2018 END USERS DAY

12th Edition

FLUXYS

AGENDA

08h30: Welcome	
09h30: Gas supply and demand outlook	**Arno Büx**
10h15: Focus on Belgium	**Huberte Bettonville**
11h00: Break	
11h15: Innovative use of “natural” gas	**Nicolas Gielis**
11h45: L/H Conversion	**Denis Bawin**
12h00: Directive SOS gas	**Denis Bawin**
12h15: Lunch	
13h45: The role of natural gas in the future energy mix	**Prof. Samuele Furfari**
14h45: Consultation Connection Agreement	**Ludo Hanot**
15h00: *Break*	
15h15: Maintenance ground exits	**Tim De Vil**
15h45: Planning works	**Ivan Brysens**
16h15: Drink	

FLUXYS

AGENDA

08h30: Welcome	
09h30: Gas supply and demand outlook	**Arno Büx**
10h15: Focus on Belgium	**Huberte Bettonville**
11h00: Break	
11h15: Innovative use of “natural” gas	**Nicolas Gielis**
11h45: L/H Conversion	**Denis Bawin**
12h00: Directive SOS gas	**Denis Bawin**
12h15: Lunch	
13h45: The role of natural gas in the future energy mix	**Prof. Samuele Furfari**
14h45: Consultation Connection Agreement	**Ludo Hanot**
15h00: *Break*	
15h15: Maintenance ground exits	**Tim De Vil**
15h45: Planning works	**Ivan Brysens**
16h15: Drink	

FLUXYS

GAS SUPPLY AND DEMAND OUTLOOK

Arno Büx
Chief Commercial Officer

FLUXYS

Agenda

- World & European Energy Outlook

- The Role of Gas in the Energy Transition

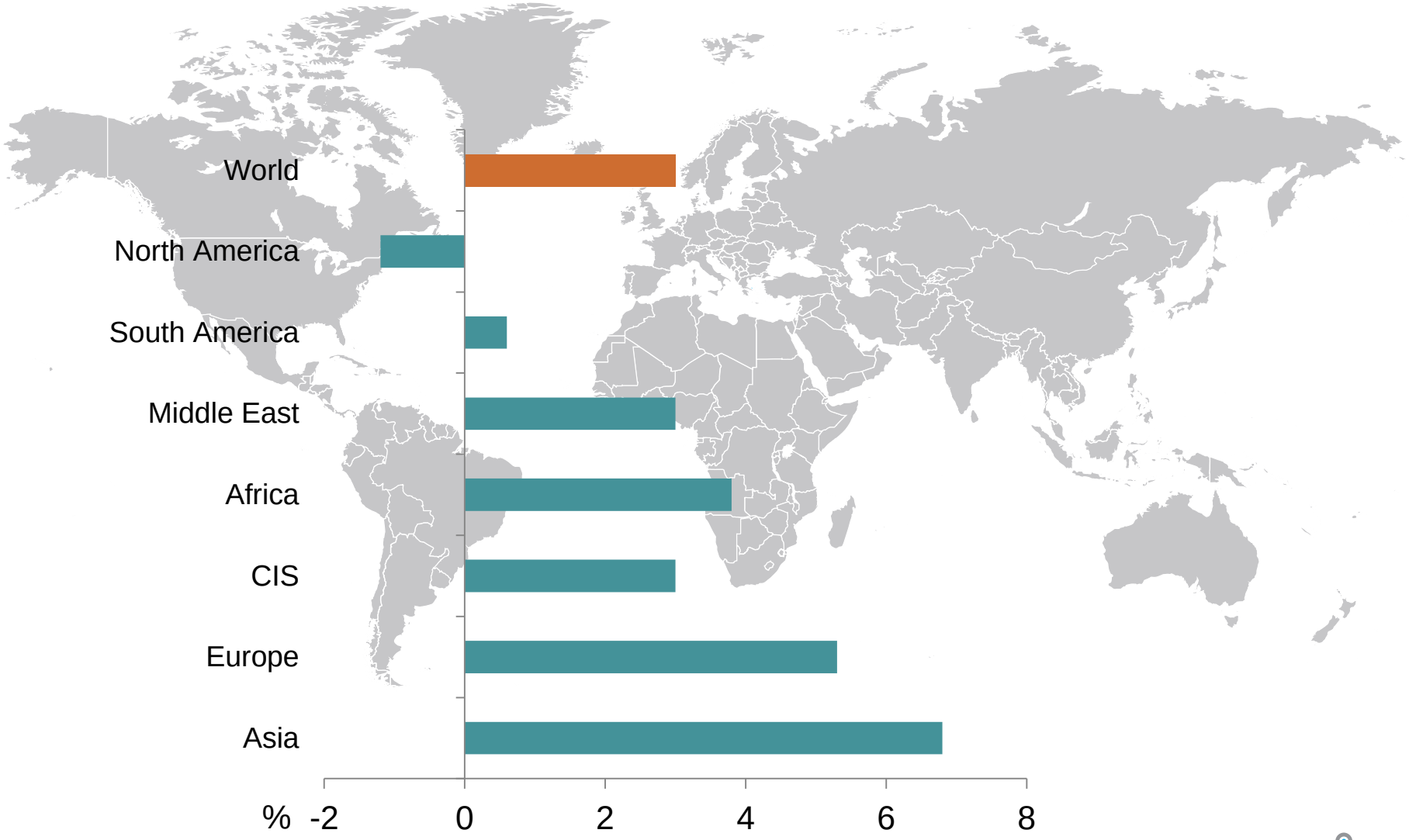
FLUXYS

World Energy Outlook (IEA)
Tipping the energy world off its axis

- Four large-scale upheavals in global energy set the scene for the new *Outlook*:
  - The United States is turning into the undisputed global leader for oil & gas
  - Solar PV is on track to be the cheapest source of new electricity in many countries
  - China's new drive to "make the skies blue again" is recasting its role in energy
  - The future is electrifying, spurred by cooling, electric vehicles & digitalisation
- These changes brighten the prospects for affordable, sustainable energy & require a reappraisal of approaches to energy security
- There are many possible pathways ahead & many potential pitfalls if governments or industry misread the signs of change

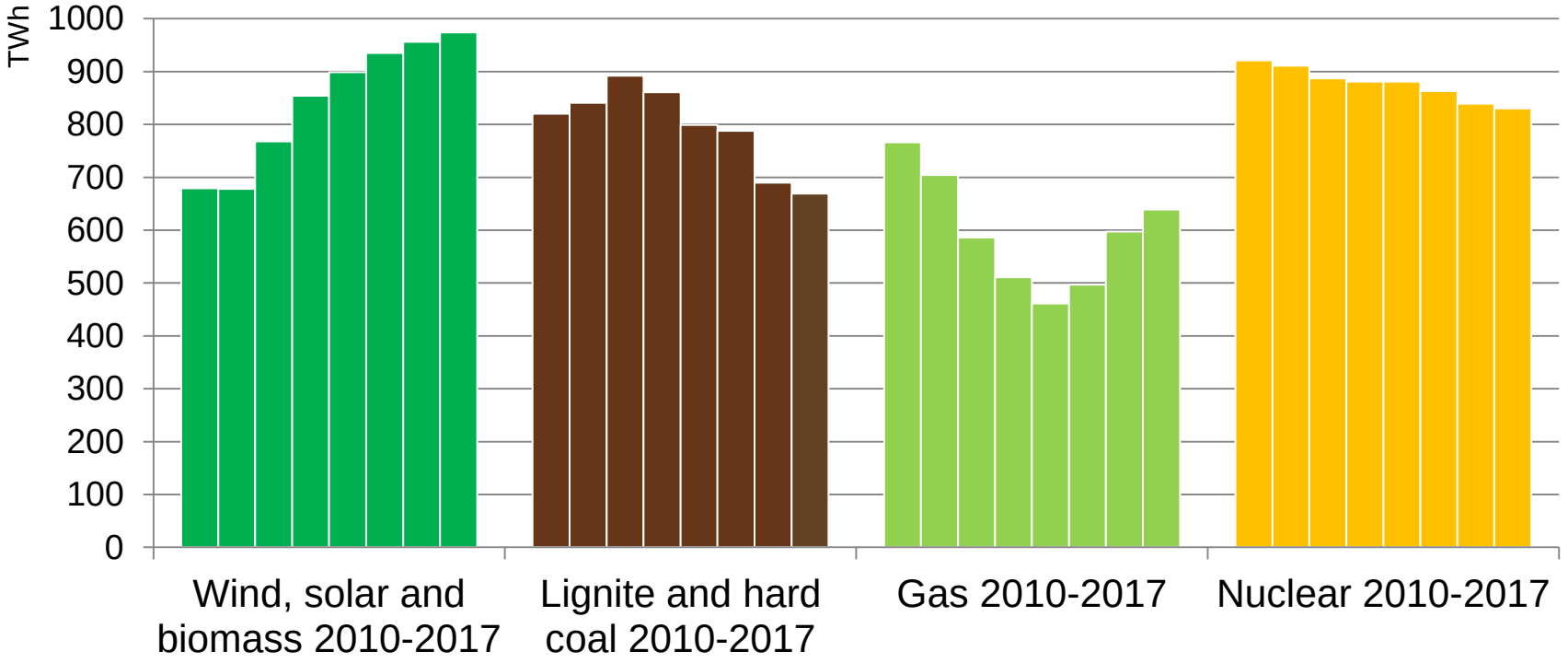
FLUXYS

WORLD GAS DEMAND 2017 UP 3%: CHINA AND EUROPE FASTEST GROWING MARKETS



FLUXYS

GAS-FIRED POWER GENERATION UP 7%: +42 TWh

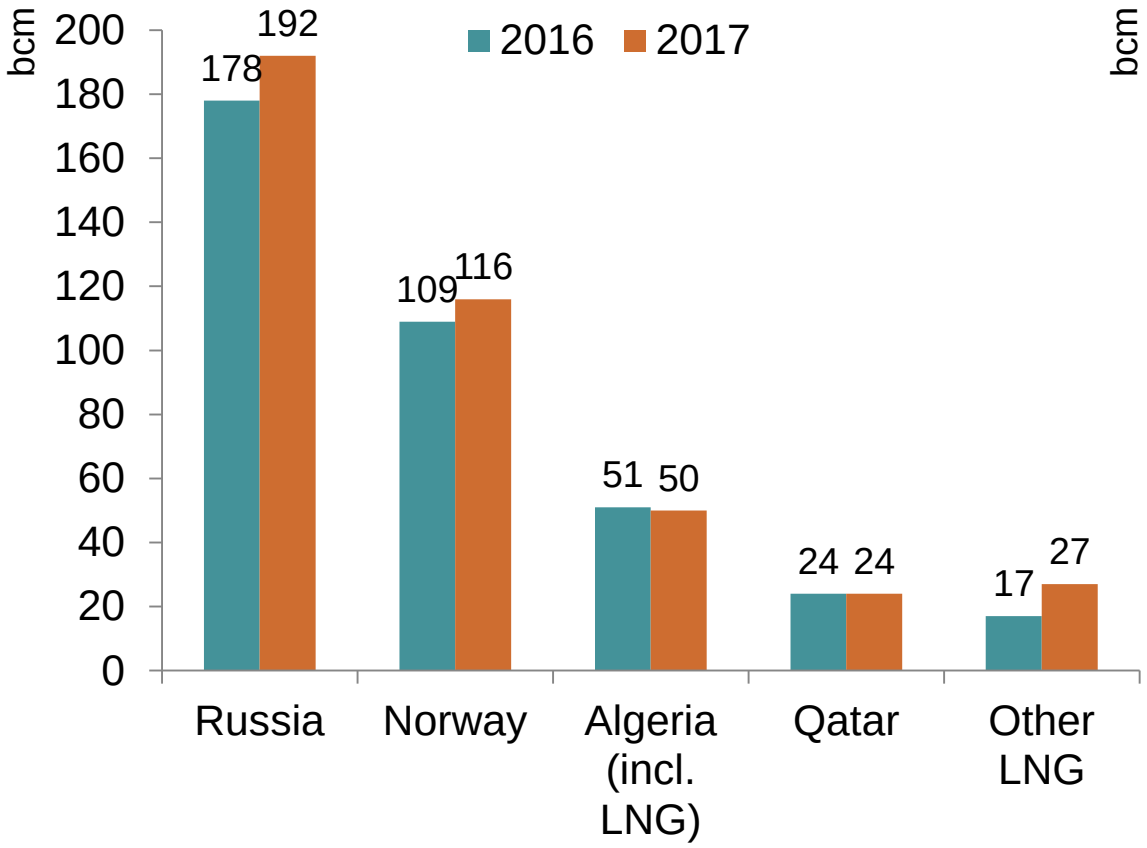


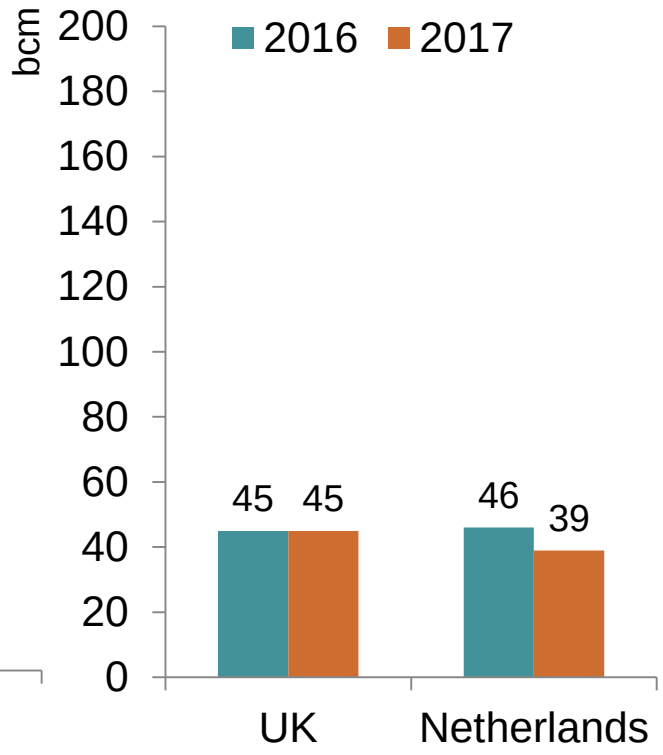
- Lower hydro generation
- Same level of coal-to-gas switching as in 2016

[Agora Energiewende – Sandbag 2018]

FLUXYS

MORE PIPE GAS FROM RUSSIA AND NORWAY, MORE LNG





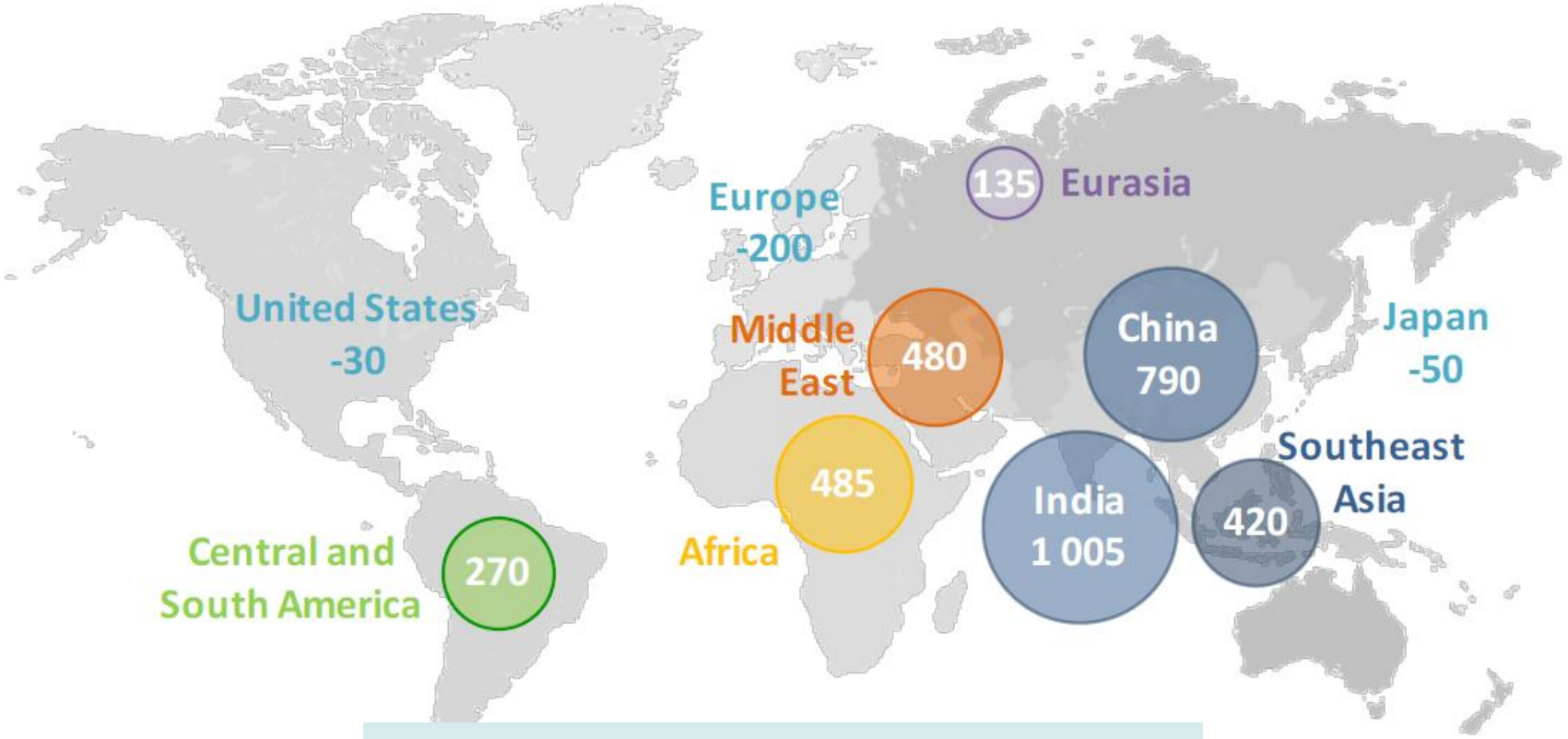
Major exporters into Europe

Major indigenous EU producers

[Gazprom, Gassco, Eurostat, National statistics, IEA]

FLUXYS

2016-2040: ENERGY DEMAND +30% (Mtoe)



