Context

- ### Federal Planning Bureau (FPB):
    Legal assignments + own initiative + research consortia
    House brand: quantitative analyses, energy demand and supply

- ### Different FPB studies on BE power sector, all with same conclusion:
    Medium term, BE needs gas

- ### Two recent studies:
    - CBA (feb 2017) -> DG Energy
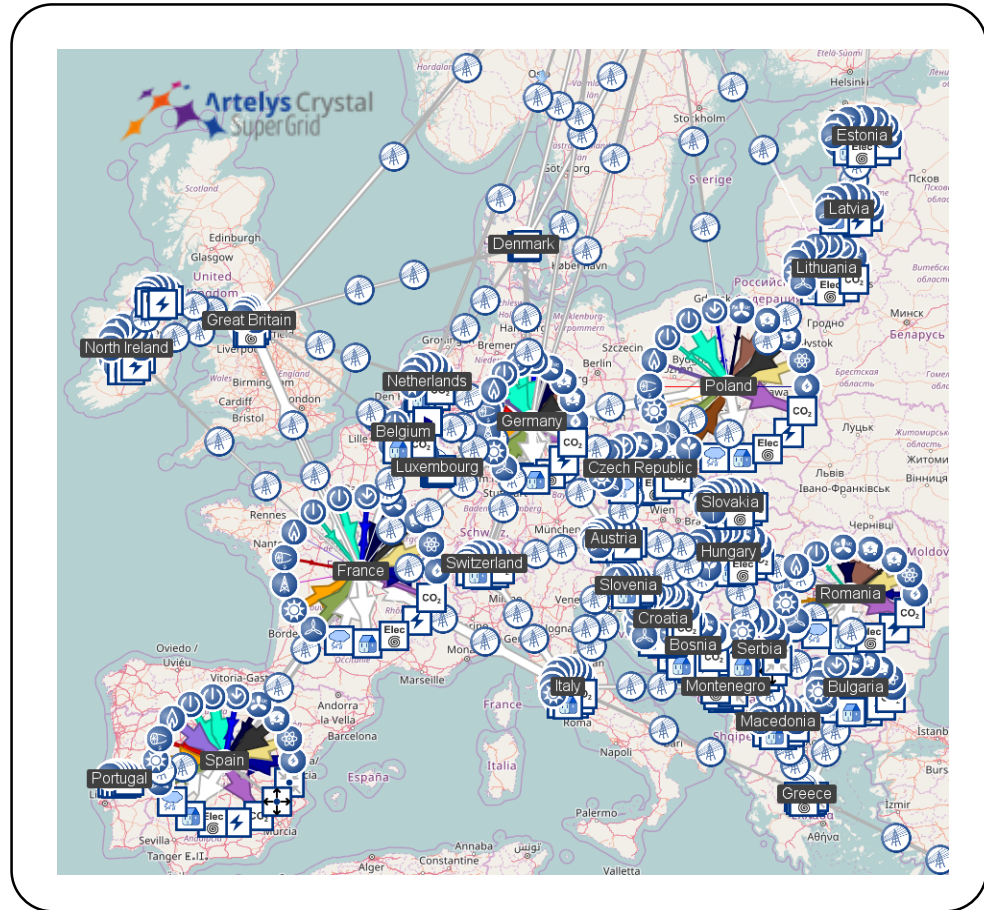   - IA 2030 Framework (may 2018) -> follow-up on BE energy outlook

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Study 1: the CBA

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Methodology: Crystal Super Grid

- Unit commitment, optimal dispatch
- Hourly load profile
- Rolling horizon
- Horizon 2030
- Especially suited to investigate interconnected future power systems with large penetration of vRES
- CO_2 emissions

Bron: Crystal Super Grid.

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Scenarios

Based on climate context and content of Structural Block (Elia, 2016):

CO$_2$ price
Base: 17 €/tCO$_2$
Clima: 57 €/tCO$_2$

| MW	CCGT	OCGT
1	3200	1200
2	2400	500
3	3200	1200
4	2400	500

Source: FPB (2017).

