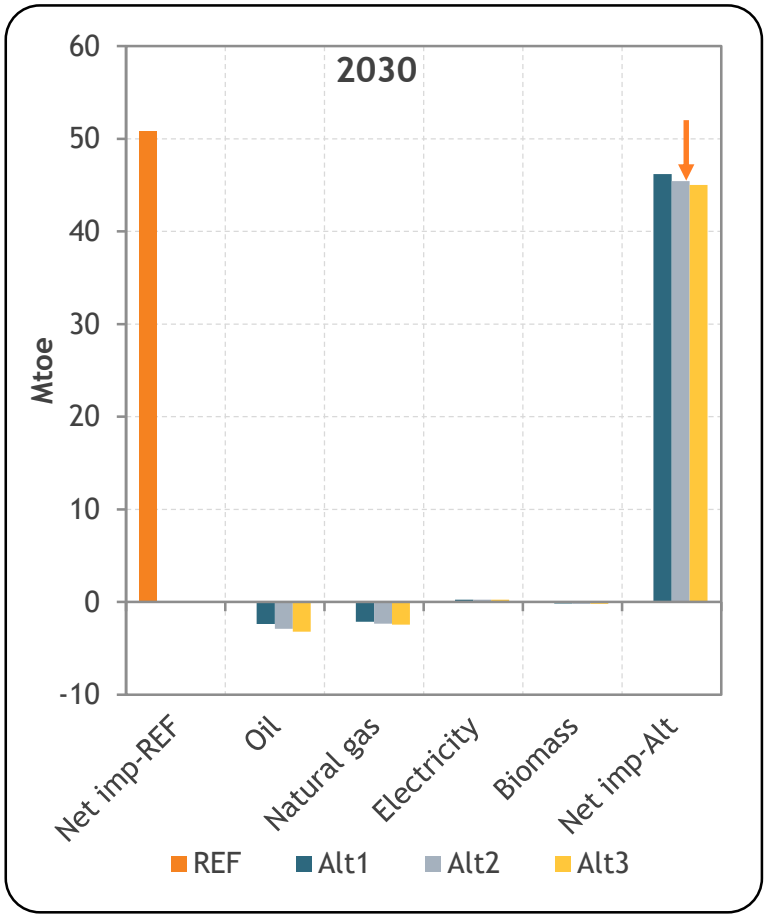


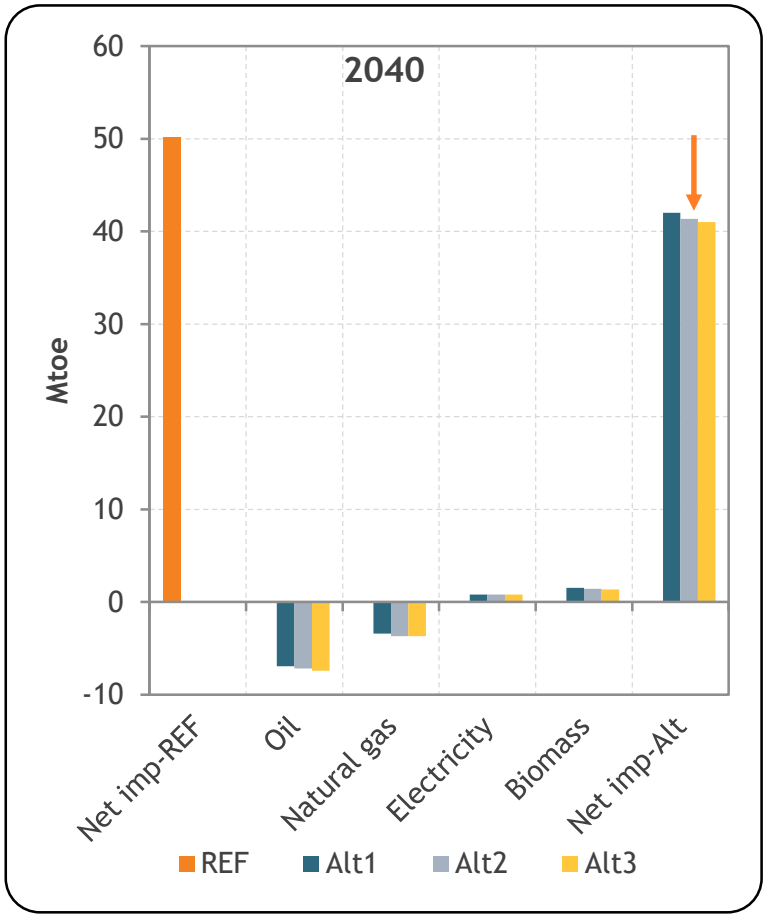


Source: FPB (WP 05-18).

