“Missing money” in de elektriciteitsmarkt

FLUX50

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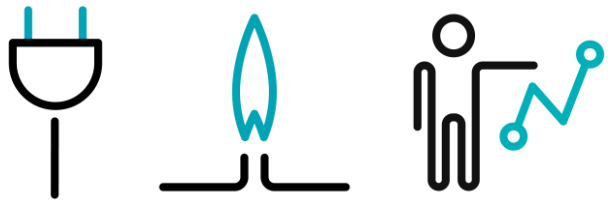


Overview

- Impact of wind on “missing money”
- Capacity for security of supply: new data from Elia on running hours
- Conclusions

Impact of wind on “missing money”: running hours of (super) peak capacity

Introduction

- Impact of wind capacity: lowers running hours for existing generation capacity
- Lower running hours

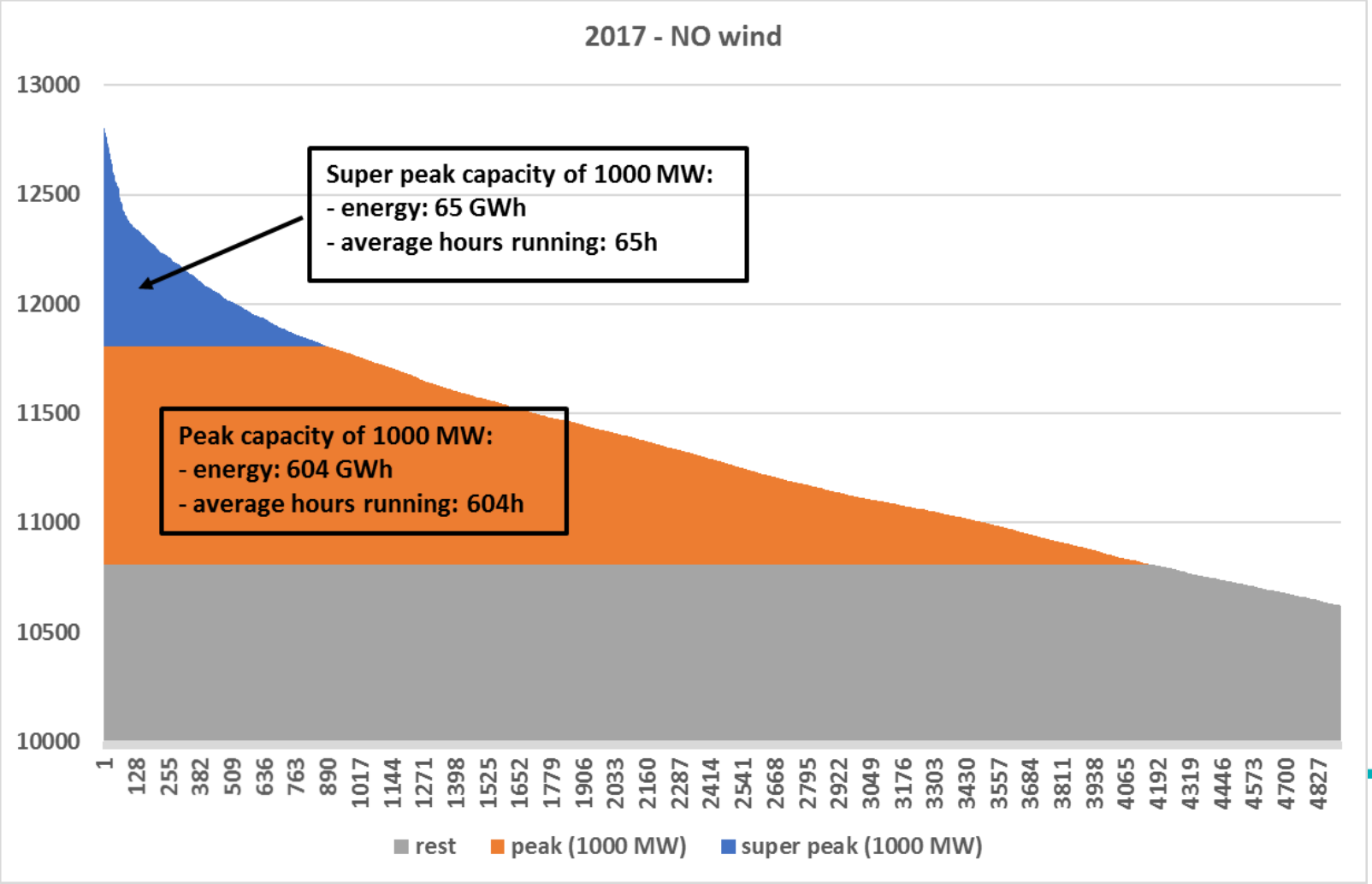
  => less income

  => existing capacity could become unprofitable to stay in the market

  => security of supply could not be guaranteed: problem of “missing money”
- You can set up a Capacity Remuneration Mechanism if there is a structural and significant problem of “missing money”