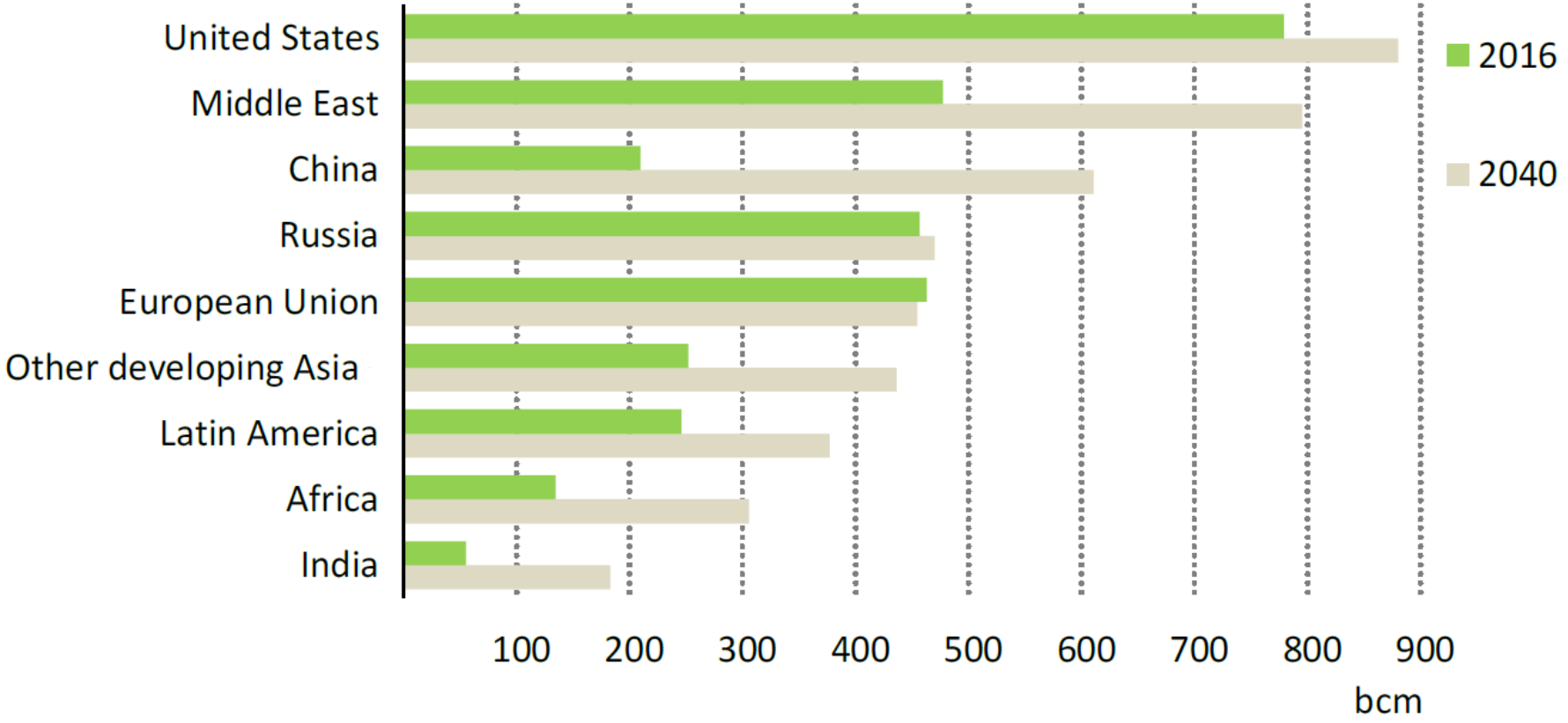
Game changers:

- Various countries change roles
- Solar PV on track to be the cheapest source of new electricity in many countries
- Electricity broadens its horizon

[IEA – World Energy Outlook 2017]

FLUXYS

GAS : CHINA ENGINE OF GLOBAL DEMAND GROWTH

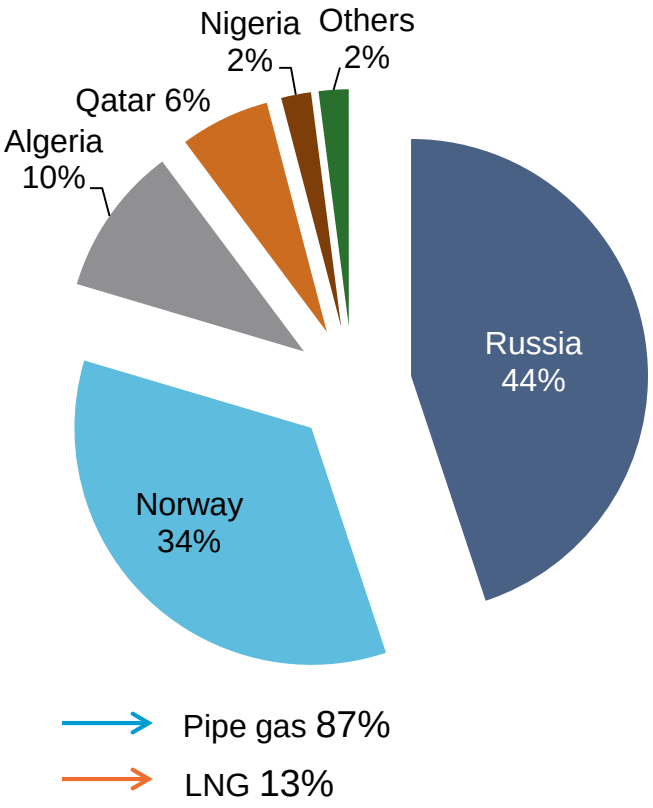


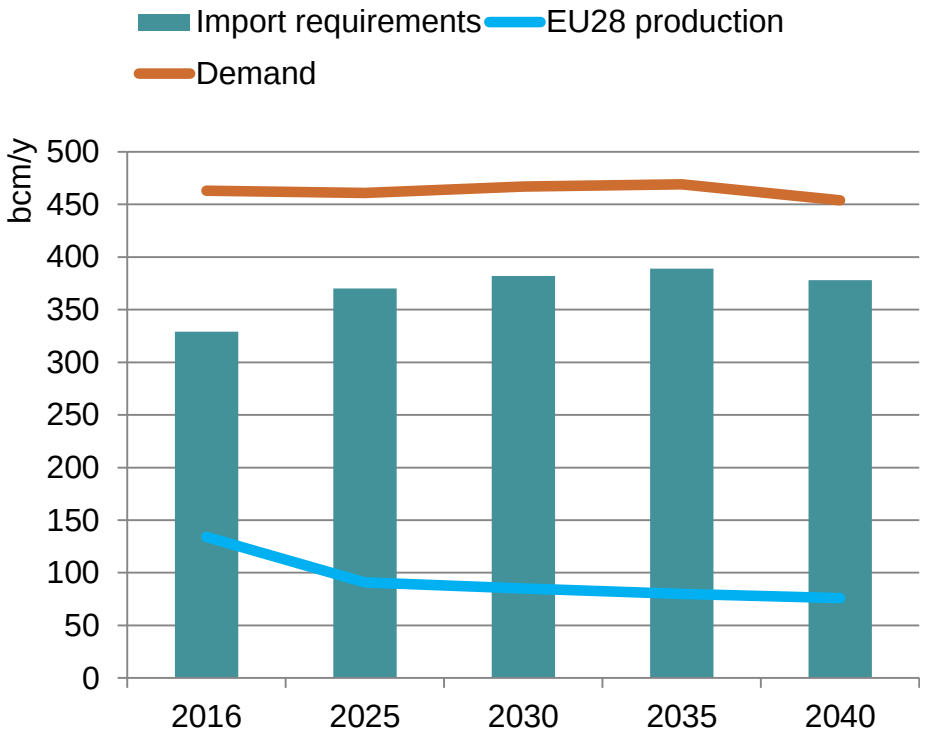
[IEA, World Energy Outlook 2017]

FLUXYS

FOCUS ON EUROPE: DESPITE FLAT DEMAND OUTLOOK, ADDITIONAL IMPORTS NEEDED

EU : imports (Norway incl.) cover 75% of consumption (2016)





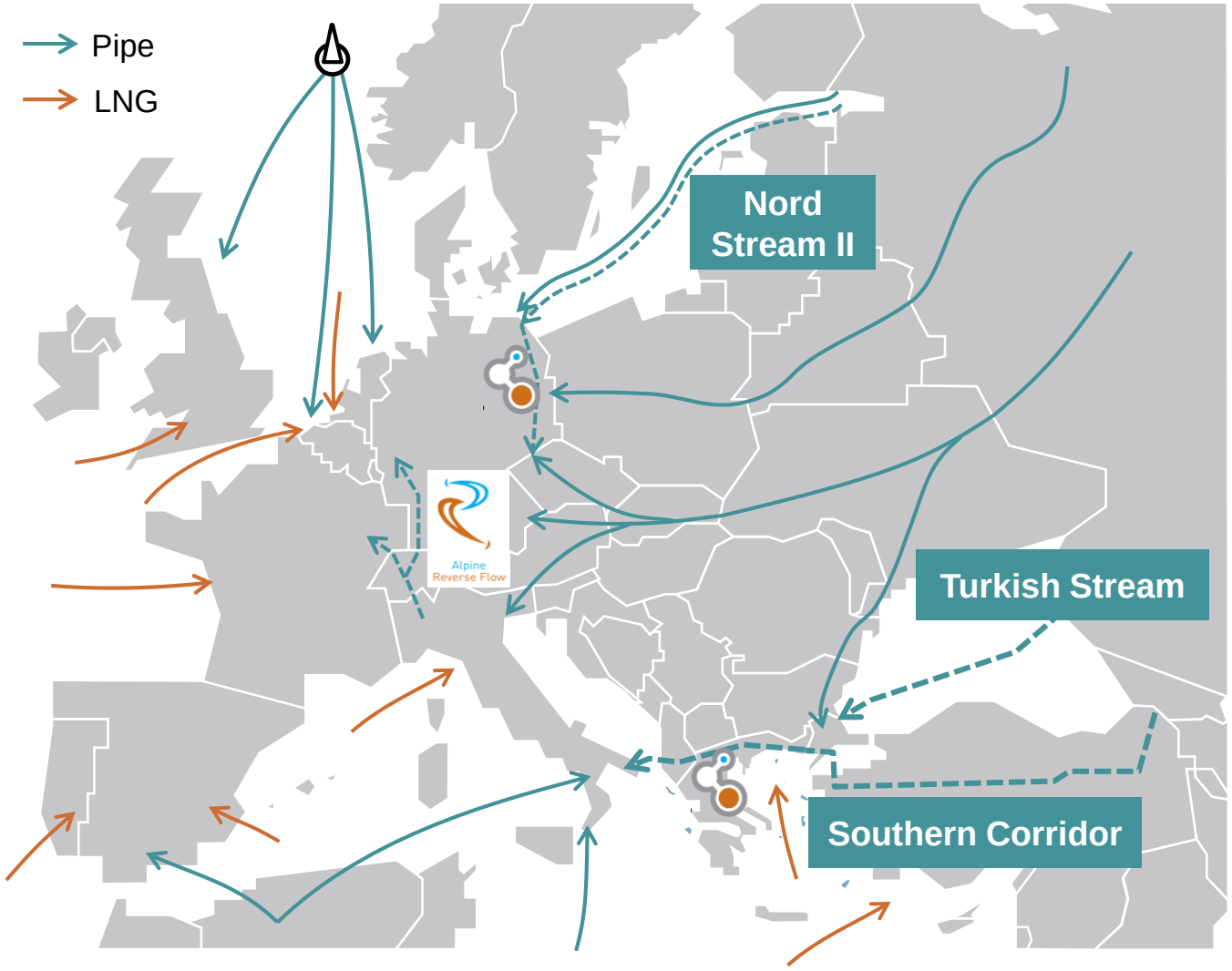
- UK North Sea and Groningen gas fields reach the end of their life
- **Annual Groningen production currently capped at 21.6 BCM and prospect of cap at 12 BCM (compared to 54 BCM a few years ago)**

Source: BP Statistical Review of World Energy June 2017

Source: World Energy Outlook 2017

FLUXYS

COVERING THE SUPPLY GAP IN EUROPE: ADDITIONAL PIPE GAS ON ITS WAY



- Additional pipe gas from Russia
- Additional pipe gas from Southern Gas Corridor
  - > Azerbaijan
  - > Turkmenistan
  - > Middle East
  - > East Med
  - > Recent promising gas discovery off Cyprus

FLUXYS

Agenda

- World & European Energy Outlook

- The Role of Gas in the Energy Transition

FLUXYS

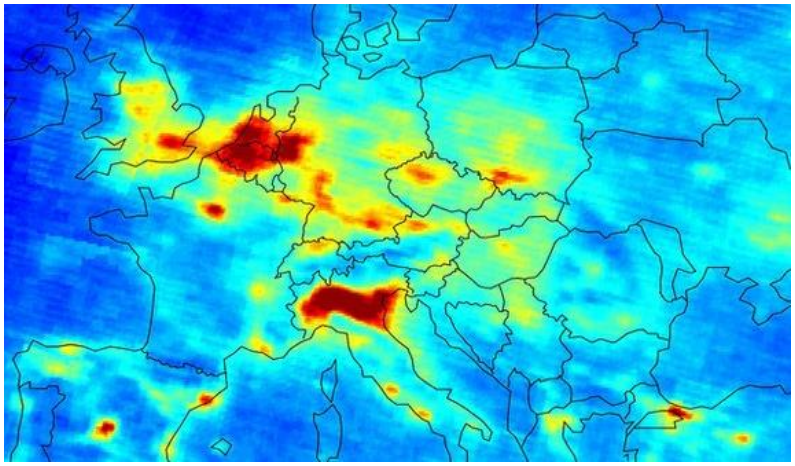
EUROPE: MAJOR CHALLENGES IN CLIMATE AND AIR QUALITY

Long term: ambitious 2030 targets for a low-carbon economy

- At least **40%** less **greenhouse gas emission** than in 1990
- At least **27%** **renewable energy**
- At least **27%** **energy-efficiency**

Short term: particulate matters and other polluting emissions drastically decrease

European Commission estimates premature deaths from air pollution at 400.000 per year



[Environmental satellite European Space Agency – nitrogen oxide levels over Europe]

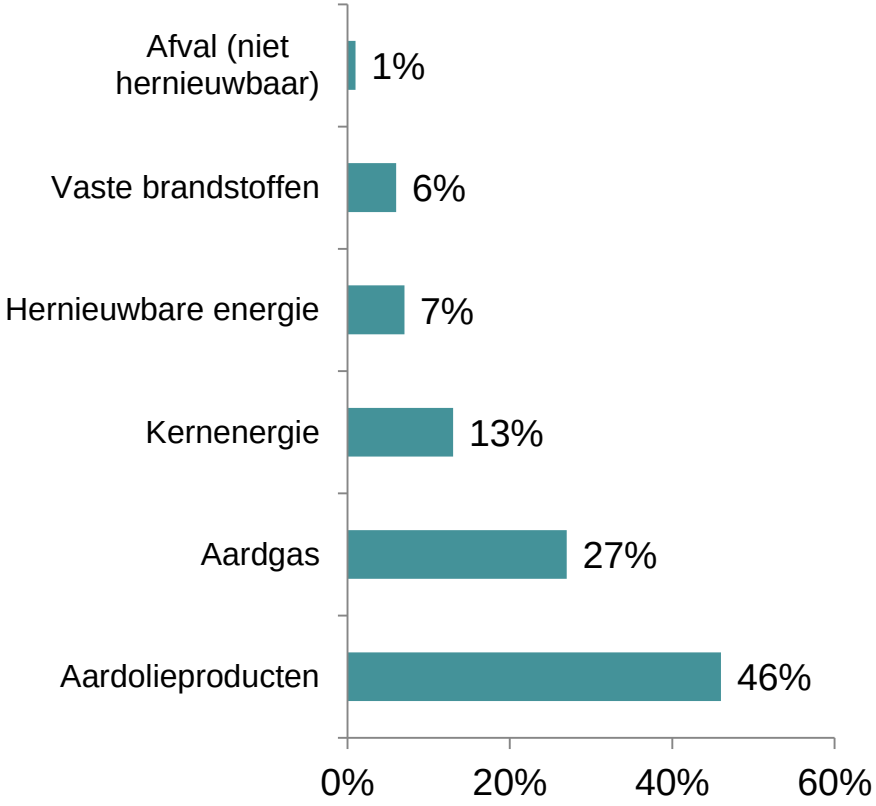
Belgian energy debate: role of electricity and natural gas?

FLUXYS

ELECTRICITY TRANSITION OR ENERGY TRANSITION?

Energiemix in België

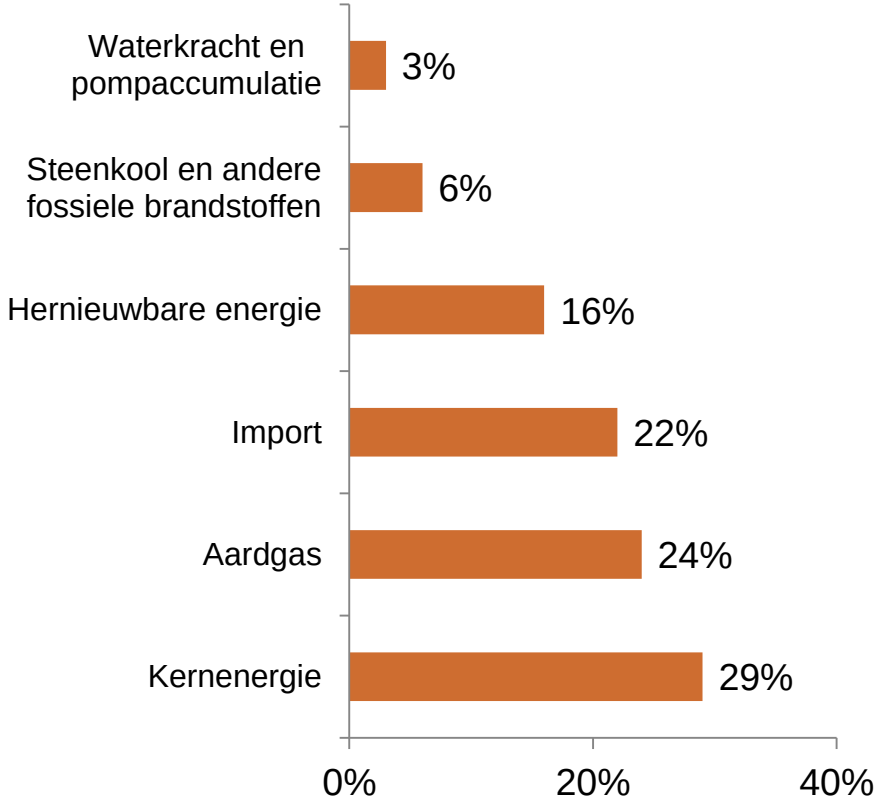
Totaal: 630 TWh



[Eurostat & DG Energie – referentiejaar 2015]

Elektriciteitsmix in België

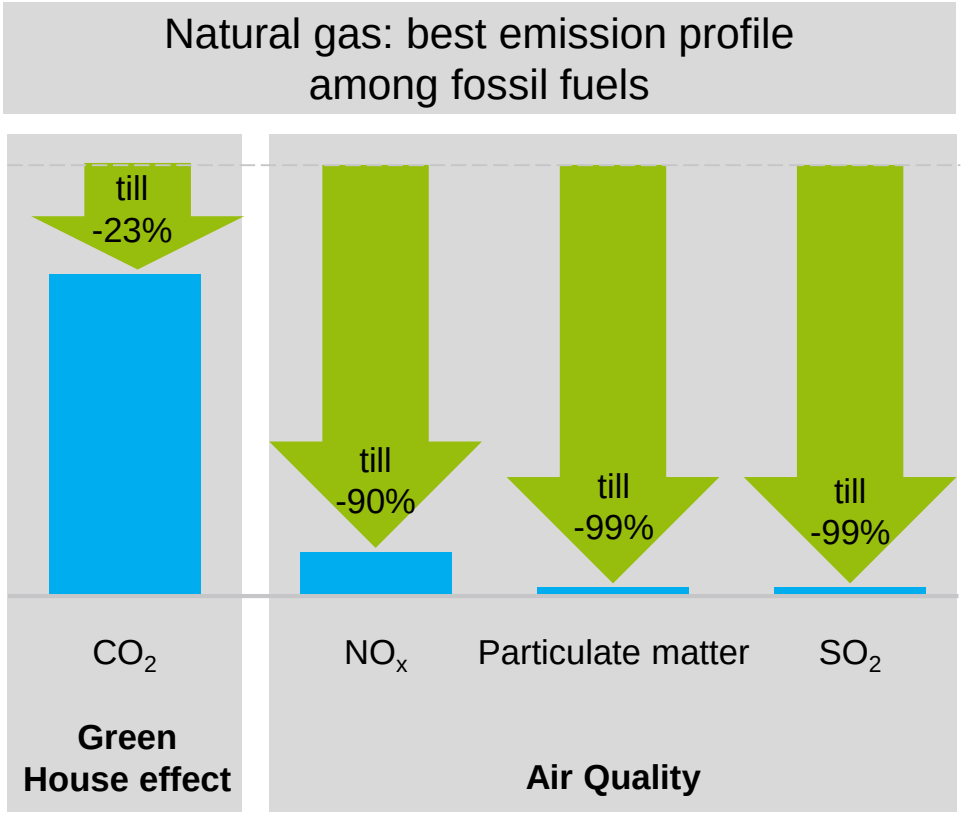
Totaal: 85 TWh



[ENTSO-E – referentiejaar 2015]