Technology choice
1. Base Gas
2. Base Decentral
3. Clima Gas
4. Clima Decentral
5. Clima Decentral & New Gas

Decentral (scen 2, 4, 5) integrates significant amount of batteries and EV's


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Results: Net Imports

- Significant decrease in Clima wrt Base scenarios:
  - from 30 TWh to 21 TWh
  - Net production increases, export increases
- Sensitivity in New Gas:
  - Belgium turns into net exporter (2.1 TWh)

30 TWh

21 TWh

-2.1 TWh

Source: FPB (2017).

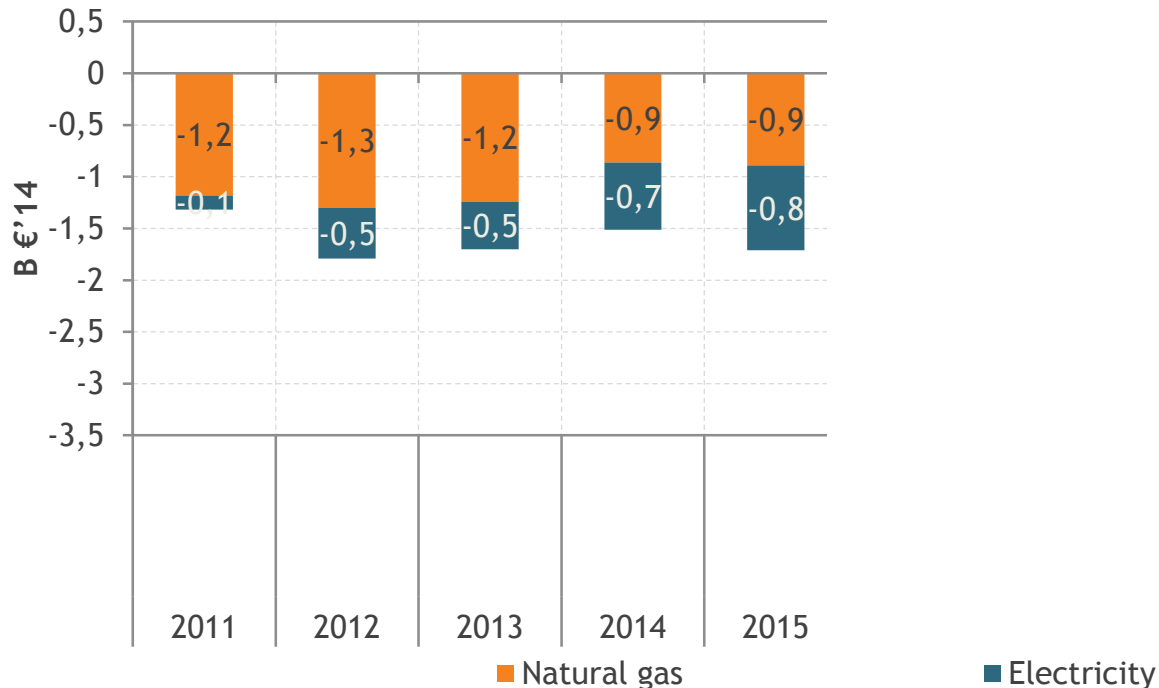plan.be
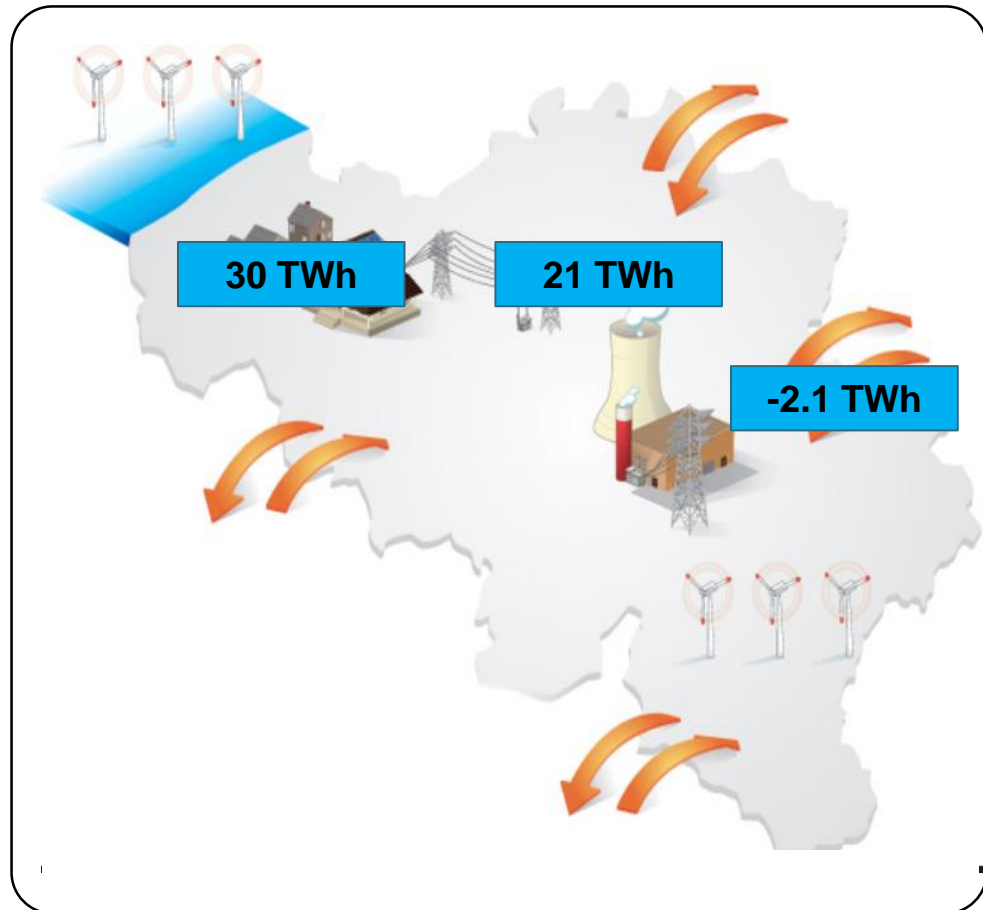
Results: CO_2 emissions