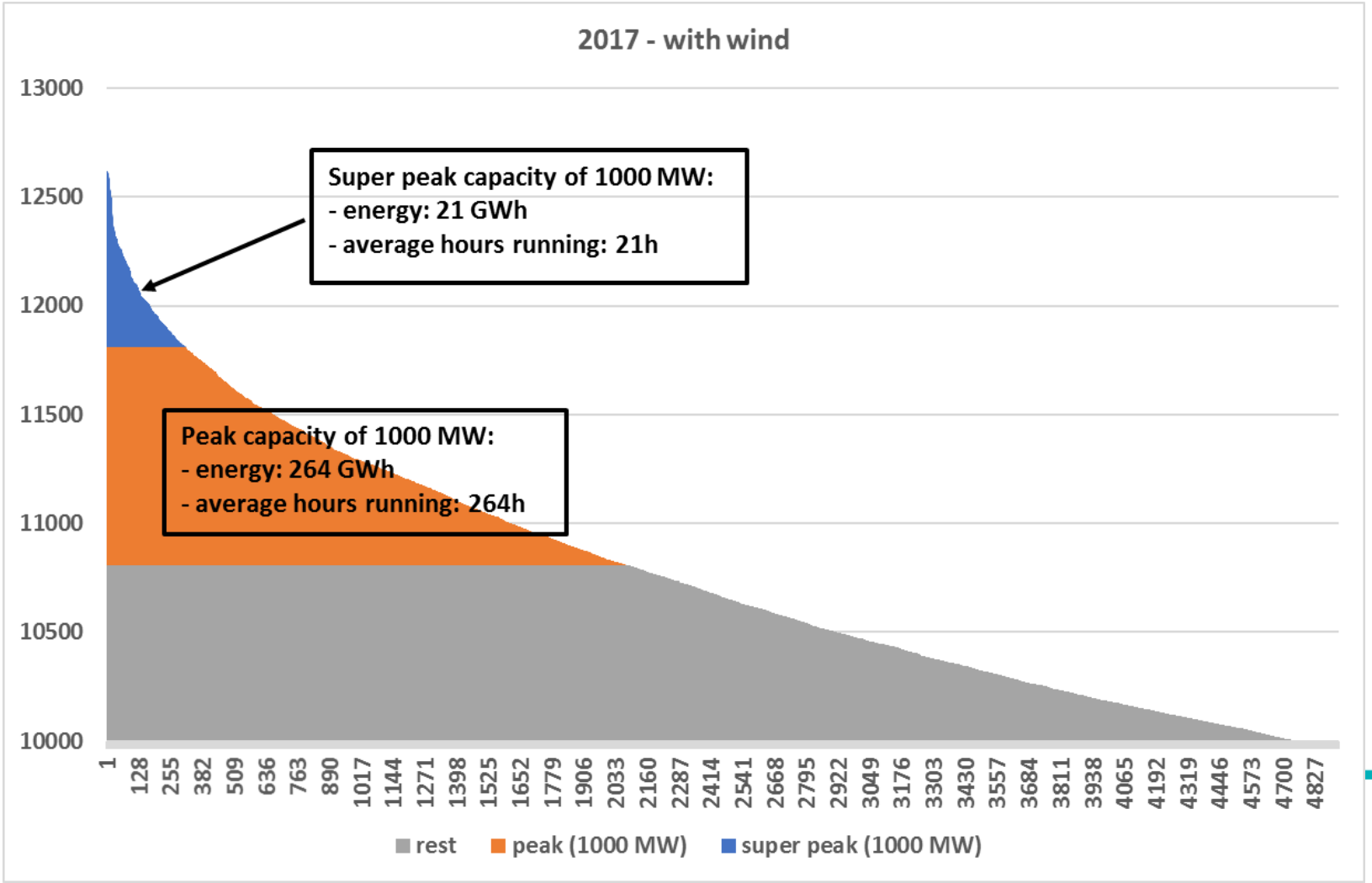
Impact of wind on running hours

- Wind significantly decreases running hours of (super) peak capacity: load duration curve of 2017 <u>without wind</u> (first 5000 quarter-hours)