(3) Energy security (V)

Net energy imports





Source: FPB (WP 05-18).

(3) Energy security (VI)

- Not projected to decrease, but…
  - … marginally smaller than REF
- Reduction in net imports + reduction in energy needs (EE)
- Diversified portfolio of supplier countries and routes

	2015		2030				2040		
		REF	Alt1	Alt2	Alt3	REF	Alt1	Alt2	Alt3
%	84.3	91.0	89.0	88.5	88.1	90.1	84.4	84.0	83.8

(4) Internal energy market

Natural gas and electricity

(Net) imports (see previous slides)

(5) R&D and competitiveness

Unit energy cost in industry (in % of VA)

- ✓ Analogy with the unit labour cost
- ✓ Unit energy cost = energy intensity * energy price

2015		2030				2040		
	REF	Alt1	Alt2	Alt3	REF	Alt1	Alt2	Alt3
18.6	22.3	21.6	21.5	21.4	20.8	21.6	21.6	21.5

REF: 20% increase in 2030 (< energy price) followed by a decrease by 7% in 2040 (< energy intensity)

Policy scenarios compared to REF: decrease by some 4% in 2030; increase by some 4% in 2040

But: more (detailed) figures are needed to address the issue (evolution in other MS and outside EU, at industry level, etc.)

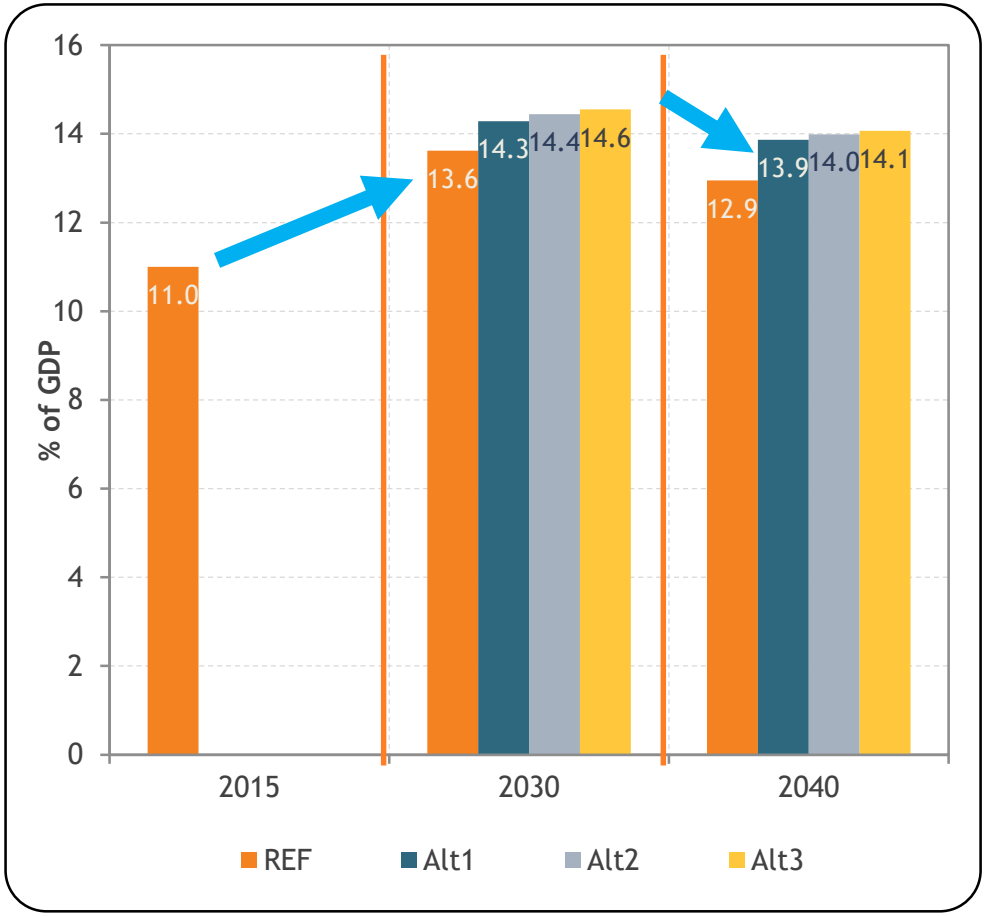
Some economic impacts (I)