- Cap and trade - ETS auction payments
- Significant increase in Clima scenarios
  - [6.2-8.6] wrt [3.9-5.6] Mt CO_2
  - Due to higher gas-based generation
- Clima Decentral & New Gas
  - 14 Mt CO_2

Source: FPB (2017).

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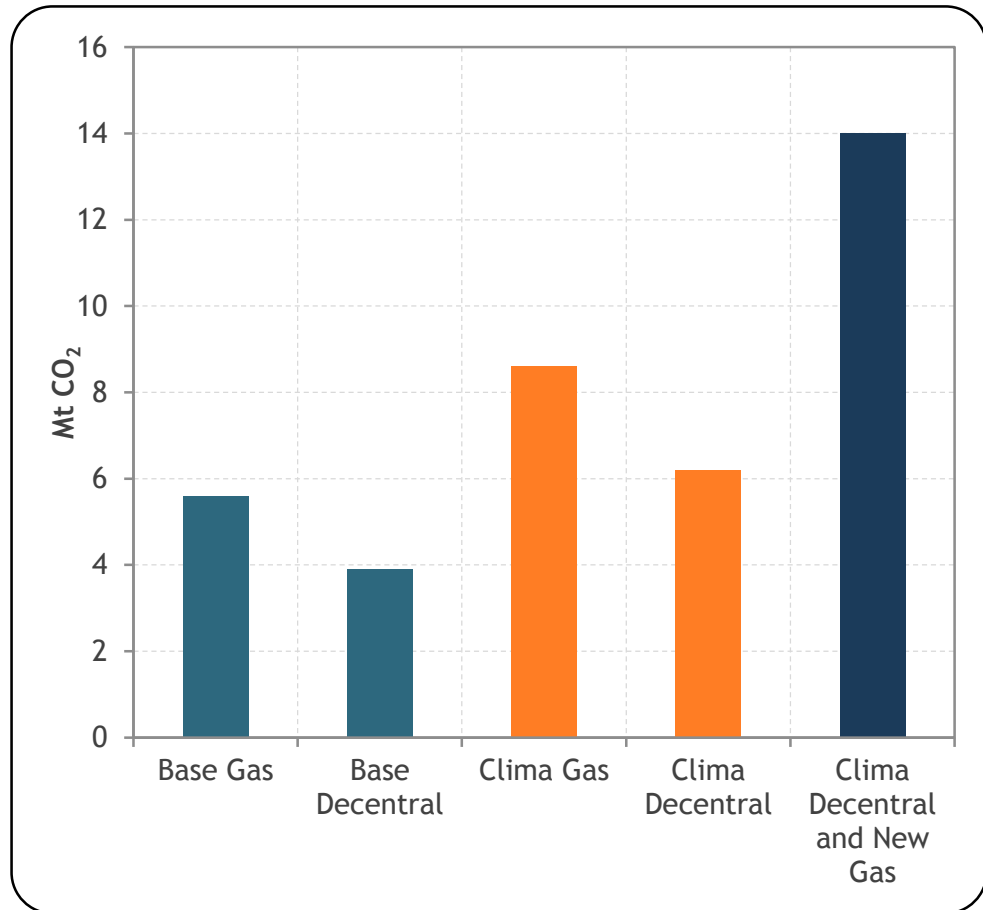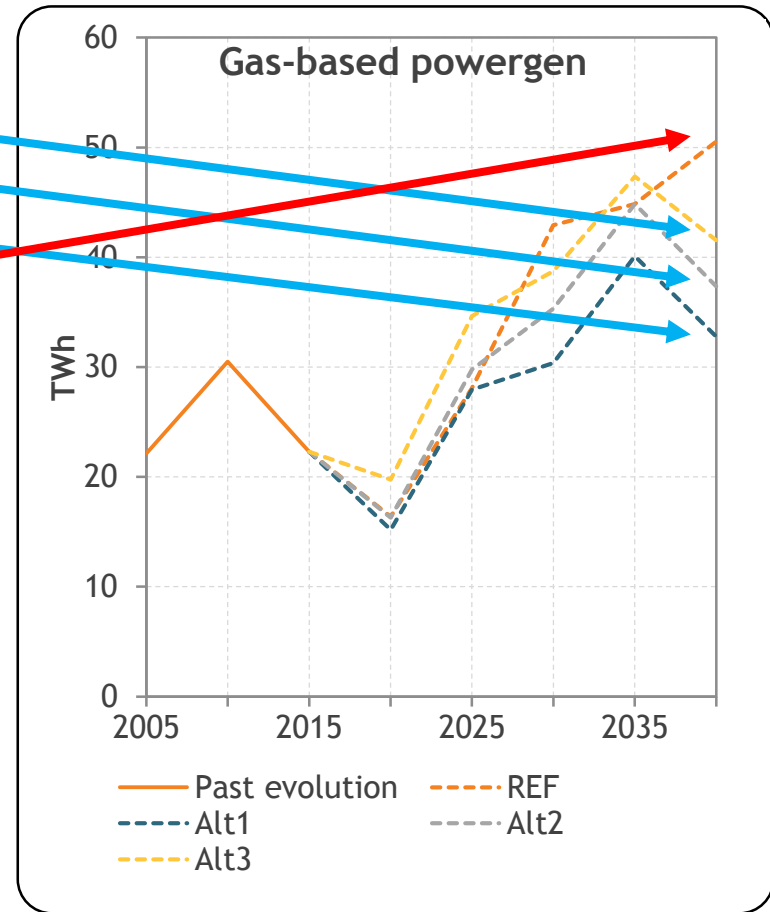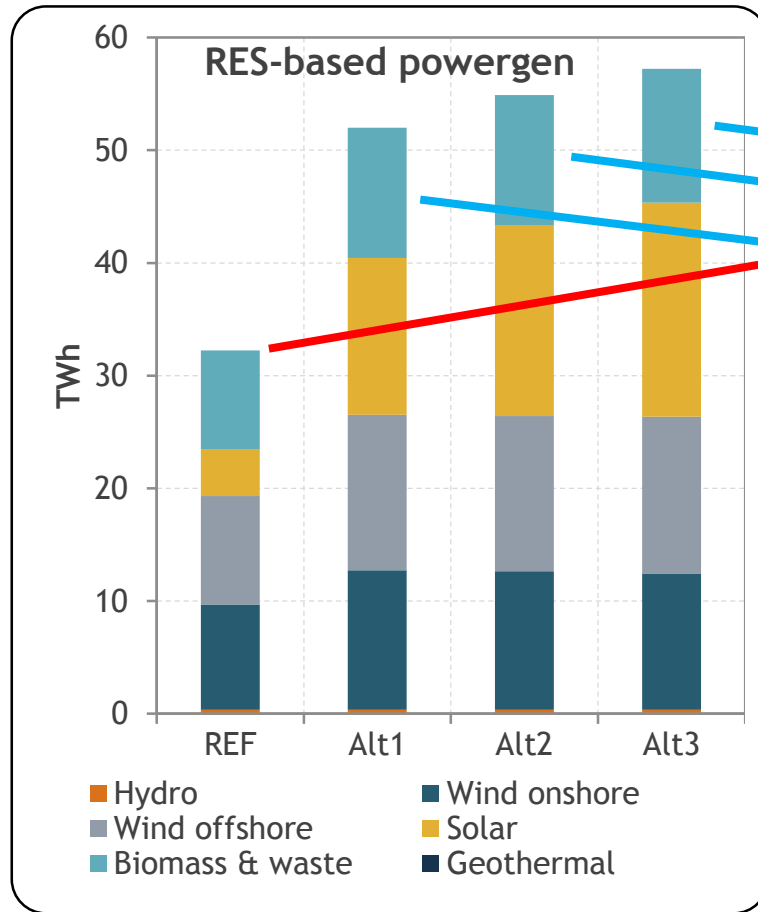
Results: Electricity and natural gas trade balance