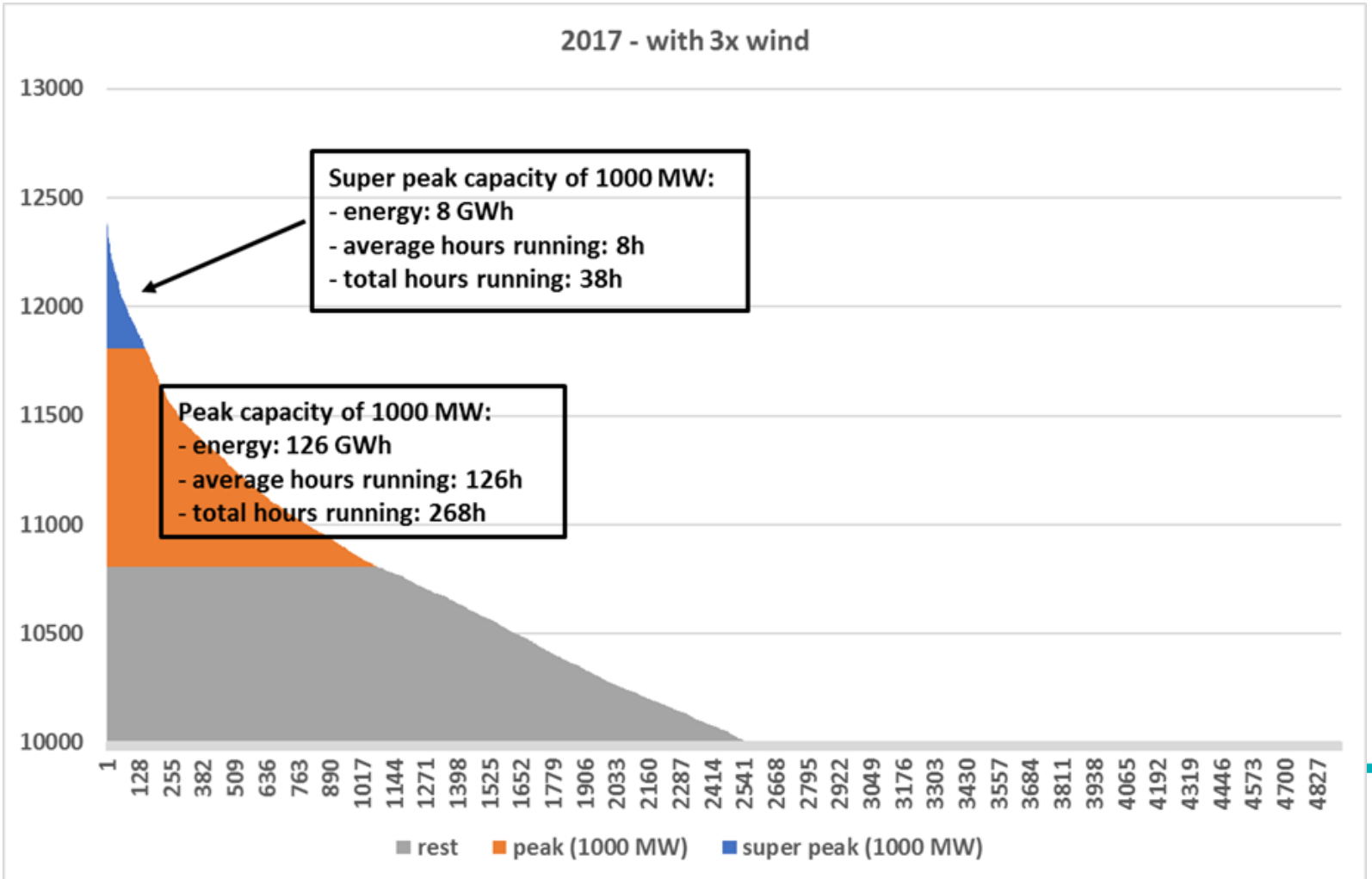
Impact of wind on running hours

- Wind significantly decreases running hours of (super) peak capacity: situation <u>with wind</u>: more than halving the average running hours



Impact of wind on running hours

- Wind significantly decreases running hours of (super) peak capacity: simulation with <u>3x wind capacity</u> => again more than halving running hours