FLUXYS

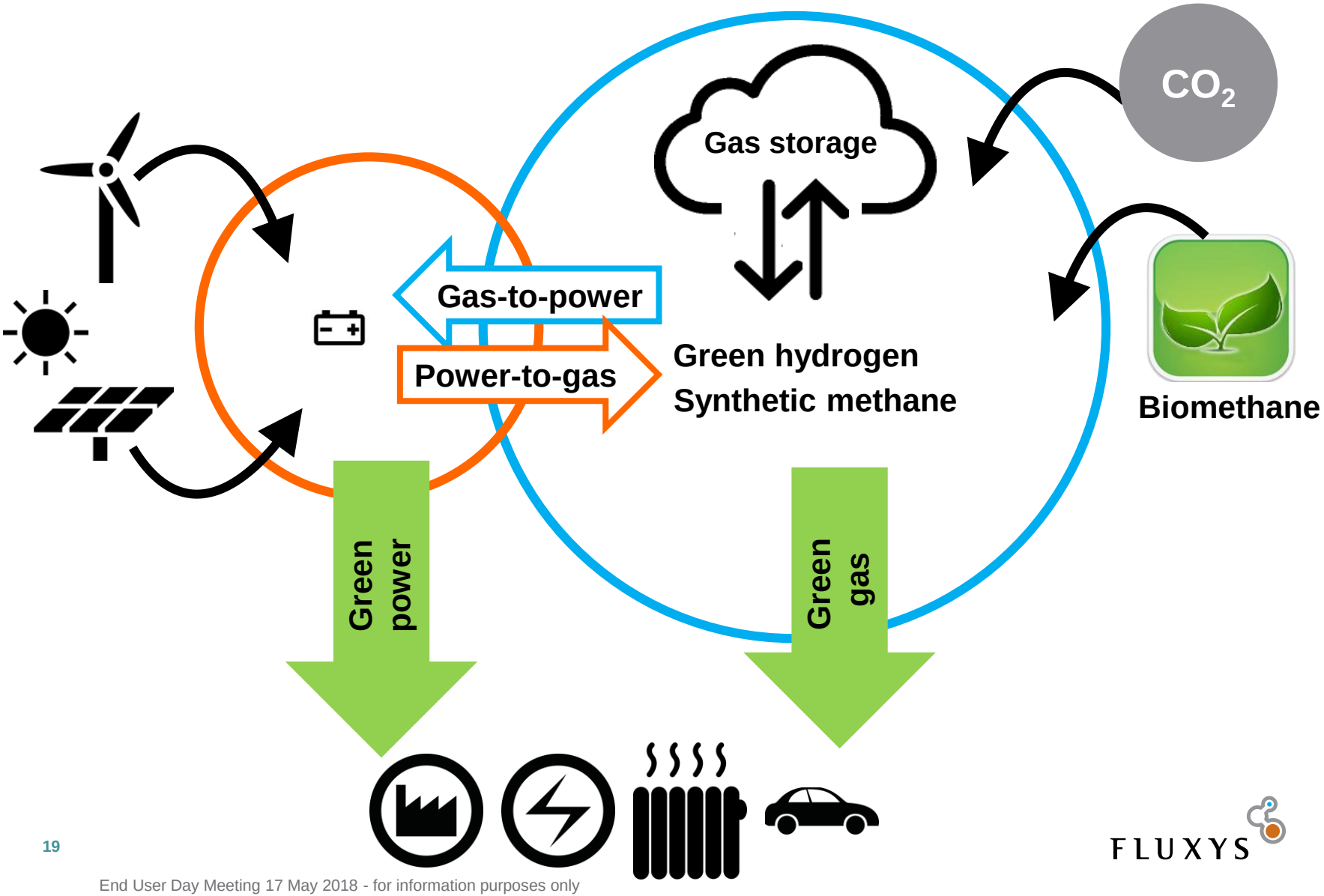
SHORT TERM: SWITCHING ON NATURAL GAS STRONGLY REDUCES AIR POLLUTION AND DECREASES CO_2-EMISSIONS



Emission: natural gas compared with diesel, gasoline, fuel oil or heavy fuel oil [Roland Berger – Thinkstep]

FLUXYS

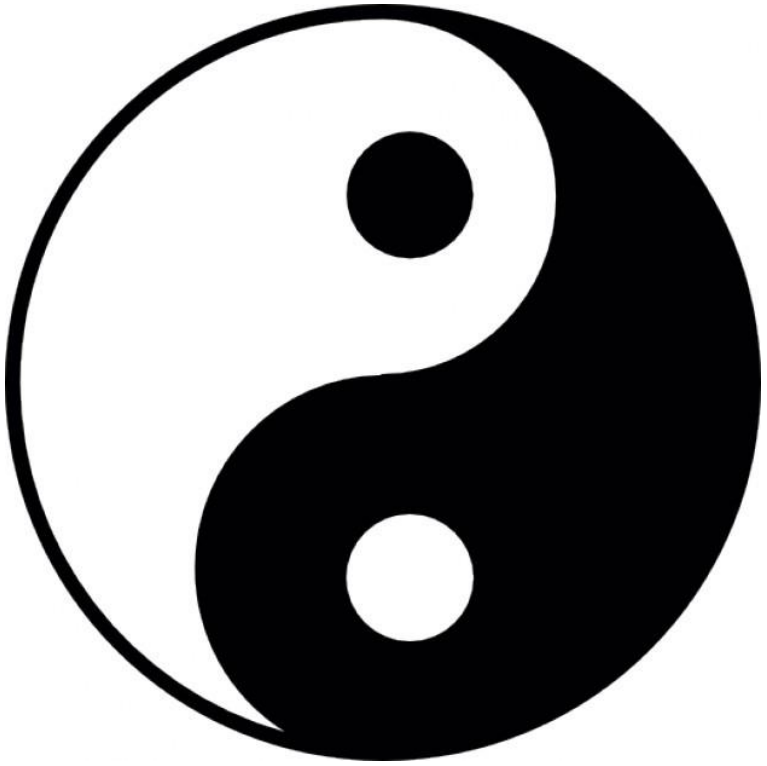
LONG TERM: COMPLEMENTARITY BETWEEN ELECTRICITY AND GAS IS THE ONLY SUSTAINABLE SOLUTION



FLUXYS

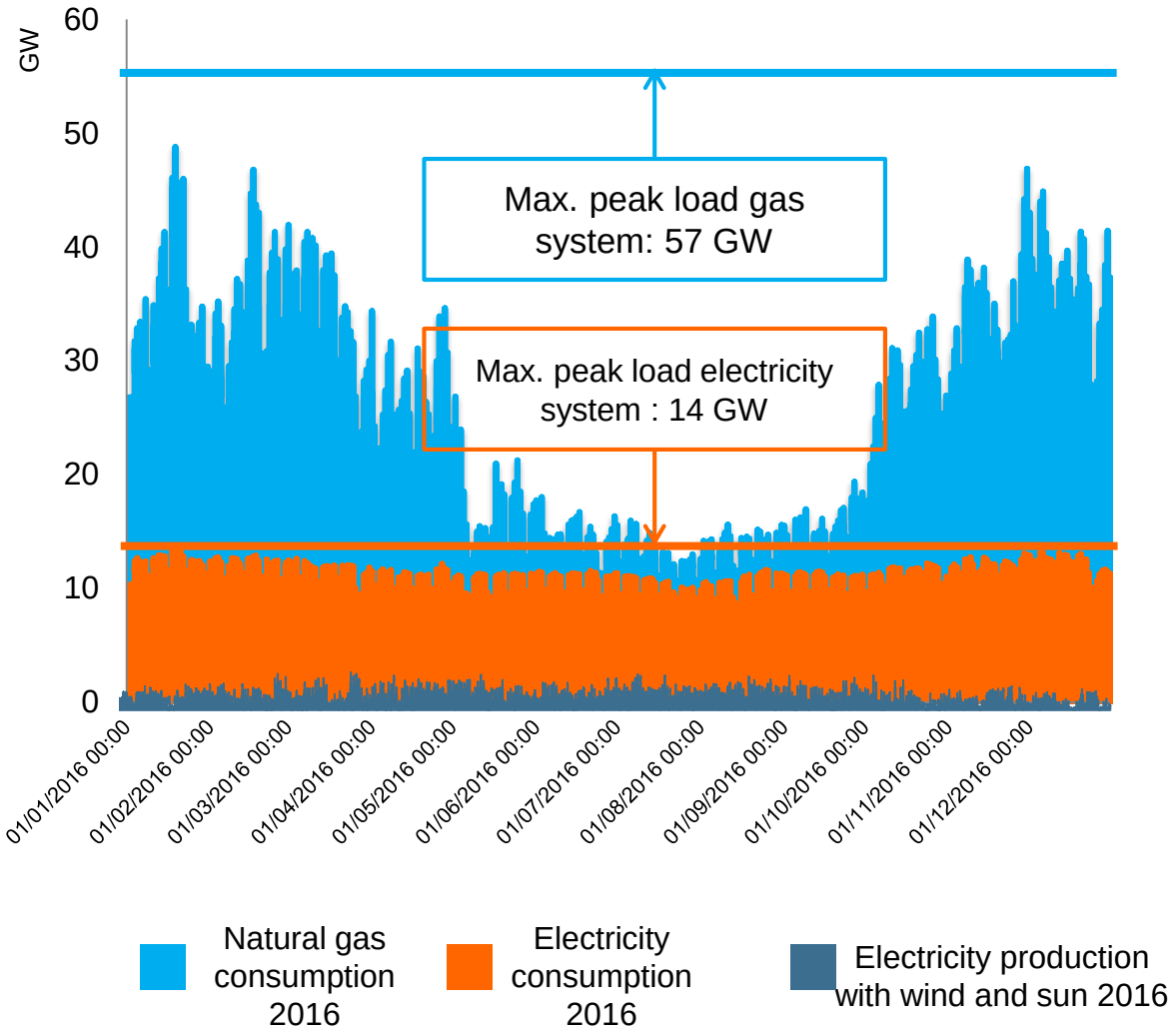
COMPLEMENTARITY?

- The strengths and weaknesses of electricity and gas are complementary: the one energy lends itself poorly to what the other is good at
- Both the electricity system and the gas system are particularly suitable for the inflow and the transport of renewable energy
- We can significantly reduce the cost of the transition to a low-carbon economy if we aim at the strengths of both energies and build bridges between the energy systems
- The strengths of the gas system: power, flexibility and storage



FLUXYS

ELECTRICITY SYSTEM NOT SUITABLE FOR FILLING HEAT DEMAND



71 GW

Ability to deliver via the electricity networks

≈20 TWh

Need for flexibility through seasonal storage

Public data Elia & Fluxys

FLUXYS

EUROPEAN COMMISSION CONFIRMS OUR VISION

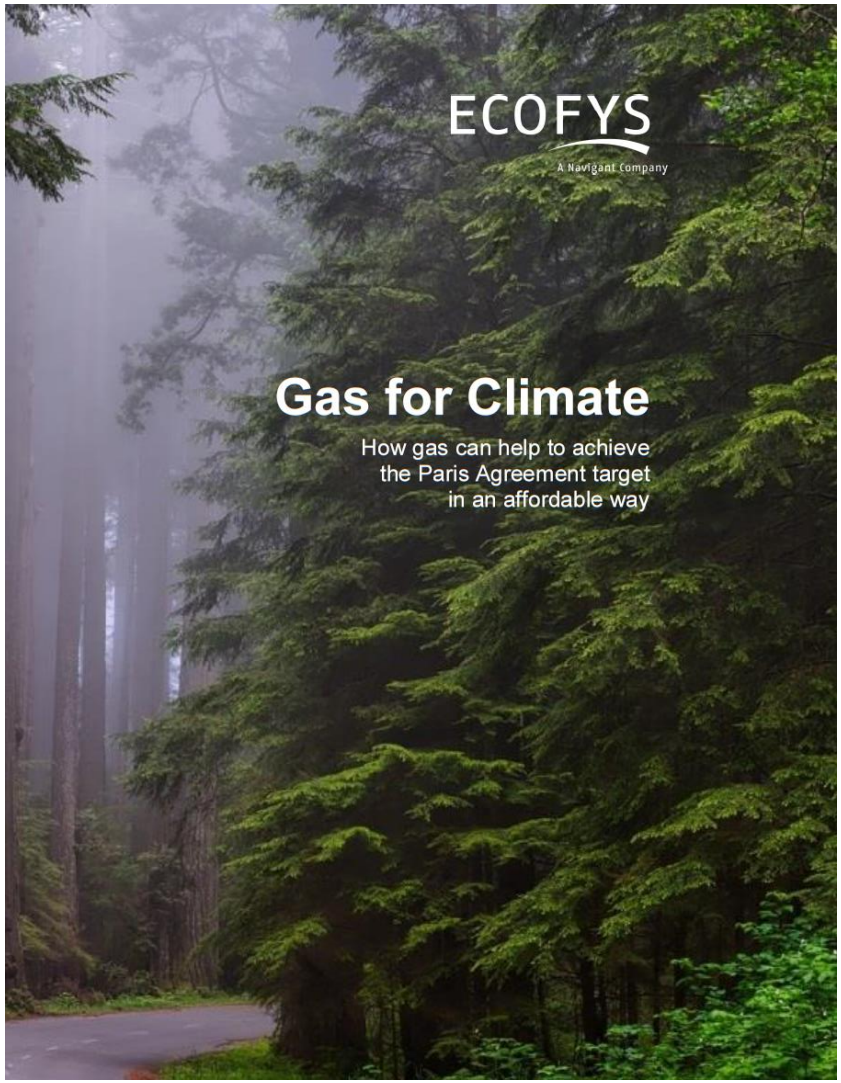
End of 2019 new regulatory proposals

- **Sector linkage:** combining electricity and gas infrastructure via e.g. power-to-gas, incl. Incentives to do so
- **Green gas:** adjusting the regulatory framework for the development of green gas

« It is not a good idea to go for full electrification. We need a hybrid energy system with a second pillar: gas »

Klaus-Dieter Borchardt, Director DG Eneregy – Internal Energy market

FLUXYS

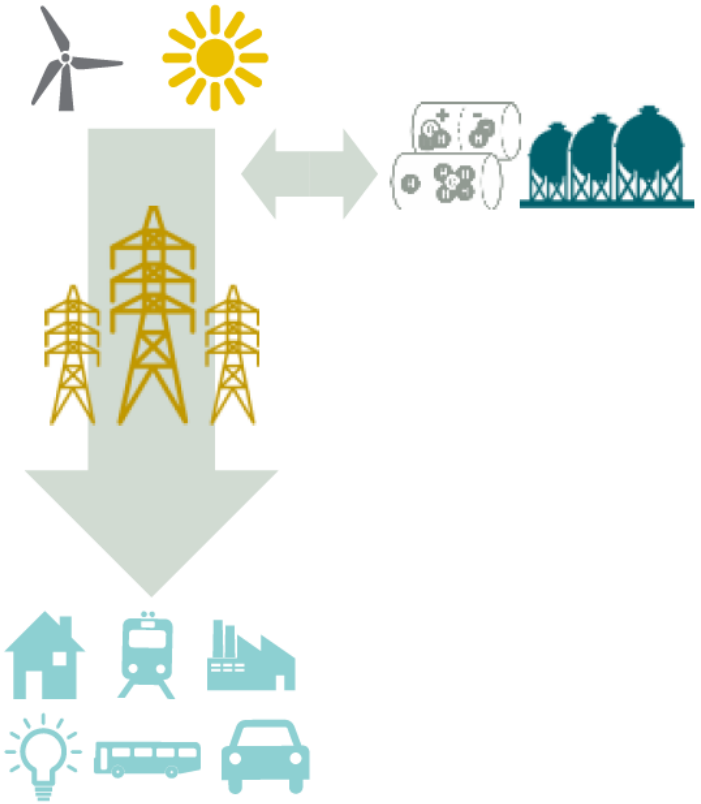


GAS FOR CLIMATE
A path to 2050

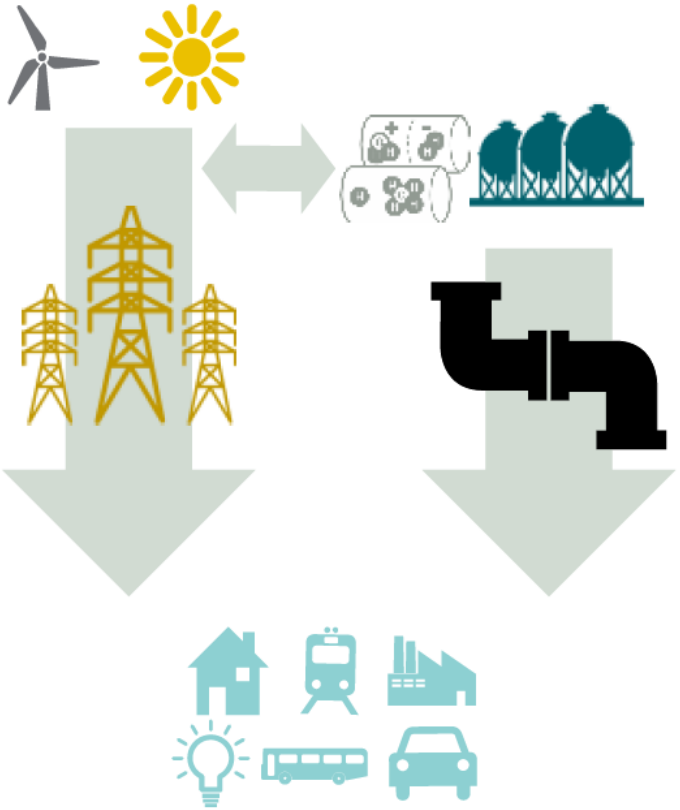
- Role of gas and gas infrastructure in a carbon-neutral energy system?
- Potential green gas in Europe?
- Impact on the cost of the energy transition?