Part B of NECPs also refers to the assessment of (macro)economic impacts

- ✓ Our study provides the impact on several cost indicators:
  - Total energy system cost
  - Fossil fuels: external bill and trade balance
  - Energy costs in final demand sectors (investment expenditures, unit energy cost, etc.)
  - Electricity system cost (investment expenditures, average cost of power generation)
- ✓ Our study does not cover the macroeconomic, skills and social impacts

Some economic impacts (II)

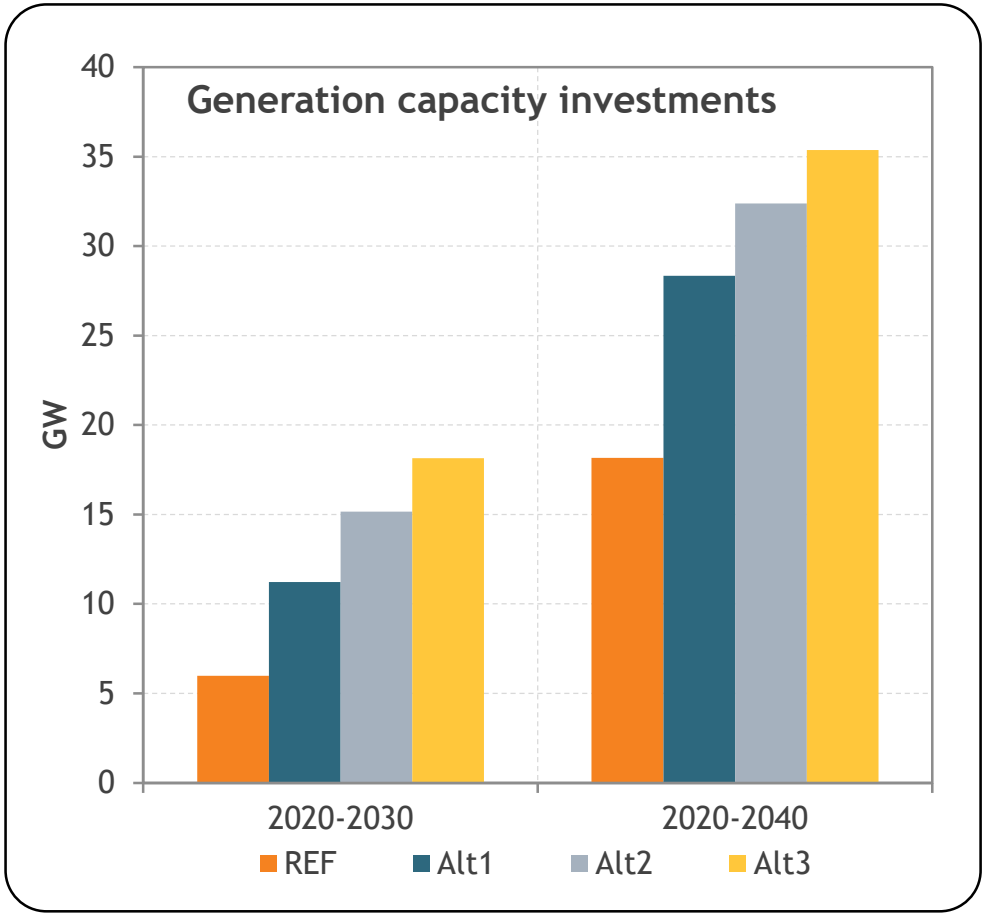
- Total energy system costs
  Related to GDP
- Encompasses
  - capital costs
  - energy purchase costs
  - direct efficiency investment cost
- Evolution CAPEX, OPEX-elec vs OPEX-fuel in REF vs policy scenarios



Source: FPB (WP 05-18).