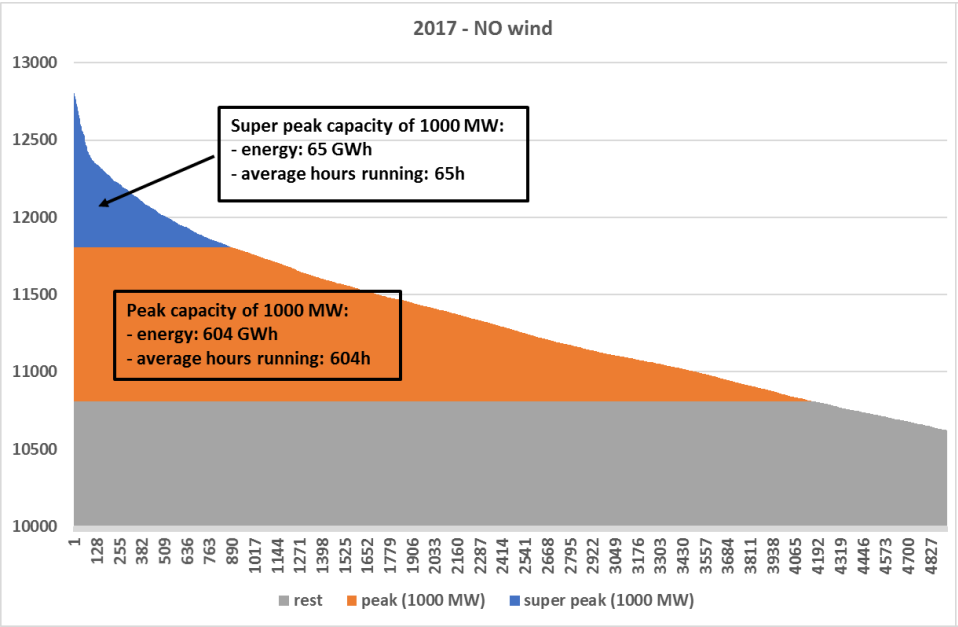


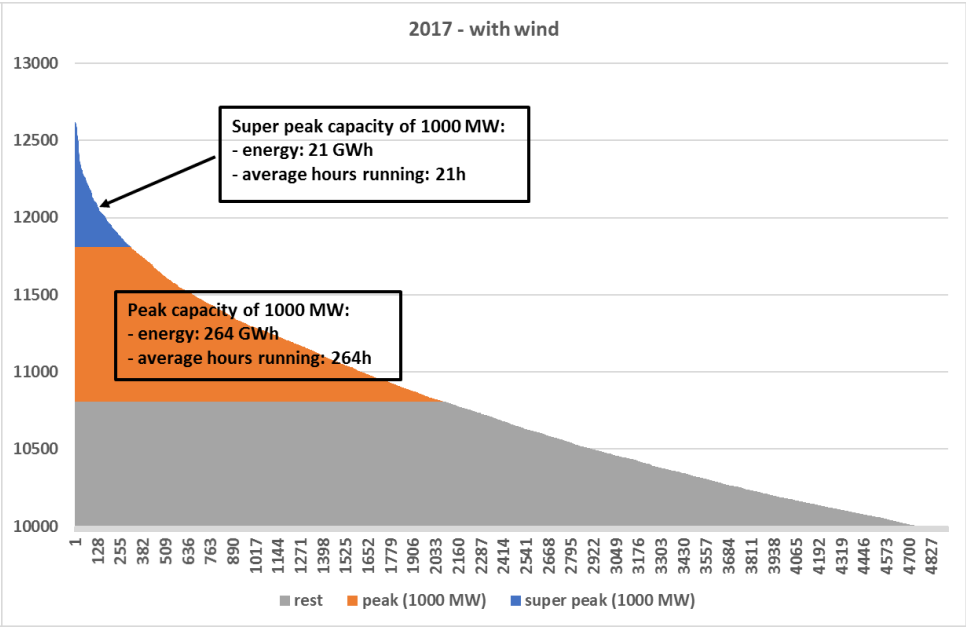
Impact of wind on running hours

- Wind significantly decreases running hours of (super) peak capacity: already in 2017 more than halving the average running hours

  ➔ Making gas-fired peaking units less attractive for the energy market

  ➔ BUT: making other types of capacity <u>more</u> attractive: Demand Response (DR) and Emergency Generators (EG) more likely to participate in the energy market when running hours decrease





Capacity needed for security of supply: new data from Elia on running hours

What capacity is needed for SoS?

- Elia study November 2017: need for 5,9 GW in 2025, after nuclear phase-out and if all existing gas-fired capacity is taken out
- But no information on “running hours” for guaranteeing SoS => strongly criticized by CREG, because this is important information
- New analysis by Elia of new scenario “Energy Pact” for 2025, including running hours for guaranteeing SoS: need for 5,7 GW in 2025, but with low running hours

	Energy Pact scenario 2025	
	capacity	**running hours average - P95**
5700 MW	700 MW	**5 - 30 h**
	1000 MW	**10 - 40 h**
	1000 MW	**60 - 100 h**
	1000 MW	**300 - 600 h**