FLUXYS

FULL ELECTRIFICATION: ELECTRICITY AND GAS STORAGE

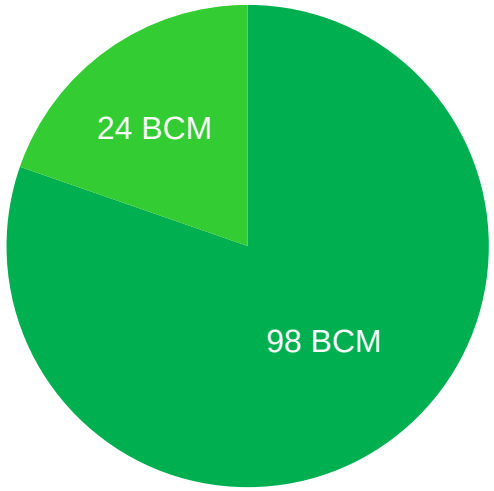


CASE STUDY: ELECTRICITY AND USE OF GREEN GAS



FLUXYS

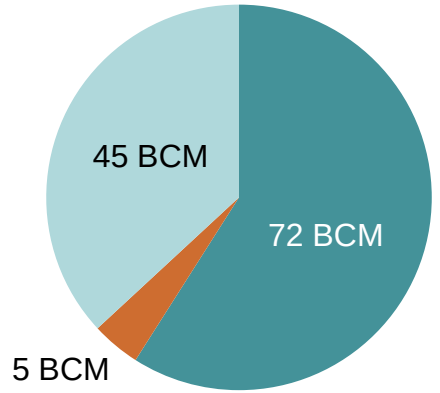
Potential production green gas horizon 2050: 122 billion m³ / year (1,350 TWh / year)



Biomethane Green Hydrogen

Etude Ecofys

Impact on social costs for the heating, transport and electricity segments?



Heating and electricity production
Transport
Industrie

In comparison with full electrification: cost savings of € 140 billion per year horizon 2050

FLUXYS

STUDY COMPASS / FLUXYS: THE ROLE OF GAS IN THE BELGIAN ENERGY SYSTEM IN THE FUTURE

- Provide factual and quantified data on the contribution that gas can make to the energy transition
- Ambitious scenario for the decarbonisation of the Belgian energy system horizon 2050
- Possible increase of the contribution of gas tested against a number of indicators

Sensitivities on energy usages

Key findings: The direct use of gas is the most efficient solution in some usages and supports decarbonisation

		Affordability 1	Sustainability 2	Security of electricity supply 3
Residential Replacement of oil boilers...	Gas boilers	🟢	🟢	🟢
	Electric heaters(i)	🟢	🔴	🔴
	Heat pumps(i)	🔴	🟠	🔴
	Hybrid heat pumps(i)	🔴	🟢	🟠
	Gas heat pumps	🟠	🟢	🟢
Transport Replacement of gasoline and diesel vehicles ...	CNG cars	🟢🔴	🟢	🟢
	LNG trucks	🟢	🟢	🟢
Industry Replacement of coal- or oil-based processes...	Petro-chemical	🟢	🟢	🟢
	Industry	🟢	🟢	🟢
Green gas	Power-to-gas	🟠	🟢	🟢
	Biomethane	🟠	🟢	🟢

Gas condensing boilers would reduce emissions, at least cost as no network reinforcement required.

Developing CNG cars is a complementary solution to electrification.

Potential oil/coal-to-gas process switches could reduce CO_2 emissions

Green gas potential could make gas a low carbon energy solution

Note : (i) With the electricity generation mix expected in 2030 according to ENTSO-E (Vision EUCO30).

Key messages

Gas can play a decisive role as an enabler of an efficient energy transition both in the short and long term

2030

Gas as transition fuel towards a decarbonised energy sector

- **Reduce emissions and improve air quality when substituting for other fuels** in transport, residential, and industry sectors
- **Enable energy transition** thanks to the **maturity of efficient technologies** and **existing infrastructures**
- Play a **bridging role in power generation** after the nuclear phase-out

Long term (2050 - onwards)

Green gas as a long-term sustainable source of energy

- **Substantial potential for biogas** in Belgium that could progressively replace natural gas by renewable gas
- **Enable development of intermittent RES** by providing **flexibility and seasonal storage** through Power-to-Gas and **leveraging existing infrastructures**
- **Support efficient sector coupling and synergies** for an efficient and affordable decarbonisation

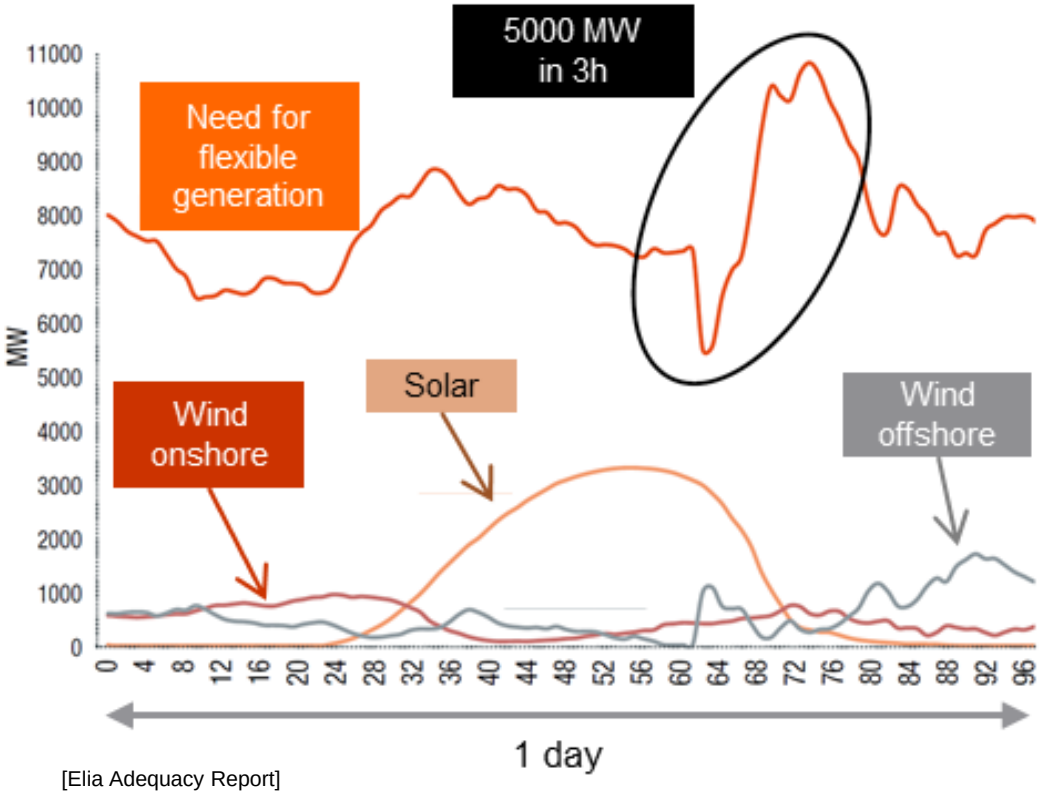
GAS & GAS INFRASTRUCTURE ARE AN INTEGRAL PART OF THE SOLUTION

- Gas & gas infrastructure enable renewable generation capacity to continue building up (in contrast with nuclear)
  - Gas-fired power stations offer the flexibility required to serve as back-up for variable renewable generation
  - Combined Heat & Power units: flexibility + increased energy efficiency
  - Power-to-gas: solution to deal with excess green electricity
- Gas-fired power stations also provide baseload capacity to compensate for phasing-out of nuclear and coal-fired generation
- Carbon footprint: in the short term local increase but decrease at EU level, in the longer run local carbon footprint curbed by using green gas

Adapted electricity market model required to provide a fair value for the availability of capacity and flexibility

FLUXYS

POWER SYSTEM REQUIRES INCREASINGLY MORE FLEXIBILITY



[Elia Adequacy Report]

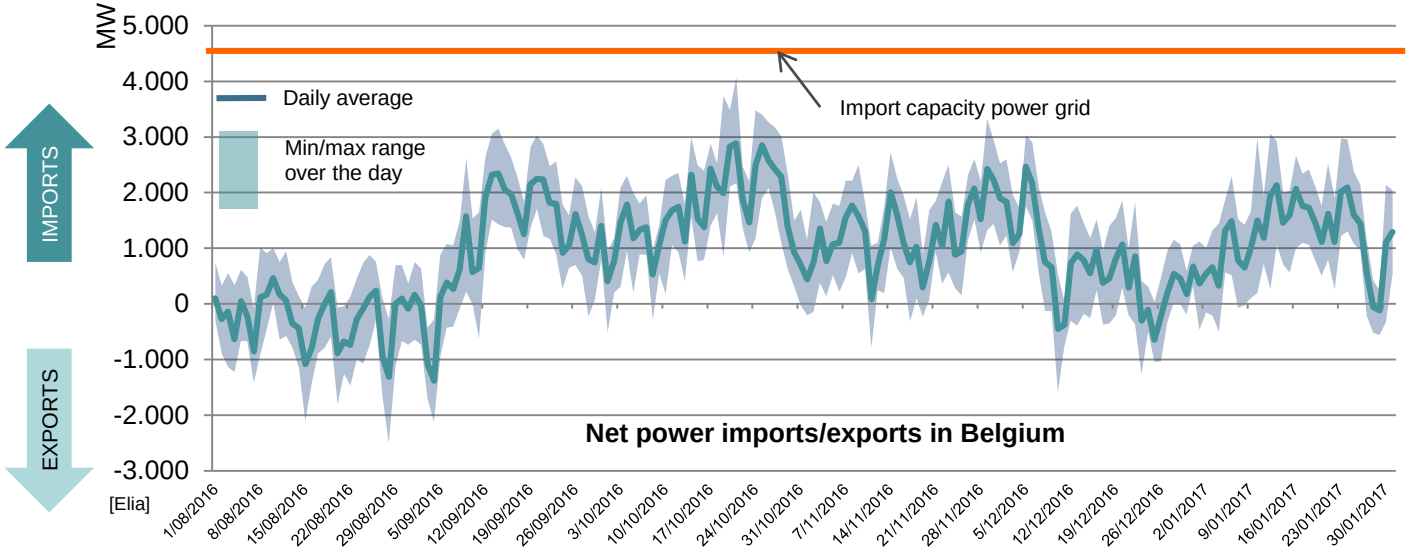
As more and more renewable capacity gets installed, increasingly more flexibility is needed to back-up for the variable generation profile

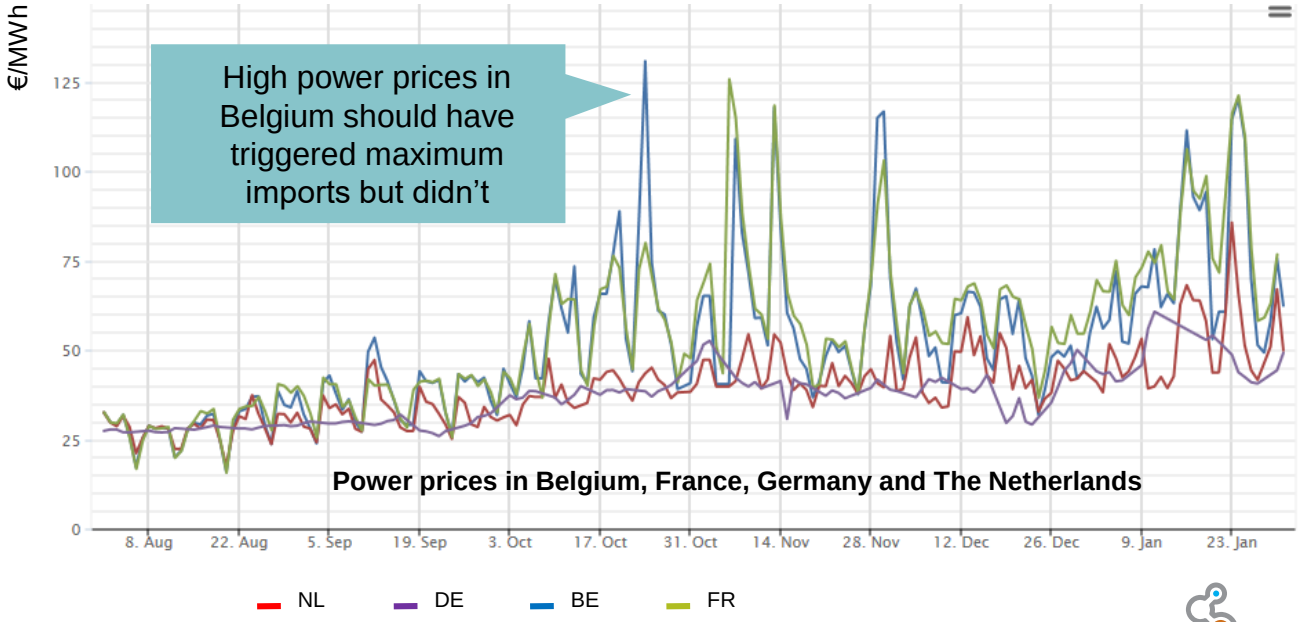
FLUXYS

POWER IMPORTS: AVAILABLE ON A FIRM BASIS?

"Compared with our neighbouring countries, we are a small system heavily dependent on imports. Consequently, a problem occurring in another country may also affect Belgium, especially at times when the capacity margin in Belgium is small. (...) After the nuclear phase-out, Belgium may have to import up to around 50% of its total electricity consumption." [Elia - Study regarding the 'adequacy' and flexibility needs of the Belgian power system (2017-2027) - April 2016]

"The import dependence occurring after 2017 need not be a problem for security of supply. (...) The current analysis using the new integral model confirms that, thanks to cross-border coupling, the reduction in security of supply can be offset by imports from neighbouring countries." [TenneT (NL), 2016 Security of Supply Monitoring Report (2015-2031), July 2016]



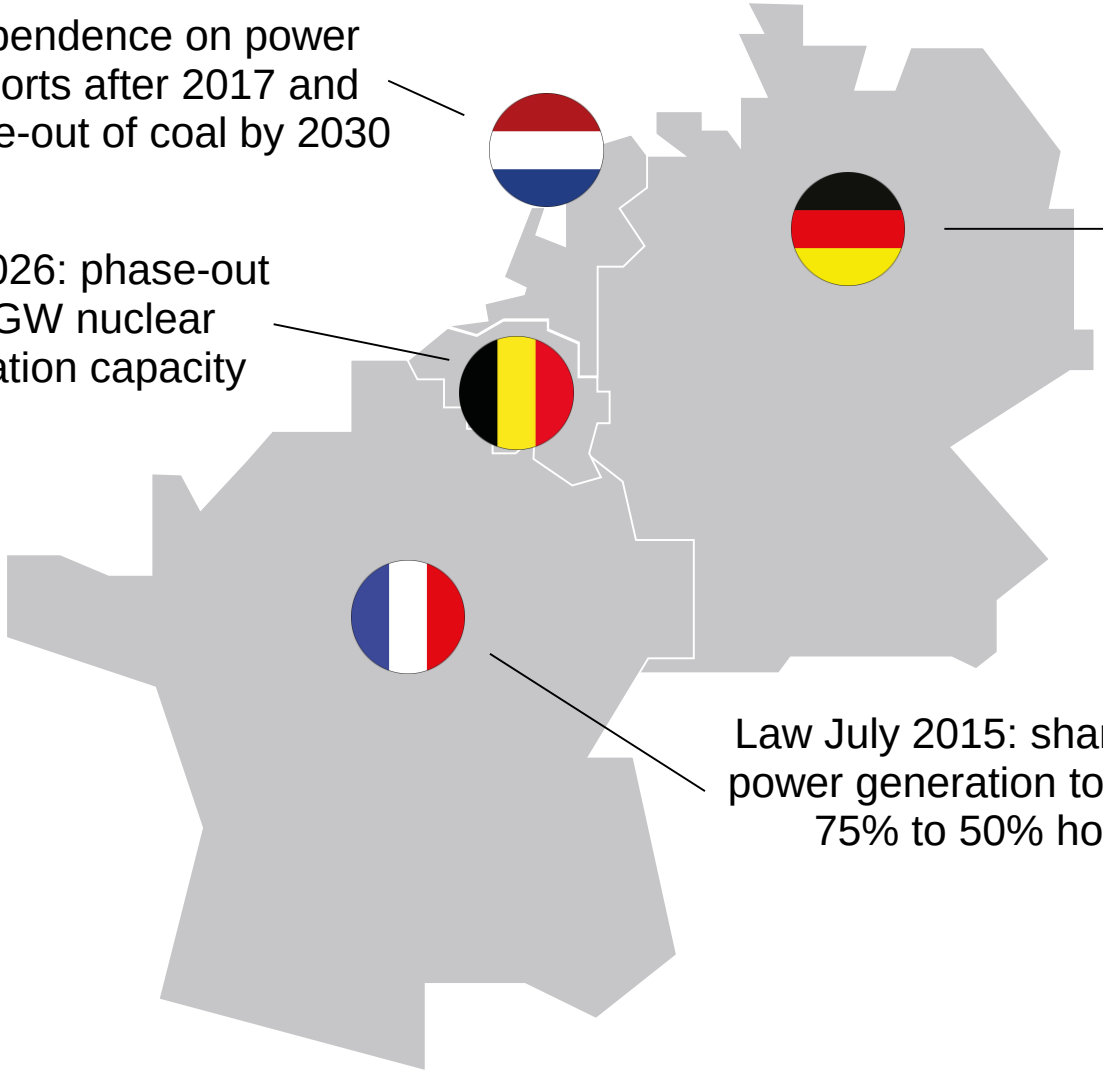


FLUXYS

…WHILE ACCOMMODATING THE DECOMISSIONING OF DISPATCHABLE GENERATION CAPACITY AS WELL

Dependence on power imports after 2017 and phase-out of coal by 2030

2022-2026: phase-out of 6 GW nuclear generation capacity



26 GW generation capacity likely to close in the early 2020's while only 2 GW dispatchable capacity is under construction

Law July 2015: share of nuclear in power generation to decrease from 75% to 50% horizon 2025

FLUXYS

THE ROLE OF GAS IN THE ENERGY TRANSITION
FLUXYS' INNOVATION AVENUES

Boostheat: Thermodynamic gas well pump

Power-to-gas project with Colruyt Group

CO_2-project with Port of Antwerp

FLUXYS

AGENDA

08h30: Welcome	
09h30: Gas supply and demand outlook	**Arno Büx**
10h15: Focus on Belgium	**Huberte Bettonville**
11h00: Break	
11h15: Innovative use of “natural” gas	**Nicolas Gielis**
11h45: L/H Conversion	**Denis Bawin**
12h00: Directive SOS gas	**Denis Bawin**
12h15: Lunch	
13h45: The role of natural gas in the future energy mix	**Prof. Samuele Furfari**
14h45: Consultation Connection Agreement	**Ludo Hanot**
15h00: *Break*	
15h15: Maintenance ground exits	**Tim De Vil**
15h45: Planning works	**Ivan Brysens**
16h15: Drink	