Some economic impacts (III)

- Investments ('20-'40)
  18-35 GW
- Annual investment expenditures ('20-'40)
  - ✓ 1.2-1.6 billion EUR <> 0.6 billion EUR in REF
  - ✓ Not including expenditures for grid reinforcement
- <> Current investment climate
- "Wait and see"



Source: FPB (WP 05-18).

Hypothesis:
Mandatory wholesale market with MC bidding just to obtain optimal unit commitment + a perfect bilateral market of CfD for power supply through which generators recover capital costs

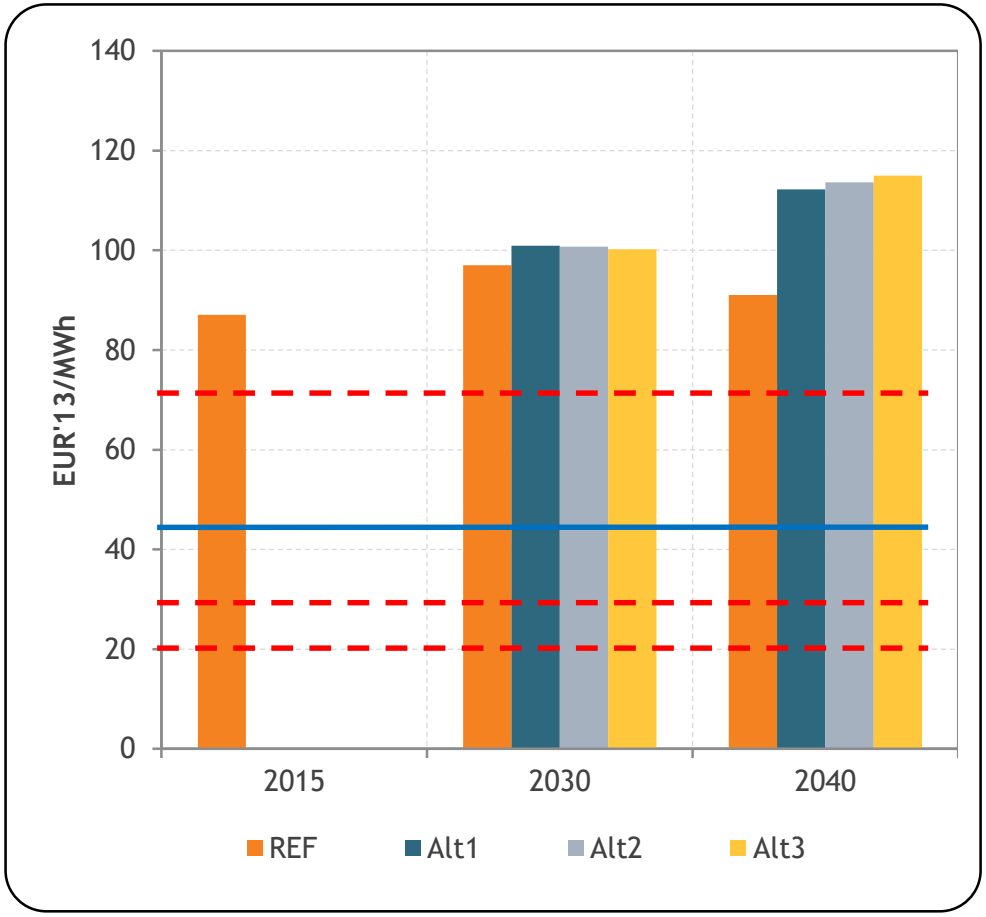
Some economic impacts (IV)

- Average electricity generation cost
  ≠ wholesale price

- 2030: increase
- 2040: slight decrease vs. further increase

"In the LT, it is uncertain whether wholesale prices based on existing market arrangements will be able to provide the revenues necessary to cover the total cost of investments"

Source: European Commission, 2015



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Source: FPB (WP 05-18).


CHALLENGE

Thank you for your attention

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www.plan.be → theme Energy