	1000 MW	**700 - 1100 h**
	1000 MW	**1200 - 1700 h**

probability of need
<50%
>50%
100%

What capacity is needed for SoS?

- 4,8 GW centralized gas-fired capacity is installed in Belgium
- Elia study November 2017:
  - 2,3 GW assumed to stay in the market;
  - 1,2 GW assumed to leave the market a few years before 2025
  - No gas-fired capacity will return from strategic reserves
- CREG December 2017: what if life time extension of those who would leave the market?
  - Cost of life time extension of CCGT with 100.000 hours: about 40 M€ (cfr. Belgian case from the past)
  - New CCGT (400 MW): about 250-350 M€
- April 2018: gas-fired capacity from Strategic Reserves announcing/willing to come back to the market (Vilvoorde+Seraing: 850 MW)

What capacity is needed for SoS?

- What if we can keep all installed centralized gas-fired capacity (4,8 GW)?
- If existing gas-fired capacity stays in the system => still shortage, but only 900 MW and <u>with very low running hours</u> (on average < 10 hours/year)

	Energy Pact scenario 2025	
	capacity	**running hours average - P95**
	700 MW	5 - 30 h
5700 MW	1000 MW	10 - 40 h
	1000 MW	60 - 100 h
	1000 MW	300 - 600 h
	1000 MW	700 - 1100 h
	1000 MW	1200 - 1700 h