FLUXYS

Focus on Belgium

Huberte Bettonville
Director Commercial Regulated

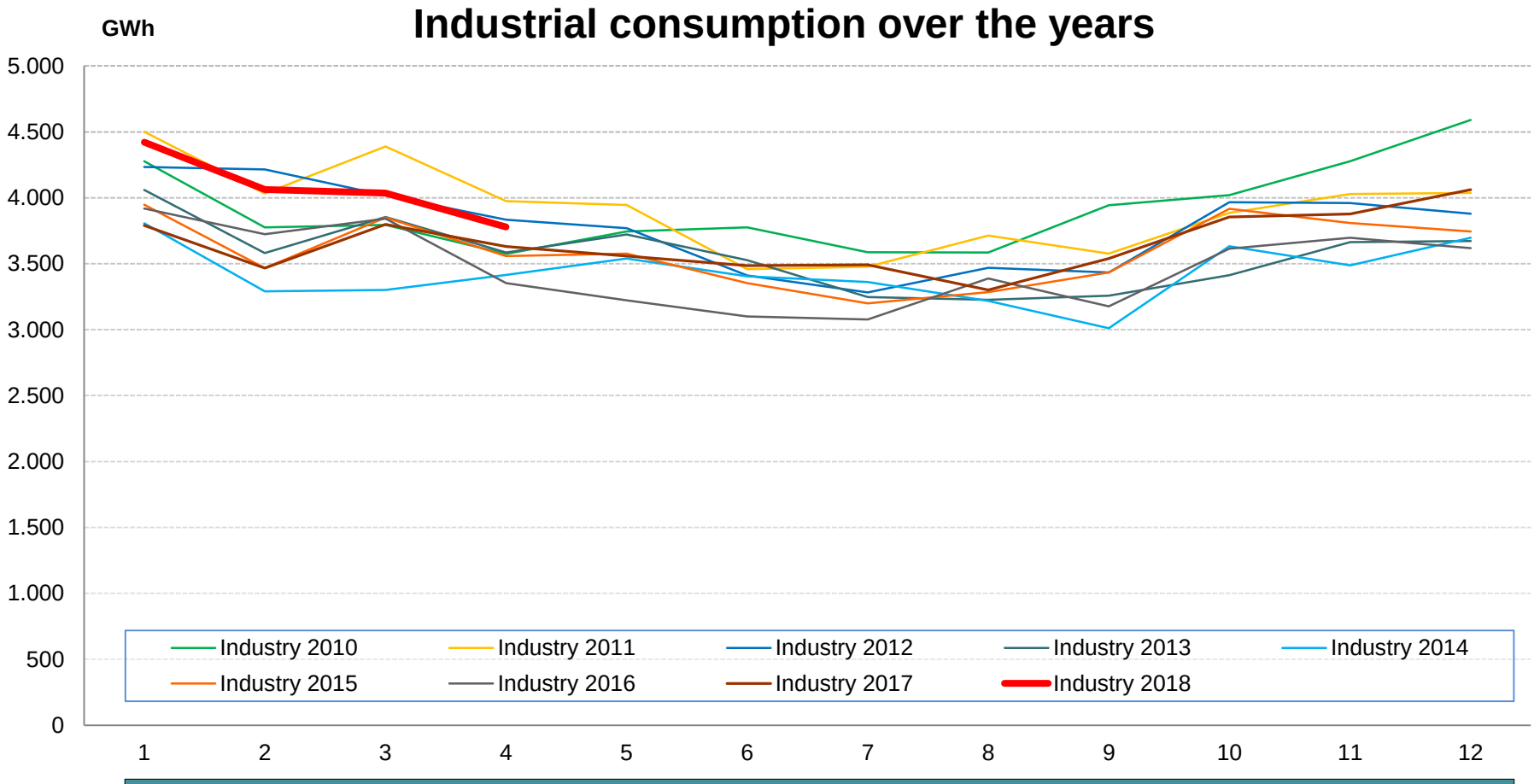
FLUXYS

AGENDA

- Belgian Consumption in 2017
- High gas prices March 2018
- Investment Plan 2018-2027
- Latest developments in Transmission
- ZTP
- LNG & Storage
- Tariff Methodology 2020-2023 : CREG Consultation

FLUXYS

Transmission: consumption of industrials in GWh

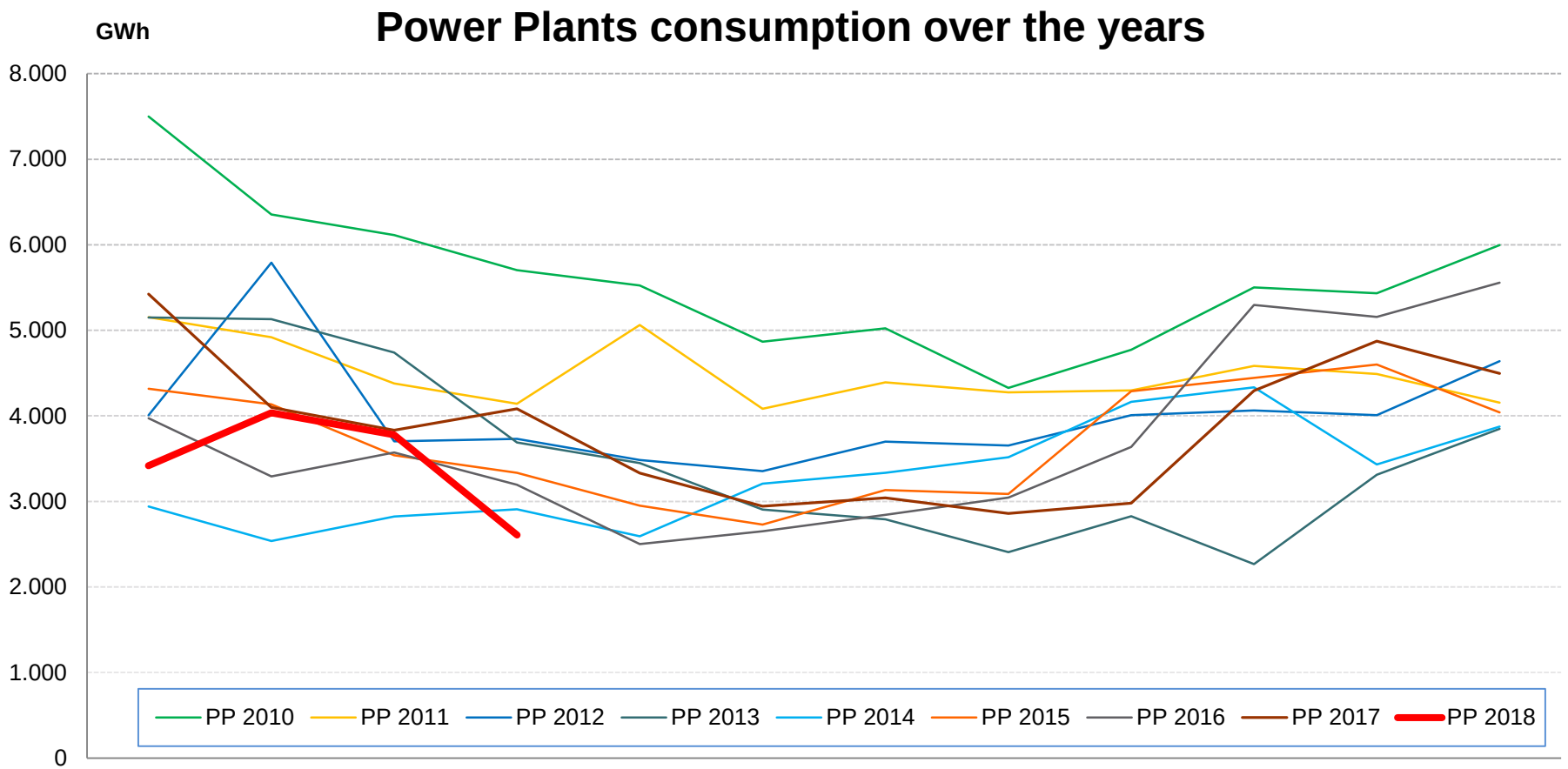


2017 : increase of consumption for industrial consumers (+5,1%)

M1-M4/2018 : strong increase of consumption compared with 2017 (+11%)

FLUXYS

Transmission: consumption of power plants in GWh

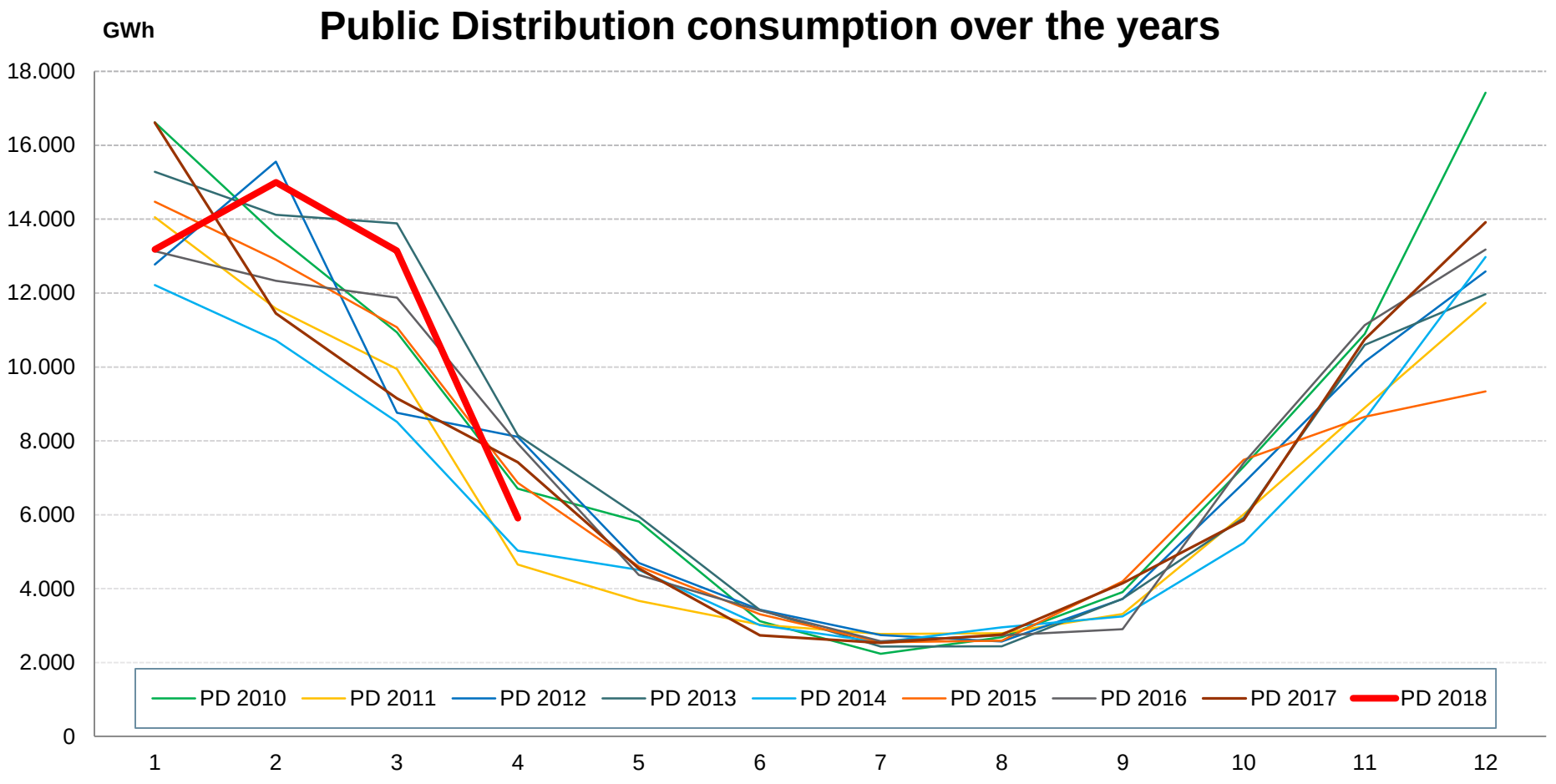


2017: increase compared with 2016 (+3,4%)

M1-M4/2018: decrease compared with 2017 (-20%)

FLUXYS

Transmission: consumption of distribution in GWh

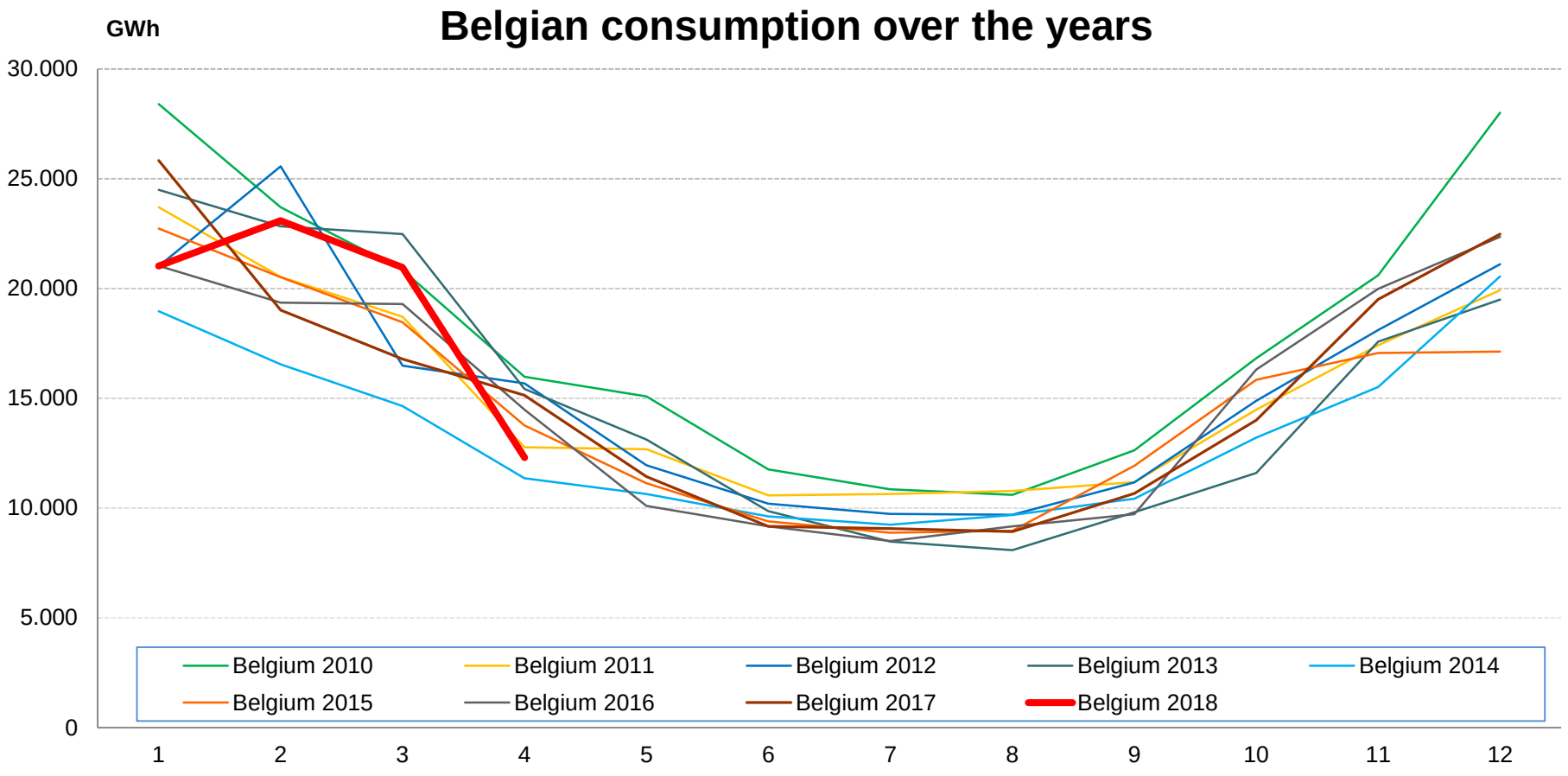


2017: average consumption level for the public distribution. (-1,2%)

M1-M4/2018: higher consumption level compared with 2017 (+5,8%)

FLUXYS

Transmission: total Belgian consumption in GWh



2017 : higher consumption level for the Belgian market (+1,4 %)

M1-M4/2018 : same consumption level for the Belgian market compared with 2017 (+0,8 %)

FLUXYS

AGENDA

- Belgian Consumption in 2017
- High gas prices March 2018
- Investment Plan 2018-2027
- Latest developments in Transmission
- ZTP
- LNG & Storage
- Tariff Methodology 2020-2023 : CREG Consultation

FLUXYS

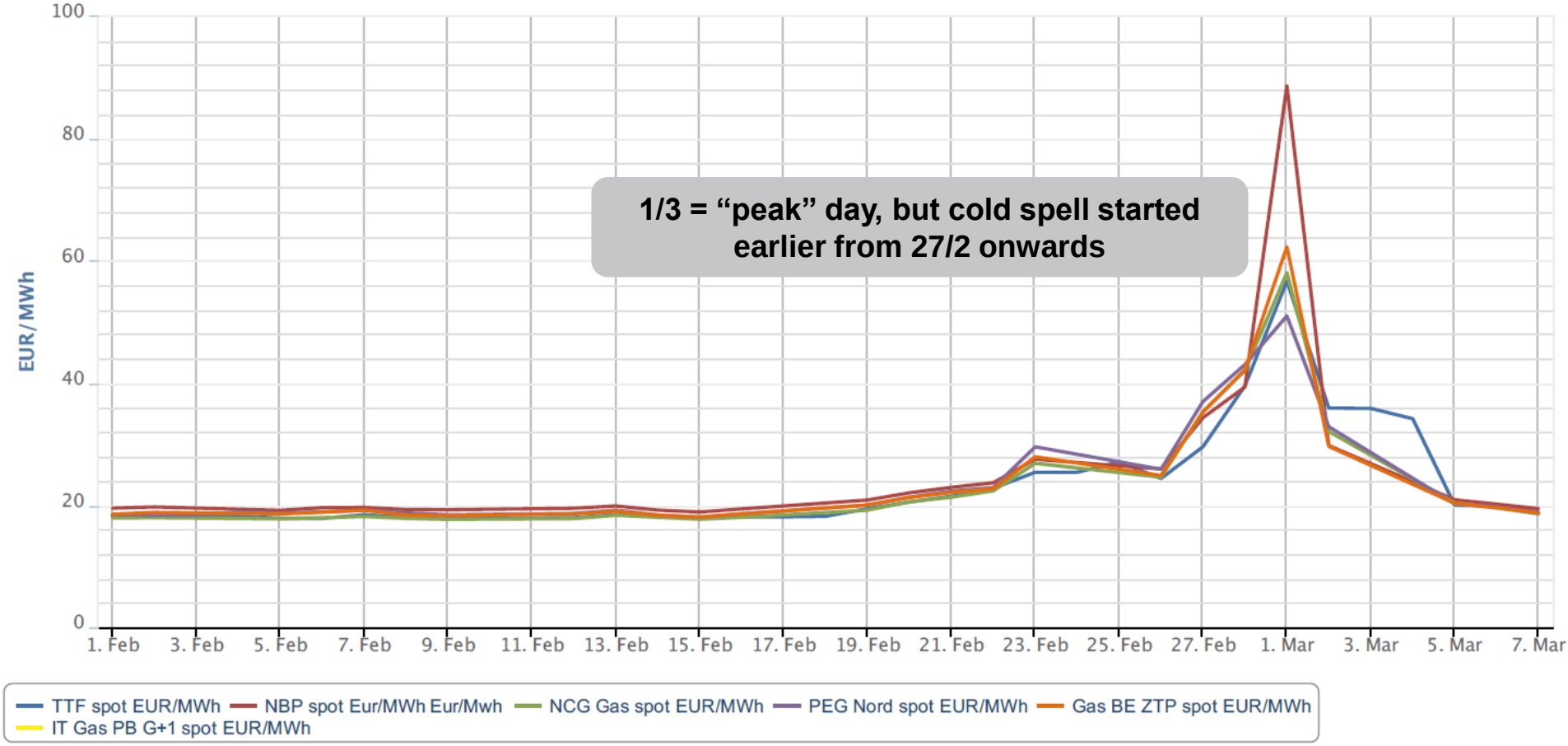
Introduction

- Cold spell (double-digit sub-zero t°): from 27/2 till 3/3
- 28/2: Shut-down BBL (NL → UK) (7h00-17h00)
- 1/3:
  - National Grid (UK) has issued a gas deficit warning as outages and cold weather left the system undersupplied
    - » Demand in UK and continental markets hits records by freezing temperatures caused by the “Beast from the East” weather front
    - » Several Norwegian and UK production and UK LNG regasification outages limited the supply in the UK.
  - Gas deficit warnings also in Italy, Denmark, Sweden, Ukraine