- Recent evolution (2011-2015): electricity ≠ natural gas

  level of deficit, respective shares, volume vs. price effect

- 2027: significant increase in energy trade deficit

  x2, triggered by electricity

Chart — y-axis: B €'14, ranging from 0.5 to -3.5. Bars for 2011-2015 split between Natural gas (orange) and Electricity (dark blue).

Year	Natural gas	Electricity
2011	-1,2	-0,1
2012	-1,3	-0,5
2013	-1,2	-0,5
2014	-0,9	-0,7
2015	-0,9	-0,8

■ Natural gas　　　■ Electricity

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Study 2: the IA

Impact assessment: Clean energy for all Belgians

RES-based powergen — TWh

Hydro · Wind onshore · Wind offshore · Solar · Biomass & waste · Geothermal

Categories: REF, Alt1, Alt2, Alt3

Gas-based powergen — TWh

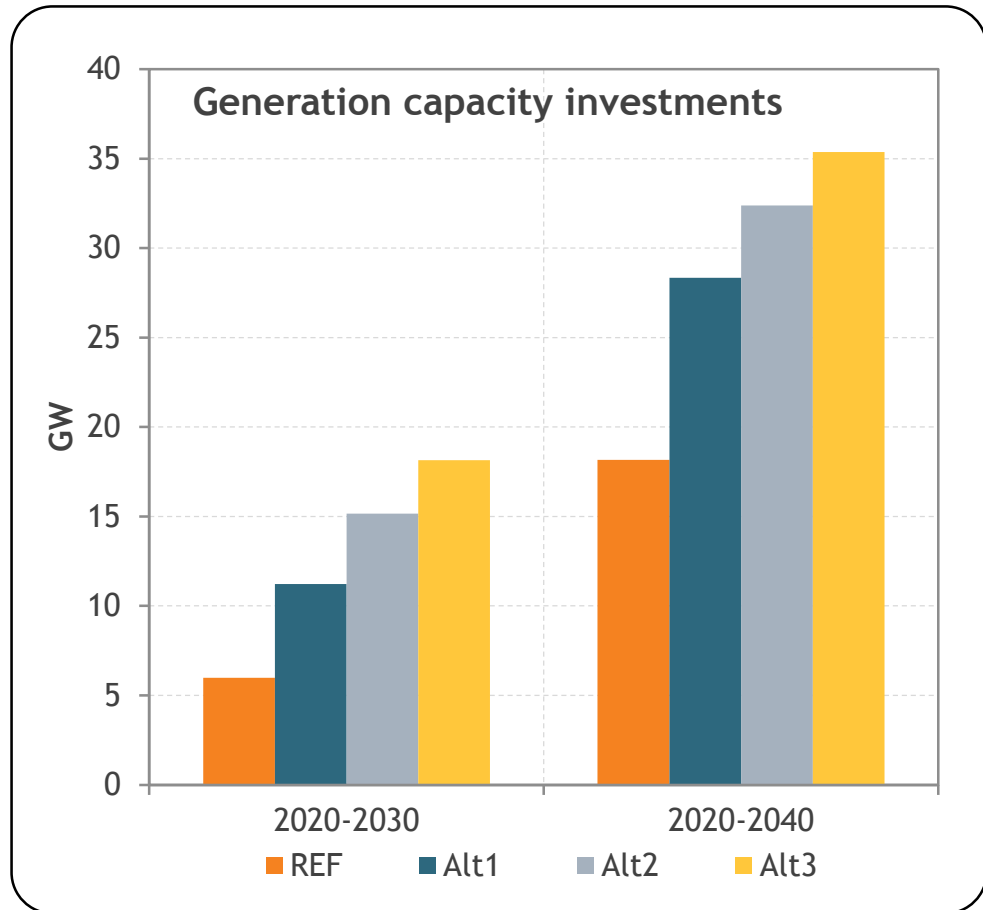Past evolution · REF · Alt1 · Alt2 · Alt3

Source: FPB (WP 05-18).

Investment outlook in generation capacity

- 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"

Generation capacity investments

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

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Conclusions

Full speed ahead for gas?

- Investing: how much?
  - ✓ Outlook: 3,4 GW – 4,5 GW – 4,7 GW – 5,8 GW
 - ✓ Electricity studies: 2,9 GW – 3,9 GW – 4,4 GW – 6,5 GW

  Gas=needed
  - Even in a strongly decentralised future
  - ST: balancing, (M)LT: SoS and demand increase
  - CO_2 emissions
    - ETS: reference year 2005
    - In 2030 [32,38]% decrease of GHG wrt 2005

- Build now: 25 years part of the system
  - Phase out by 2050 (low carbon economy)
  - Part of P2G (methane, hydrogen, ...)

    Nuon, Statoil and Gasunie join forces using hydrogen in future CO2-free energy plants

Hydrogen Enriched Combustion Testing of SIEMENS Industrial SGT-400 at Atmospheric Conditions

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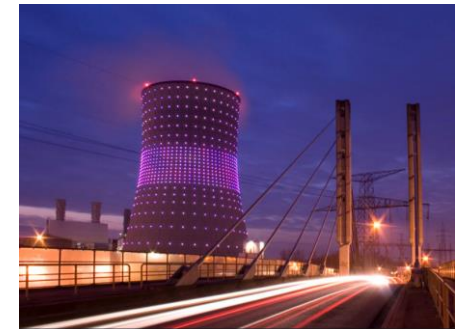
Full speed ahead for gas? (2)

- Investments in electricity generation capacity are huge
  - "Whatever we do", but <> current investment climate
  - Reflection required on
    - how much investments are socially acceptable and desired
    - how investments can be triggered

> *"Does not concern technology that much, but rather social necessity and political will"* Klaus Shäfer, CEO Uniper, Feb 17, 2017

- Trade-off: every upside has a downside
  - To gas <> CO_2 emissions, energy dependence, …
  - Not to gas <> more electricity imports, higher investments, …

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