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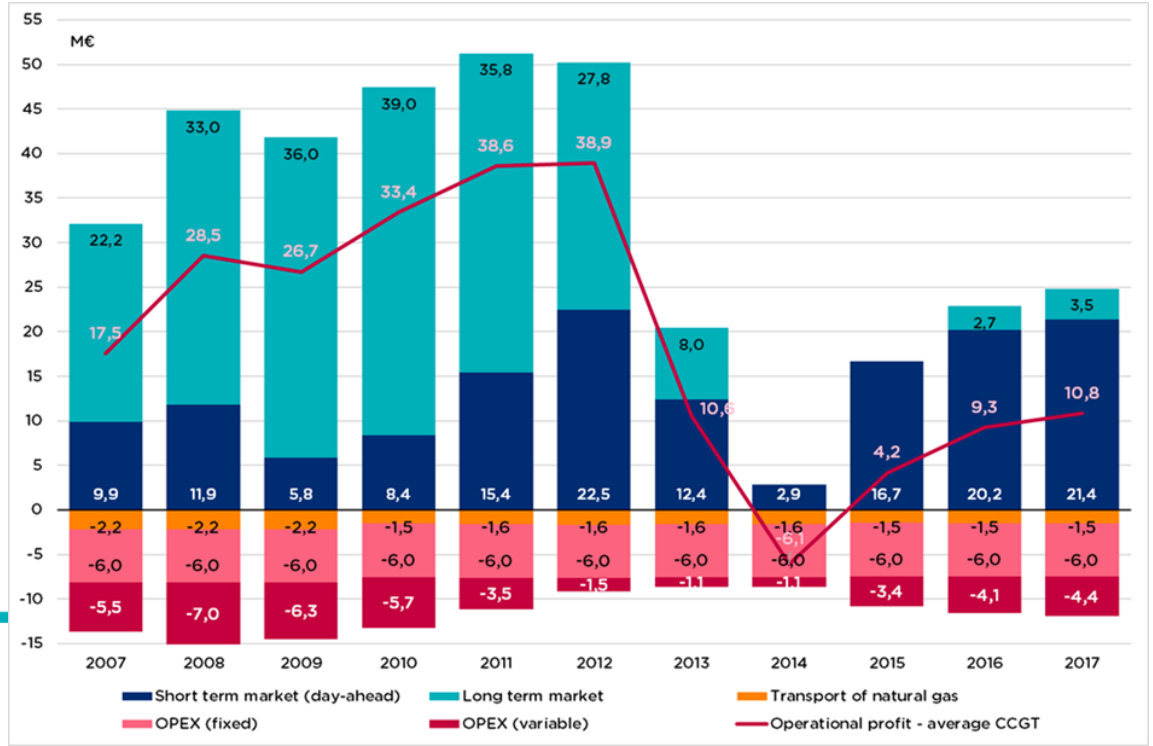
Existing gas-fired capacity profitable in the market

- Existing CCGTs already profitable: 2017 operational profit of 10,8 M€ for average CCGT in Belgium (see CREG study 1628+1719)
- Prices until 2021: higher profits on forward market than before
- After 2022-2023: no price quotations yet, but profits expected to be higher because 2 GW nuclear capacity leaving the market (Doel 3, Tihange 2)
- Vilvoorde+Seraing want to come back to the market



CREG

Very low running hours for peak capacity

- Very low running hours seem ideal for Demand Response (DR), Electric Vehicles (EV), Emergency Generators (EG):
  - Top 1700 MW: ideal for DR/EV
    - On average: only 5-10 hrs/yr (% energy of total demand: 0,01-0,02%)
    - 1 in 20 years: 30-40 hrs/yr (% energy: 0,06-0,09%)
  - Next 1000 MW: ideal for EG/EV
    - On average: only 60 hrs/yr (% energy: 0,08%)
    - 1 in 20 years: 180 hrs/yr (% energy: 0,22%)
  - Total running hours => max values!
- Top 2700 MW: ideal for DR/EG/EV => this alternative should be looked at more closely (e.g. in Belgian hospitals alone, there is already 200 MW of EmergencyGenerators)

	Energy Pact scenario	
	capacity	running hours average - P95
	700 MW	5 - 30 h
	1000 MW	10 - 40 h
5700 MW	1000 MW	60 - 100 h
	1000 MW	300 - 600 h
	1000 MW	700 - 1100 h
	1000 MW	1200 - 1700 h

What if there are unexpected events?

- Elia: additional capacity could be needed in case of unexpected events:
  - ➔ November 2017: Elia proposes 1000-2000 MW of additional needs in case of unexpected events
  - ➔ New Elia analysis: this additional capacity has very low running hours
  - ➔ Need for monitoring what is happening in Belgium and other countries

What if there are unexpected events?