Analysis of impact UK/NOR/BBL outage on Belgium

FLUXYS

Evolution of Day Ahead index on major European hubs



Outages in UK/NOR/BBL combined with high gas demand (temp° related) triggered all over Europe high gas prices on all markets

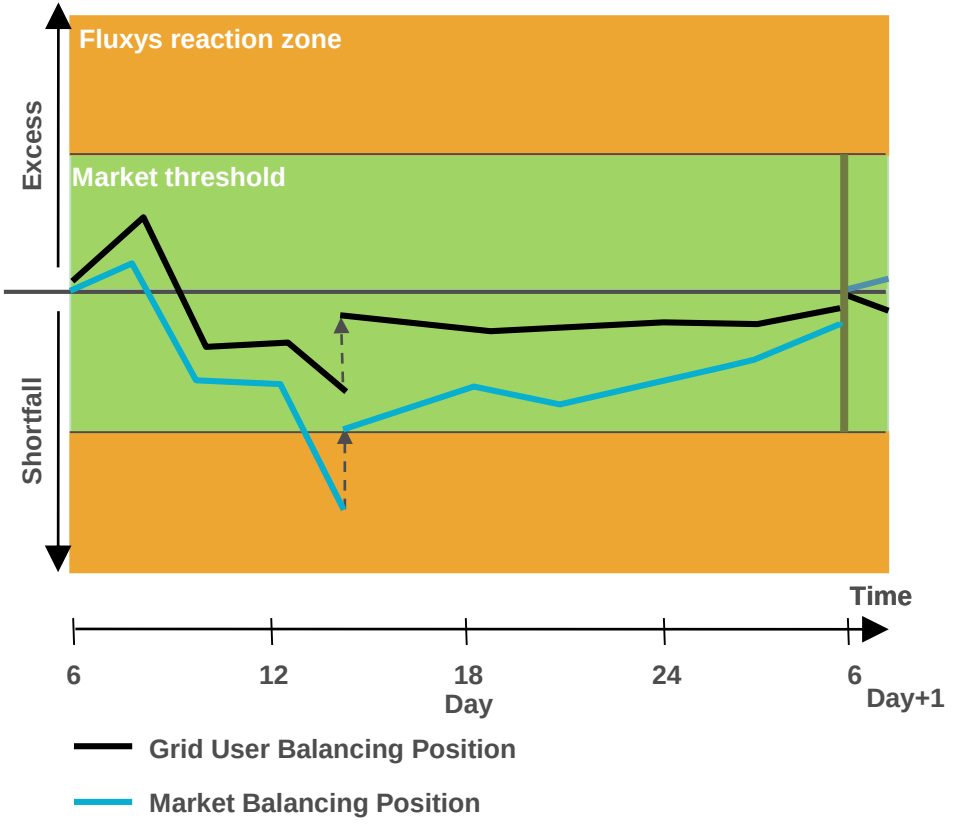
FLUXYS

Impact on Belgian balancing system

During cold spell, market was structurally short, also in Belgium.

→ Cumulated market balancing position went beyond limits at which Fluxys BE starts compensating:

- From 26/2 to 2/3 (H + L): gas purchases ~150.000 MWh
- On 1/3, within the day, Fluxys BE paid between 62,5 and 120 €/MWh



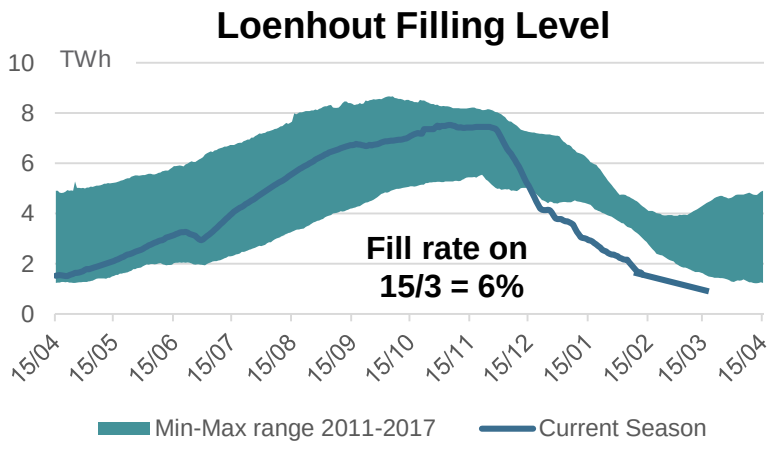
During cold spell, FLX was able to find all necessary balancing gas, yet at high prices but globally in line with market behavior → market-based balancing works well

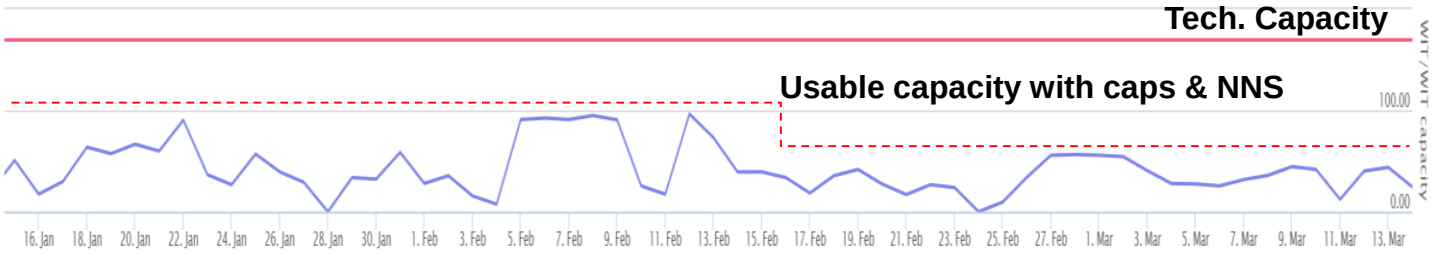
N.B. Fluxys BE buys the "missing" gas on the market and invoices causers back-to-back at "settlement" price + incentive for "imbalance causers"

FLUXYS

What about Loenhout storage?

- Loenhout filling level is at historical low level, already before cold spell was announced (13% on 26/2)
- At this level contractual emission rights are capped, in line with pressure in reservoir
- But any remaining throughput (also from other shippers not using) can be accessed by shipper using “Non-Nominated Service” (NNS)





Loenhout ramped up during cold spell, enabling shippers to benefit from market conditions. NNS was used a lot, enabling to maximize available throughput

FLUXYS

COMPARING 2 COLD SNAPS

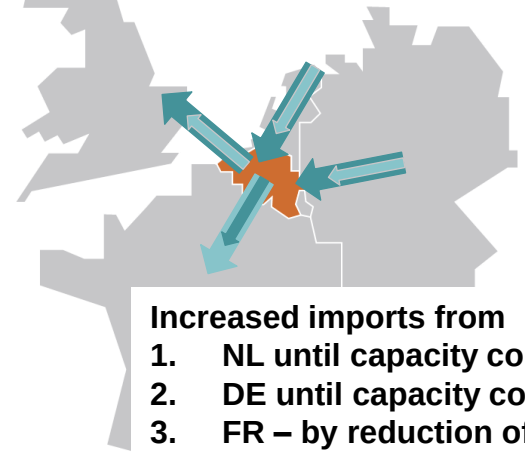
Feb-March 2013

- Back of the winter season
- Low storage levels (40%) – Rough almost empty
- Sudden cold snap in NW-Europe
- Unexpected partial unavailability of North-Sea production
- Groningen able & allowed to compensate (43 BCM/y)

Feb-March 2018

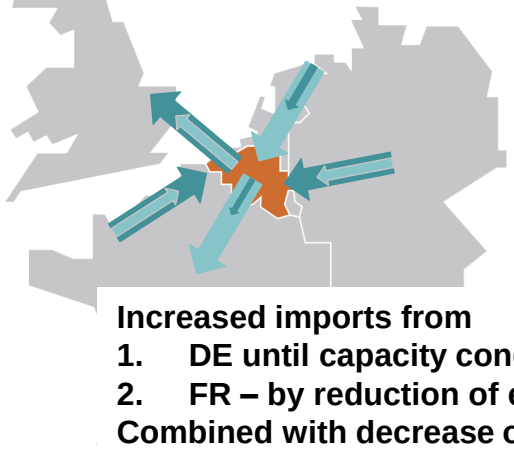
- Back of the winter season
- Low storage levels (35%) – Rough closed
- Sudden cold snap in NW-Europe
- Unexpected partial unavailability of North-Sea production
- Groningen “constrained” → limited compensation

Major increase of flows towards UK compensated differently as different availability of Groningen and related stress in NL*



Increased imports from
1. **NL until capacity congestion**
2. **DE until capacity congestion**
3. **FR – by reduction of exports**

Peak Storage withdrawal in EU: 6 TWh/d



Increased imports from
1. **DE until capacity congestion**
2. **FR – by reduction of exports + DK LNG**

Combined with decrease of NL imports
Peak Storage withdrawal in EU: 11 TWh/d

*GTS didn’t declare any emergency situation, purely relying on market to compensate.
Shipper feedback confirms that demand forecasts were largely underestimated

FLUXYS

Conclusion

- Market stress due to combination of high demand, poor forecasts, constrained production, low level of storage, and UK/NOR outages

- Balancing gas available…but at a price
  - Gas index prices all over Europe under pressure (60€/MWh and more)

- Change in flow pattern observed
  - Increased flows at exit IZT, compensated by entry Loenhout Storage, DNK LNG, EYN 2 and decreased flows at exit Virtualys and Entry ZZ

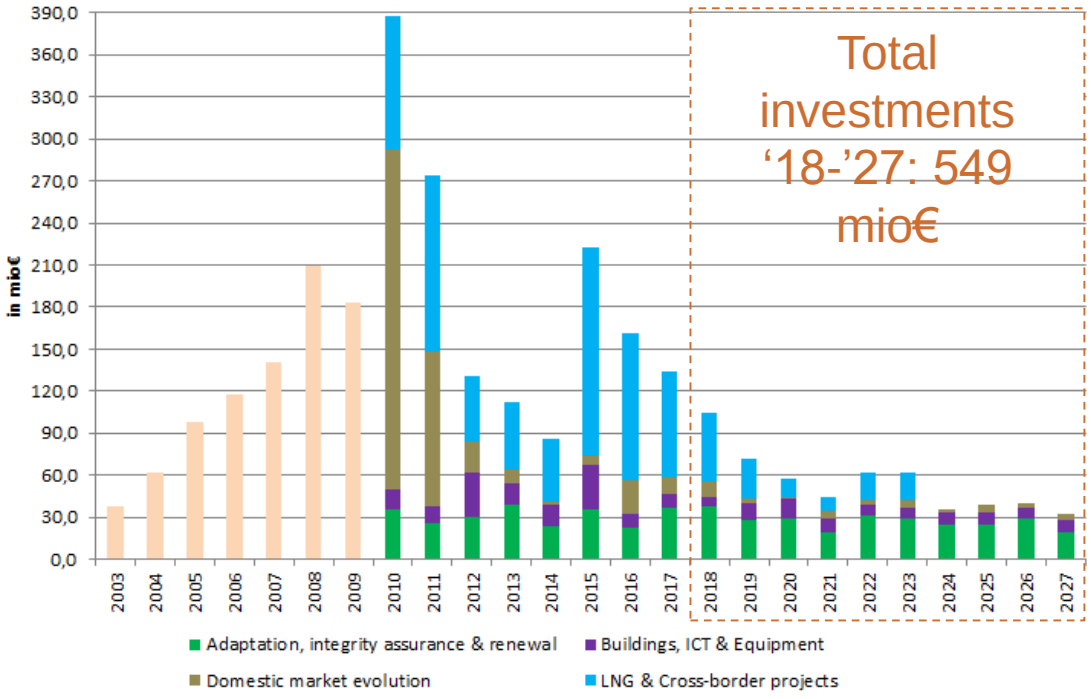
FLUXYS

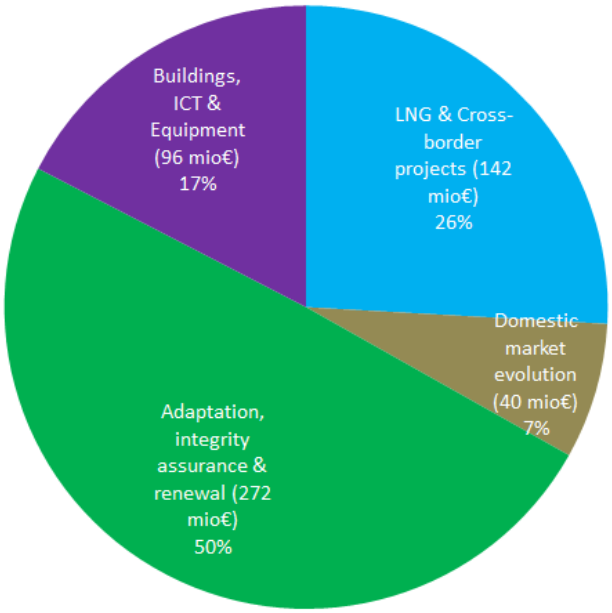
AGENDA

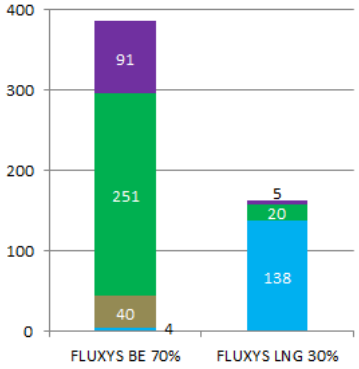
- Belgian Consumption in 2017
- High gas prices March 2018
- Investment Plan 2018-2027
- Latest developments in Transmission
- ZTP
- LNG & Storage
- Tariff Methodology 2020-2023 : CREG Consultation

FLUXYS

Evolution of investments (in mio€ 2017)







The investments of the last 10 years consolidated the Belgian network as a crossroads of natural gas flows in the region, with large capacity (> 10 M m³/h), bi-directional and without congestion.

Future investment plan has an increased accent on renewals, which is a logical result of a mature network.

FLUXYS

AGENDA

- Belgian Consumption in 2017
- High gas prices March 2018
- Investment Plan 2018-2027
- Latest developments in Transmission
- ZTP
- LNG & Storage
- Tariff Methodology 2020-2023 : CREG Consultation

FLUXYS

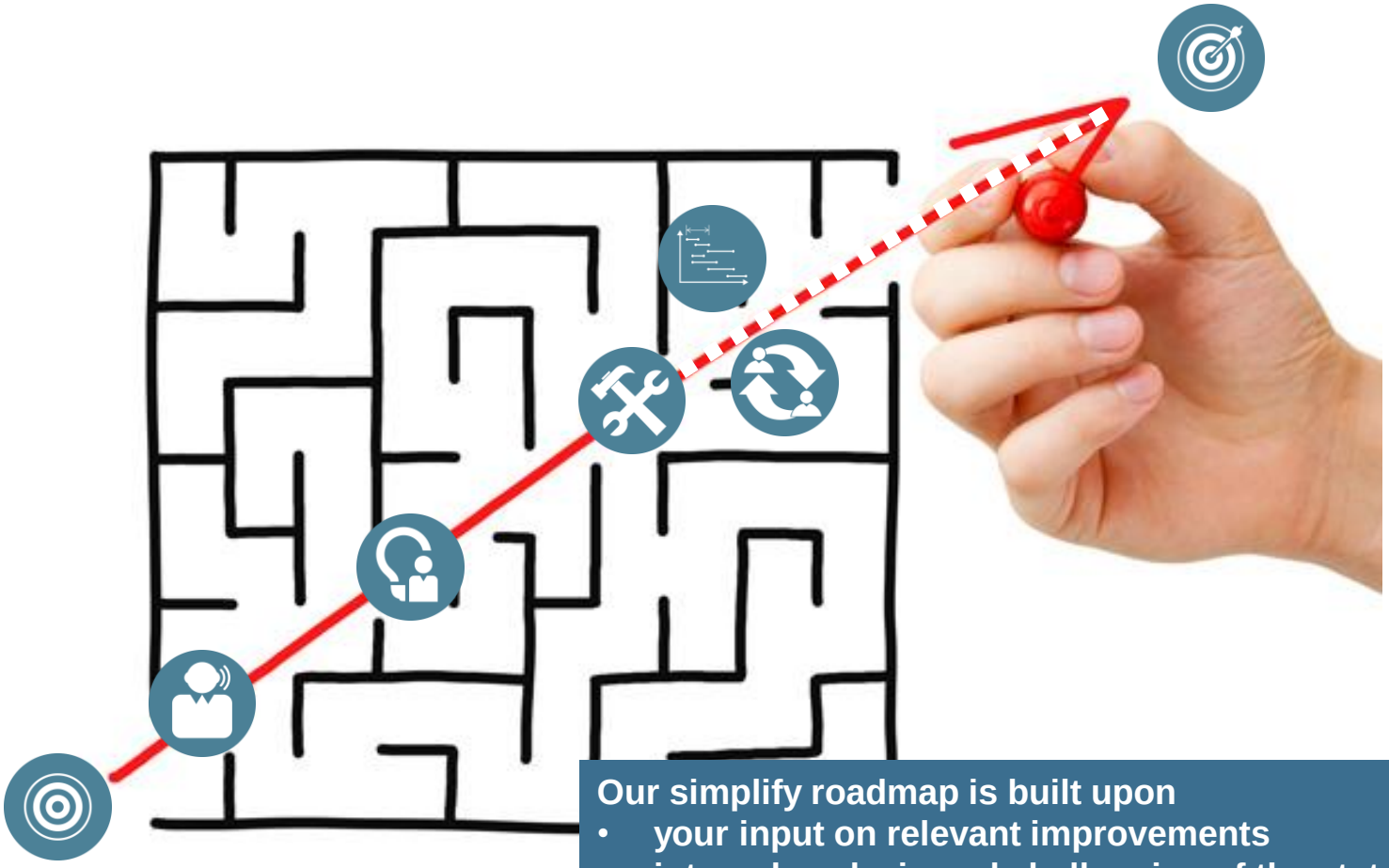
1. SIMPLIFY

2. Substitution Services

3. Virtual Interconnection Points

4. Quality Conversion Service

Simplifying our services will increase their value for you

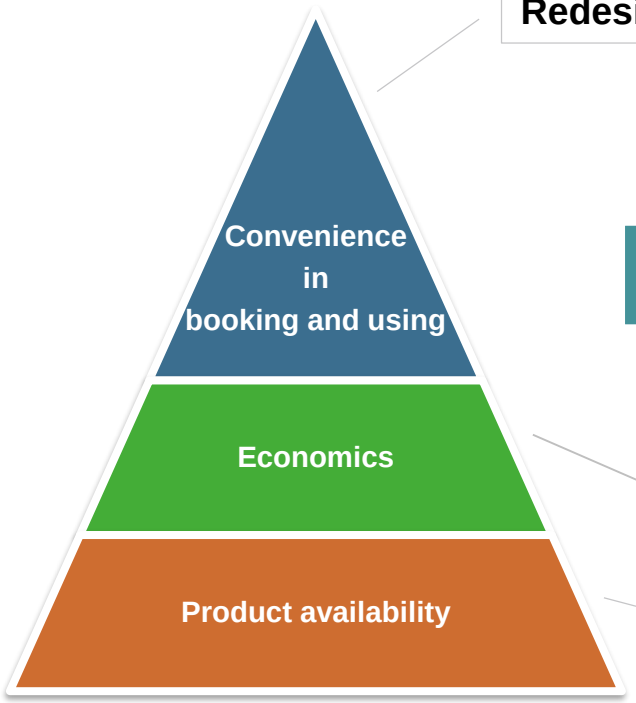


Our simplify roadmap is built upon

- **your input on relevant improvements**
- **internal analysis and challenging of the status quo**
- **a stepwise approach for implementation**

Gas market are evolving towards short term and virtualization

IMPROVING OUR OFFER ALONG THE SHIPPER JOURNEY AND VALUE CHAIN



Redesign Commercial website & data access – group level

Becoming shipper → Determining capacity need → Buying capacity → Using capacity → Paying invoice

Digitalize sales process

Streamline invoicing cycle & back-billing

Make products available on Day-Ahead

...