- Running hours for capacity in case of unexpected events is very low:
  - On average: 5 hours => <10 GWh (<0,01% of total demand)
  - Extreme year (1 in 20 years): 30 hours => <60 GWh (<0,08% of tot demand)
  - Installation time of DR, EmergencyGenerators, small CHP: **less than 1 year**

	Energy Pact scenario		
	capacity	**running hours average - P95**	
	1000 MW	**5 - 30 h**	in case of unexpected events
	1000 MW	**5 - 30 h**	
5700 MW	700 MW	**5 - 30 h**	
	1000 MW	**10 - 40 h**	
	1000 MW	**60 - 100 h**	
	1000 MW	**300 - 600 h**	
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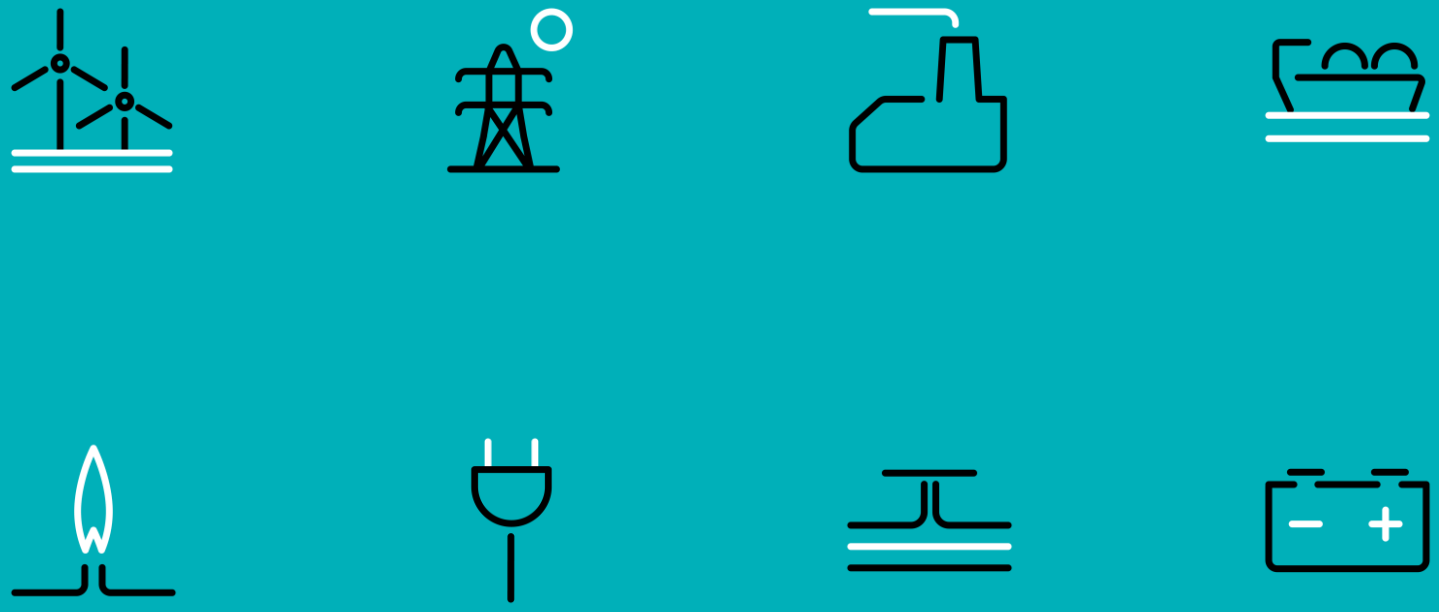
probability of need
<50%
>50%
100%

Conclusions

Conclusions

1. **CRM only when SoS is at stake** ("structural and significant missing money")
2. From Elia analysis: one can see SoS is not at stake if we can keep existing gas-fired capacity + new capacity like Demand Response (DR) and Emergency Generators (EG), with low lead time (< 1 year)
3. Is there missing money for existing capacity?
   - Existing CCGTs are profitable
   - Gas-fired capacity in strategic reserve wants to come back to the market
4. **Wind capacity** leading to very low running hours for (super) peak capacity => **favorable for DR/EG/EV**
5. Unexpected events: additional capacity needed, but with very low running hours (on average: 5 hours/year)

CREG



Commission for Electricity and Gas Regulation

Backup slides

Sanity check

- How is it possible we only need 900 MW of extra capacity in 2025 to replace 5900 MW of nuclear capacity (if we can keep existing gas-fired capacity)?

  ➔ back-on-the-envelop sanity check of Elia results:

  - Winter 2017:
    - Import: max 3100 MW during peak moments
    - 700 MW of gas-fired capacity in Strategic Reserve (not needed if we can import 3000 MW)
    - Nuclear availability : 5000 MW
  - 2025 compared to 2017: replace 5000 MW nuclear
    - Better use of existing import capacity + reinforcements: 4500 MW of import capacity => at least +1400 MW
    - Extra interconnection capacity with UK+GE: +2000 MW
    - 850 MW of capacity from Strategic Reserves
    - 3500 MW extra wind capacity => need for extra capacity decreases with 350 MW

    ➔ total of 4600 MW of extra capacity

  ➔ Total need for extra capacity: 5000 – 4600 = 400 MW

Capacity needed for SoS

- Federal Planning Bureau (September 2017)

  "**[I]f we succeed in keeping the capacity of the current operational thermal flexible park online until after the complete phase-out of all the nuclear units, generation adequacy should be assured.** It is when one (or more) of the current units decides to leave the system that adequacy can no longer be guaranteed in terms of the legally defined LOLE criterium. Investments in new OCGT could mitigate the situation. Condition to trigger these investments, however, is that market design should be simultaneously revised. Opportunities in terms of Demand Response should be carefully scrutinized because they can possibly provide a cheaper way to guarantee security of electricity supply."

Best strategy in a world of uncertainty?

- How good are we at forecasting technological innovation and cost evolutions? See table: very bad! (DeStandaard, 18/01/2018)
- Ten years ago: would we have taken the same decisions if we would have known what we know today on PV and wind cost evolutions?

Voorspelde versus reële energieproductie

In TWH (Terawattuur = 1 miljard KWH)

Energiebron	Productie 2017	Voorspelling voor 2020: Commissie Ampere (2000)	Voorspelling voor 2020: Energiecommissie 2030 (2006)	Voorspelling voor 2020: Gemix (2009)
Zonne-energie	2,9	0,5	0	0,3
Windenergie op land	2,6	1,2	4	2,8
Windenergie op zee	2,8 (*)	3		5,4
Biomassa	3,1	0,9 - 3,5	4	8,5
Nucleaire energie	40,2		±35	±44
Gas	21,8		±37	±23
Steenkool	0		10	4,6

(*) 7,9 TWH voorspeld in 2020

Bron: Elia, eigen berekening

Bron : De standaard

Best strategy in a world of uncertainty?

- What about: battery costs, electric cars, heat pumps, demand response (for longer periods), power to gas/liquid (H2 or CH4 or NH3), biogas, solar cost, cost of HVDC, (very far) offshore wind, impact of smart meters, energy efficiency, fuel cells, big data, carbon capture and storage,…?
- What about the margin of error regarding the forecast that new CCGTs is the best economical option for Belgium in 2030-2040?
  - fuel prices, CO2 prices (cfr study Albrecht: wide margin!)
  - technological innovation
  - energy policy in neighboring countries
  - changes in behavior at moments of scarcity / high prices
  - …
- “real options theory”: in a world of uncertainty (on future cost evolutions), being able to postpone an investment decision has a lot of value

Is all new capacity unprofitable?

What about other types of capacity?

- New small CHP:
  - Cogen Vlaanderen: “Potential of extra 1000 MW”
  - Clearly profitable (CREG study 1583)
- Emergency Generators (EG) (gas/diesel engines):
  - Low capex (diesel): 5 times cheaper than CCGT
  - Probably >1000 MW already installed, so no new Capex => make it available for the market (already being done in the Netherlands)
- Small, flexible gas engines arbitraging with day-ahead and real time prices could already be profitable (CREG study 1583)
- Demand Response (DR) for longer periods (hours/days): not exceptional! => ICH with 2h-4h-8h activation time (in 2015: 1/3–1/3–1/3 of ICH volume)
- Electric Vehicles (EV): 50 kWh unused per EV => for 100k EVs: 5 GWh
- Impact of new incentives for being balanced: imbalance price will increase to >10000 €/MWh when scarcity