Progressive implementation, starting in Belgium and further rolled-out at group level.

FIRST CONCRETE CHANGES

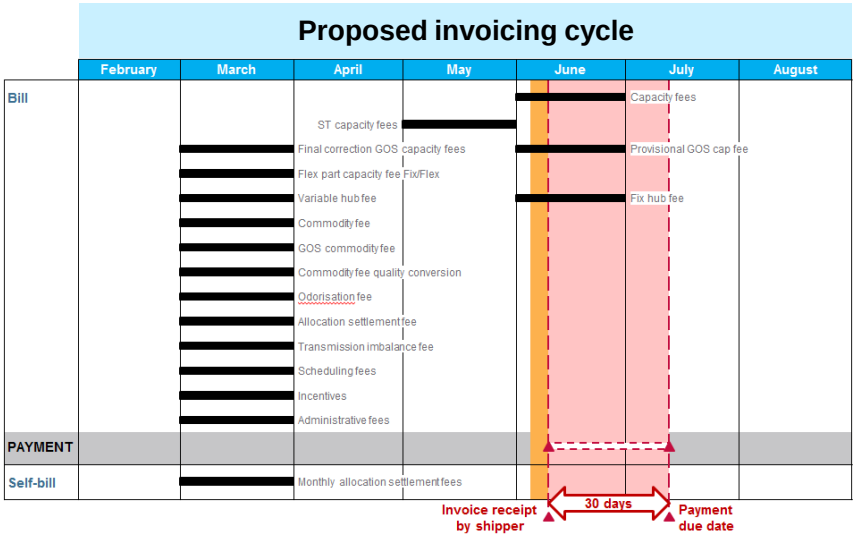
Sales channels & products

- Offer IP products on PRISMA and at least on day-ahead basis

SERVICES		Sales Channel[1]	Allocation method	Duration[2]
Entry and Exit Services on IPs VIPs & LNG Terminal	Blaregnies L	PRISMA	Auction	Y, Q, M, DA, WD
	Eynatten 1			
	Eynatten 2			
	Hilvarenbeek L			
	IZT			
	Virtualys			
	VIP BE-NL[3]			
	Zeebrugge[4]		FCFS	Any duration, incl. WD
	Zelzate 2			
	ZPT			
	Zeebrugge LNG Terminal			
	Dunkirk LNG Terminal[5]			
Quality Conversion Service H→L				B-o-Y
Quality Conversion Service L→H				Any duration, incl. D-A
Capacity Conversion Service (unbundled to bundled)				Y, Q, M, DA
Conversion into OCUC and Wheeling[6]				Y, Q, M, DA[7]
Exit Service for End Users Domestic Exit Point		EBS	FCFS	Any duration, incl. D-A
Exit Service for Distribution Domestic Exit Point		Implicit		
Entry and Exit Services on Loenhout		Implicit		
Other Services	Zee Platform Service	Written only	N/A	N/A
	ZTP Trading Services			
	Imbalance Pooling Service			
	L/H Capacity Switch Service			
	Reshuffling Service			

Invoice simplification

- Streamline invoicing cycle
- Invoice digitalization
- Remove fees/services with no to limited added-value



Positive market reaction
We aim at a roll-out of changes by 1/7/2018

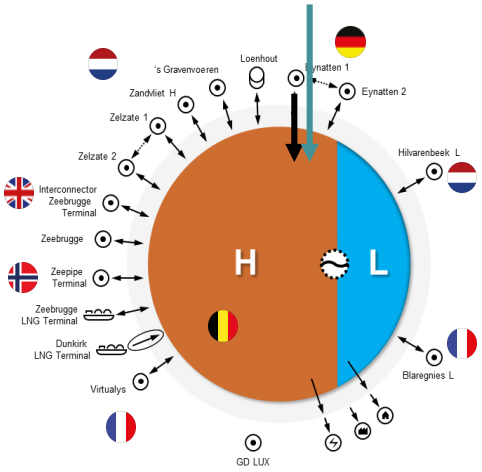
FLUXYS

SUBSTITUTION SERVICES

- Several requests to offer flexibility in using existing LT contracts
  - Our proposal: several “substitution” services whereby an existing contract can be transferred onto a new IP, insofar it was surrendered and the new capacity acquired on PRISMA
  - Consultation outcome : Market welcomes our proposals, but requests to increase the flexibility and optionality

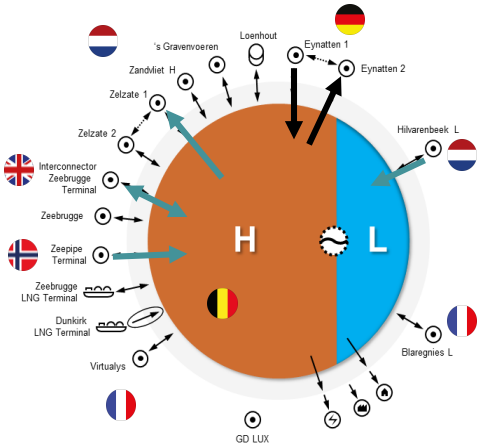
- Final proposal
  - Capacity conversion: substitute unbundled with bundled on the same IP
  - Reshuffling: substitute LT contracts (entry for entry or exit for exit for min 4Y)
  - L/H Switch: substitute L entry with H entry
  - Diversion: substitute capacities (entry or exit) on IPs where wheeling is possible

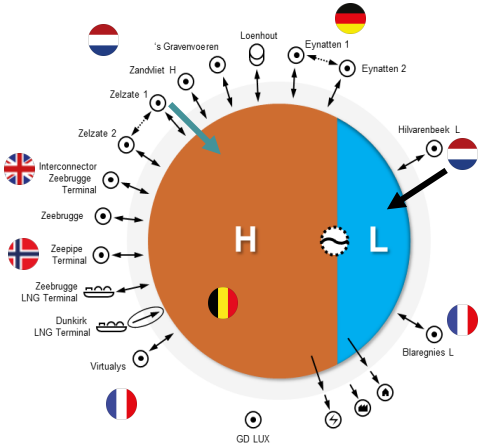
SUBSTITUTION IN A NUTSHELL



Capacity Conversion Y→D-A

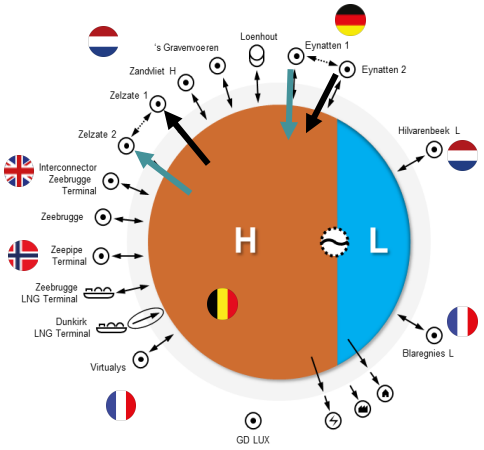
Reshuffling 4Y/5Y





Yearly L/H Switch

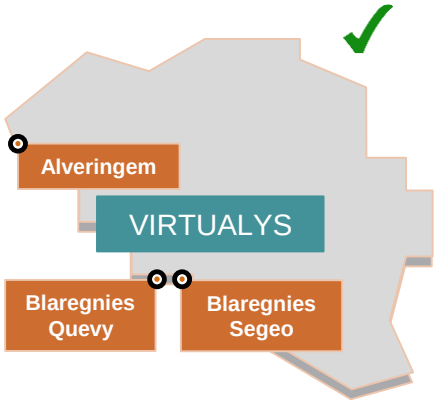
Diversion Y→M



FLUXYS

VIRTUAL INTERCONNECTION POINTS

- Successful launch of Virtualys – First VIP in NW Europe

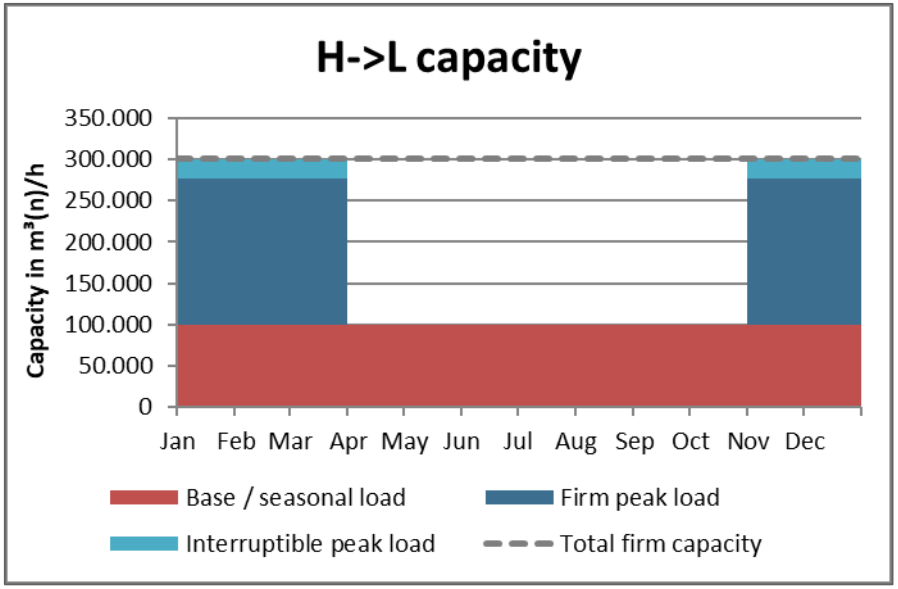


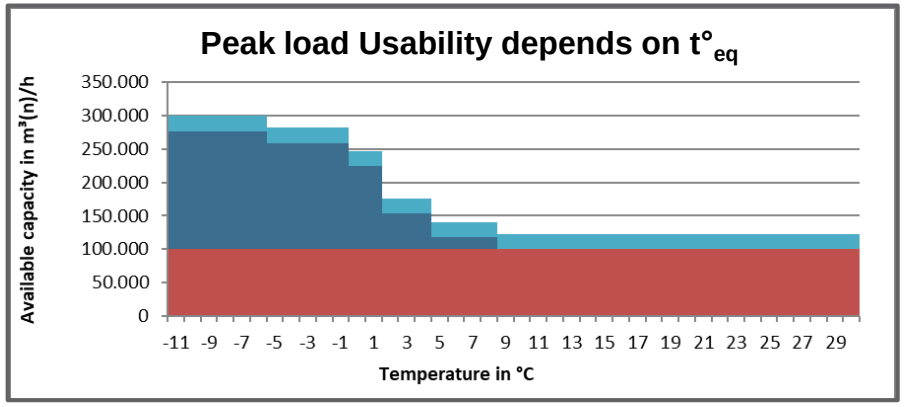
- With GTS, a similar model could be introduced
- So far implementation halted in NL, awaiting clarification on regulatory framework
- CAM NC possibly amended in coming months

→ VIP with GTS is put on hold until further clarity comes

FLUXYS

QUALITY CONVERSION SERVICES
OUR CURRENT OFFER





Peak load H→L service:

- From 1 Nov to 31 Mar: 177k.m³(n)/h conditional to temperature + 23k.m³(n)/h interruptible sold in bundles
- 1 bundle = 1kWh/h Firm + 0,13kWh/h Interr.
- Tariff:
  - » Fixed tariff: 1,695€/bundle
  - » Variable tariff: 1,603€/MWh

Base load H→L service:

- 100k.m³(n)/h available all year
- Fixed tariff @ 3,389€/kWh/h/y
- No variable tariff

Seasonal load H→L service:

- 100k.m³(n)/h summer - 50k.m³(n)/h winter
- Fixed tariff @ 3,021€/kWh/h/y
- No variable tariff

Subscription window for next Gas year will be organized in June 2018

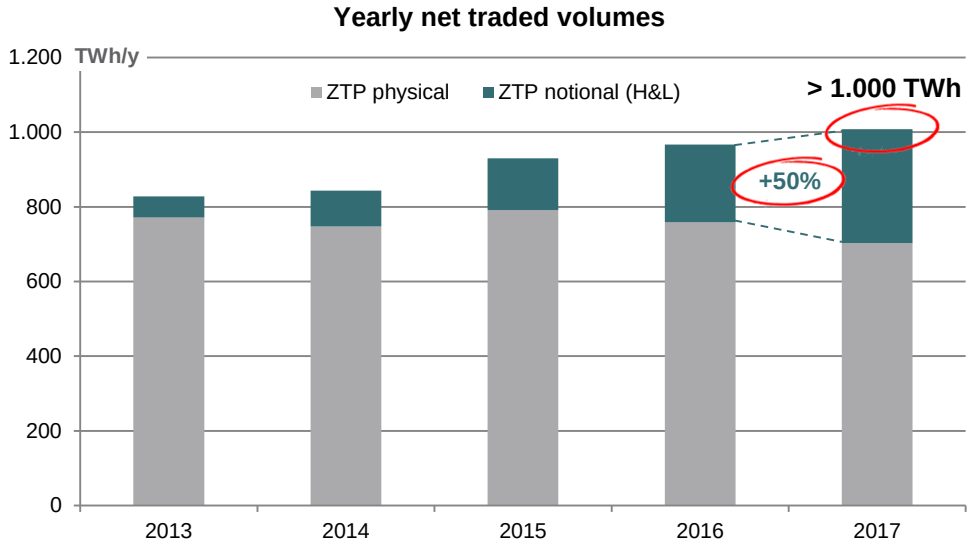
FLUXYS

AGENDA

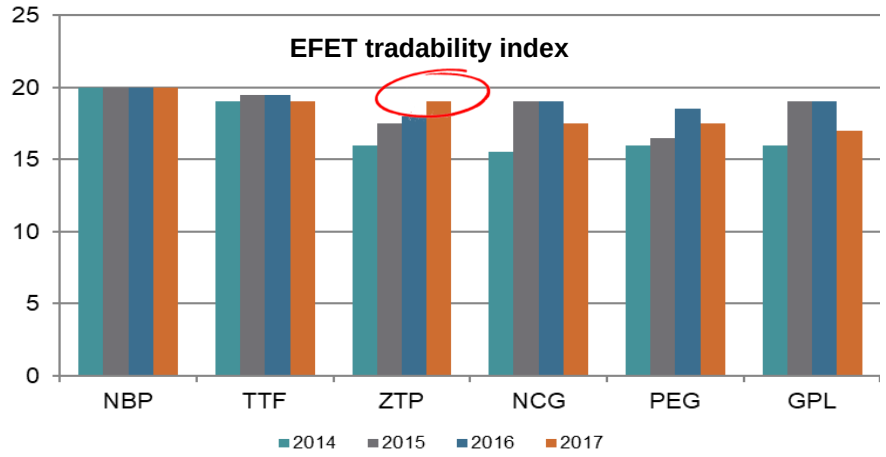
- Belgian Consumption in 2017
- High gas prices March 2018
- Investment Plan 2018-2027
- Latest developments in Transmission
- ZTP
- LNG & Storage
- Tariff Methodology 2020-2023 : CREG Consultation

FLUXYS

ZTP FURTHER GROWING IN 2017



Source: Fluxys – based on nominated quantities

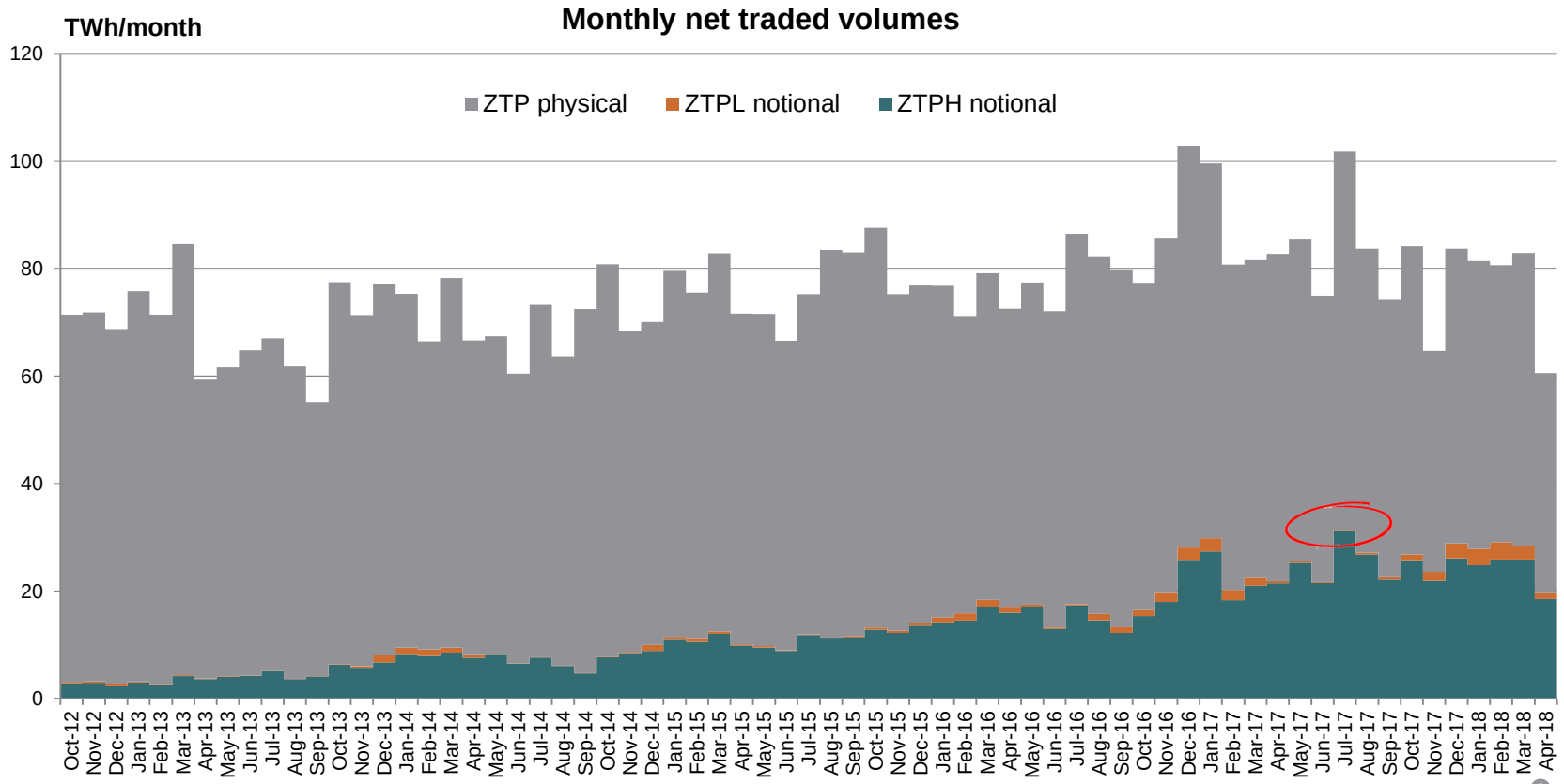


Source: EFET Gas Hub Development Study 2017

- Since 1/10/2017, ZTP Physical and Notional trading are coupled through Imbalance Transfer Service
- ZTP Notional traded volume still on the growth with year-on-year increase of 50%.
- Total traded volume on ZTP products reached unprecedented record of 1000 TWh in 2017
- EFET Tradability index of ZTP improved, especially thanks to liquidity surge and market making in 2017

ZTP TRADED VOLUMES

2017	ZTP physical	ZTP notional (H&L)
Average # of active parties per day	46	43
Average traded volume per day (GWh)	1919	828
Highest traded volume per day (GWh)	2661	1349



Source: Fluxys – based on nominated quantities

FLUXYS

AGENDA

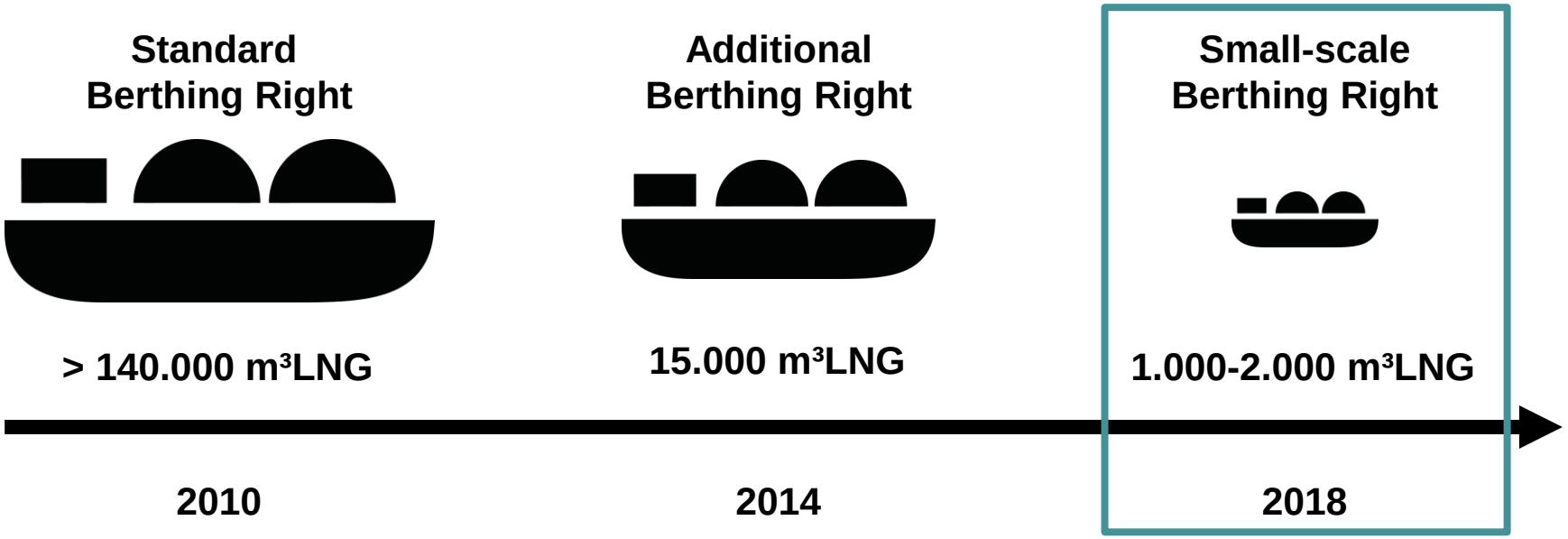
- Belgian Consumption in 2017
- High gas prices March 2018
- Investment Plan 2018-2027
- Latest developments in Transmission
- ZTP
- LNG & Storage
- Tariff Methodology 2020-2023 : CREG Consultation

FLUXYS

LNG ACTIVITY @ ZEEBRUGGE

Works on track with 5th Tank

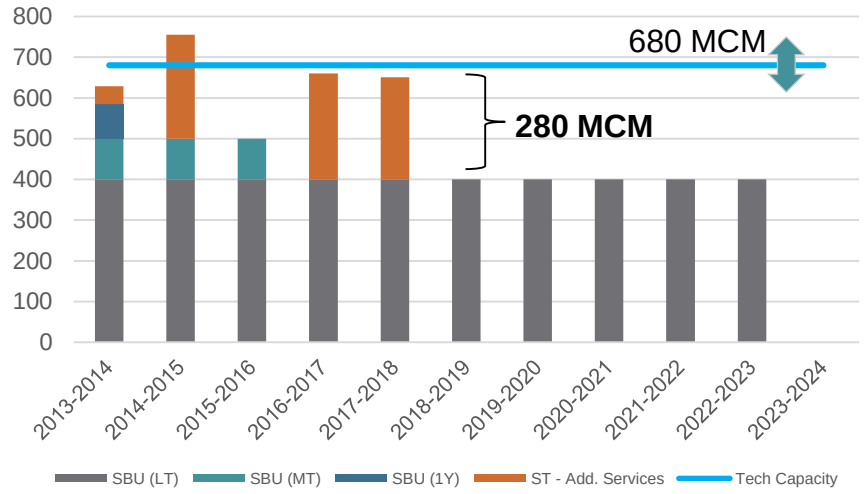
REINFORCING OUR RELOADING OFFER



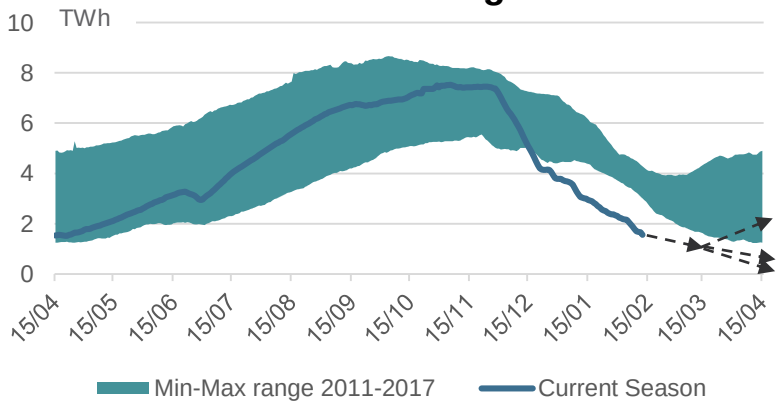
- Our new Small-Scale Berthing Right proposal aims at supporting the development of small-scale activity at Zeebrugge
- Main characteristics of the new offer
  - SSBR = right to berth and load LNG for small-scale ships
  - 70 slots per year available, offered through Subscr. Window and then FCFS
  - Indicative tariff - subject to consultation and CREG approval - 1.1 €/MWh loaded, with a min. of 28.000 € per SSBR
  - In 2018, one time opportunity to convert subscribed Add. Berthing Right into SSBR, on a financial neutral basis

STORAGE SERVICES FOR SEASON 2018-2019

Loenhout Storage Capacities



Loenhout Filling Level



- The offer for season 2018-2019 * consists of
  - 280 MCM in SBU's
  - Additional Storage Services
    - » Volume, injection or withdrawal
    - » Resulting from the unsold SBUs
    - » Subject to simulation of the underground
    - » Can be combined to shape alt. products

- Storage services are offered First Come First Served
  - For a yearly term until 15 April 2018
  - For shorter term as from 15 April 2018

* A storage year starts on 15/04/y 6AM and ends on 15/04/y+1 6AM

FLUXYS

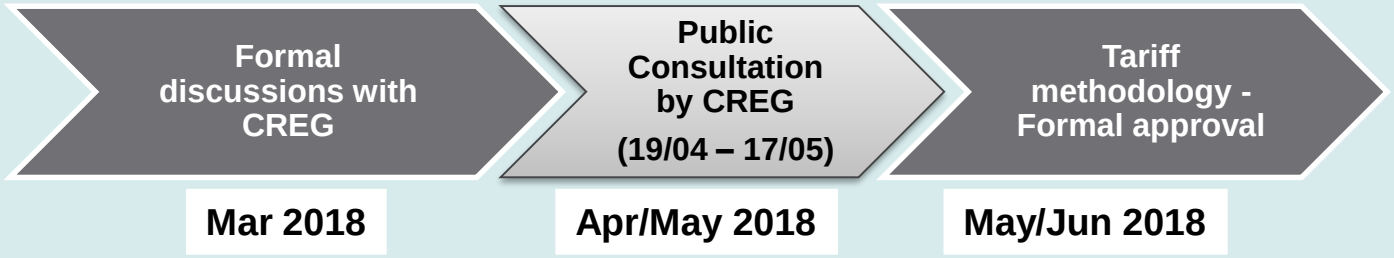
AGENDA

- Belgian Consumption in 2017
- High gas prices March 2018
- Investment Plan 2018-2027
- Latest developments in Transmission
- ZTP
- LNG & Storage
- Tariff Methodology 2020-2023 : CREG Consultation

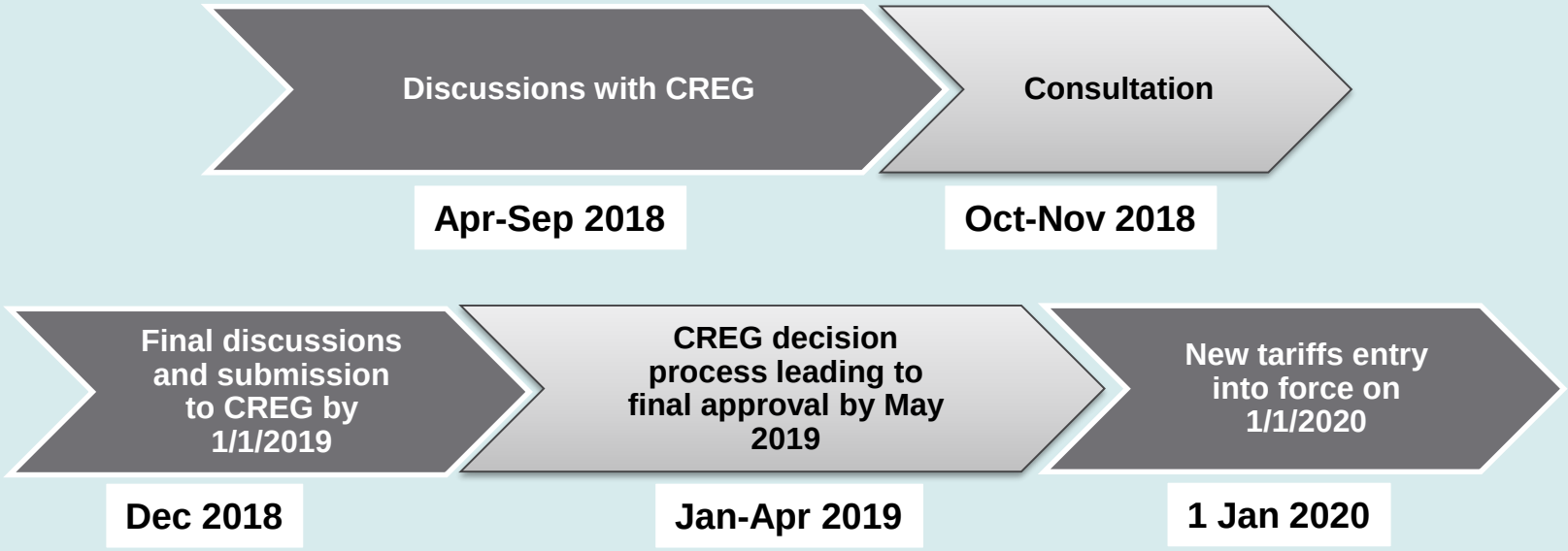
FLUXYS

Process & Timeline 2018/2019

Tariff methodology – CREG



Tariff design 2020-2023 & TAR NC implementation



FLUXYS

CREG's Methodology 2020-2023 – Main elements

Main principles of regulation unchanged (RAB x WACC regime)

Main changes concerns:

- Risk free rate (OLO) fixed ex-ante: 2,4% for 2020-2023 period
  - Based on prognoses bureau du plan for 2020-2022
  - No more ex-post correction of WACC based on realized OLO
  - → Increased Stability & predictability
- Benchmarking as option for correcting tariffs if necessary
- Incentive on manageable OPEX is kept but
  - With 3 layers:
    - » 50/50 sharing between tariffs & margin is applicable only to the first layer, 75% for tariffs in the second layer & 80% above.
  - Other incentives are introduced for a limited maximum amount covering:
    - » CH4 emissions, L/H conversion investments, connection of Biomethane/PtG/CNG satellite installations, installation of high efficiency boilers, data platforms availability, Firmness of capacity and capacity sales.

FLUXYS

AGENDA

08h30: Welcome	
09h30: Gas supply and demand outlook	**Arno Büx**
10h15: Focus on Belgium	**Huberte Bettonville**
11h00: Break	
11h15: Innovative use of “natural” gas	**Nicolas Gielis**
11h45: L/H Conversion	**Denis Bawin**
12h00: Directive SOS gas	**Denis Bawin**
12h15: Lunch	
13h45: The role of natural gas in the future energy mix	**Prof. Samuele Furfari**
14h45: Consultation Connection Agreement	**Ludo Hanot**
15h00: *Break*	
15h15: Maintenance ground exits	**Tim De Vil**
15h45: Planning works	**Ivan Brysens**
16h15: Drink	

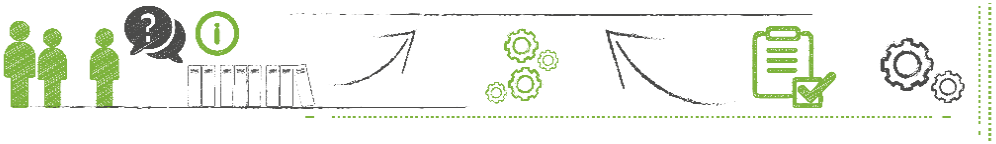
FLUXYS

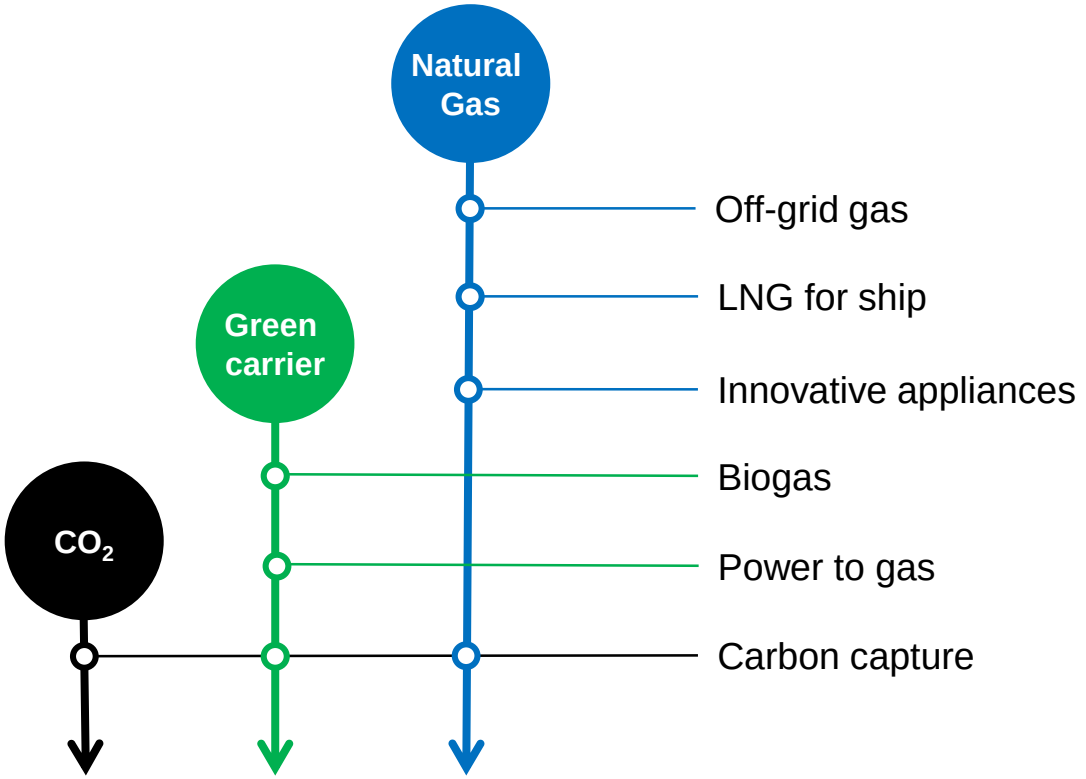
Innovation in Gas

Nicolas Gielis
Innovation Manager

FLUXYS

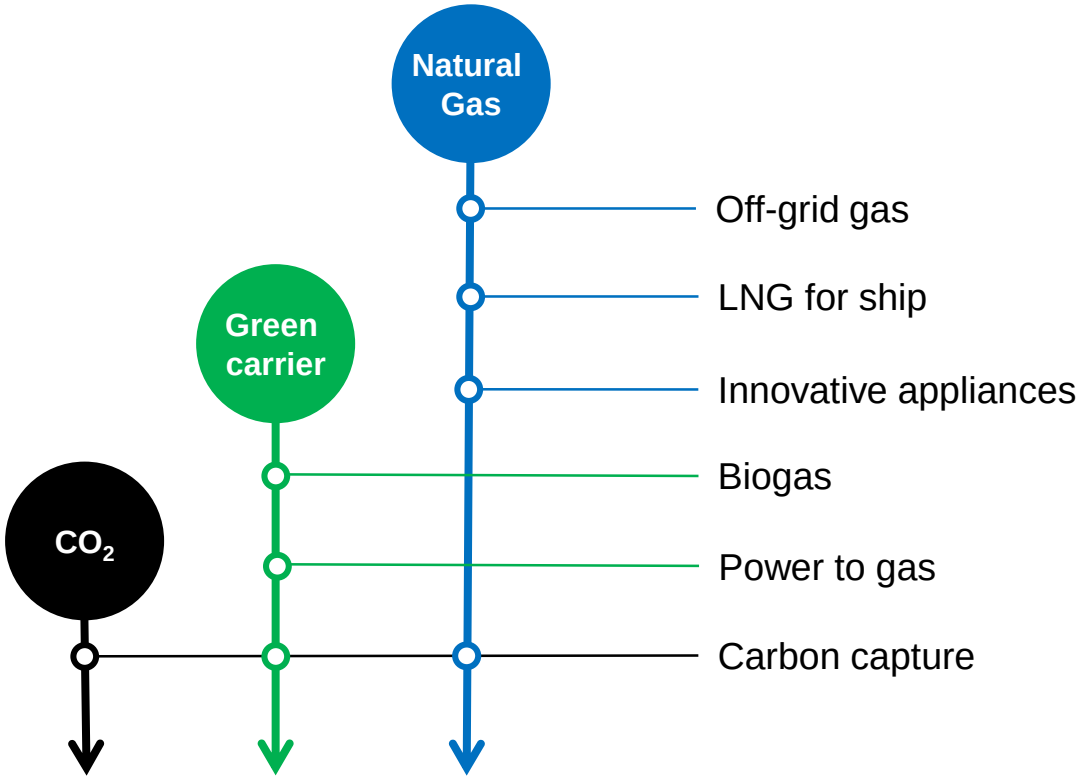
How is Fluxys promoting innovative use of Natural Gas ?





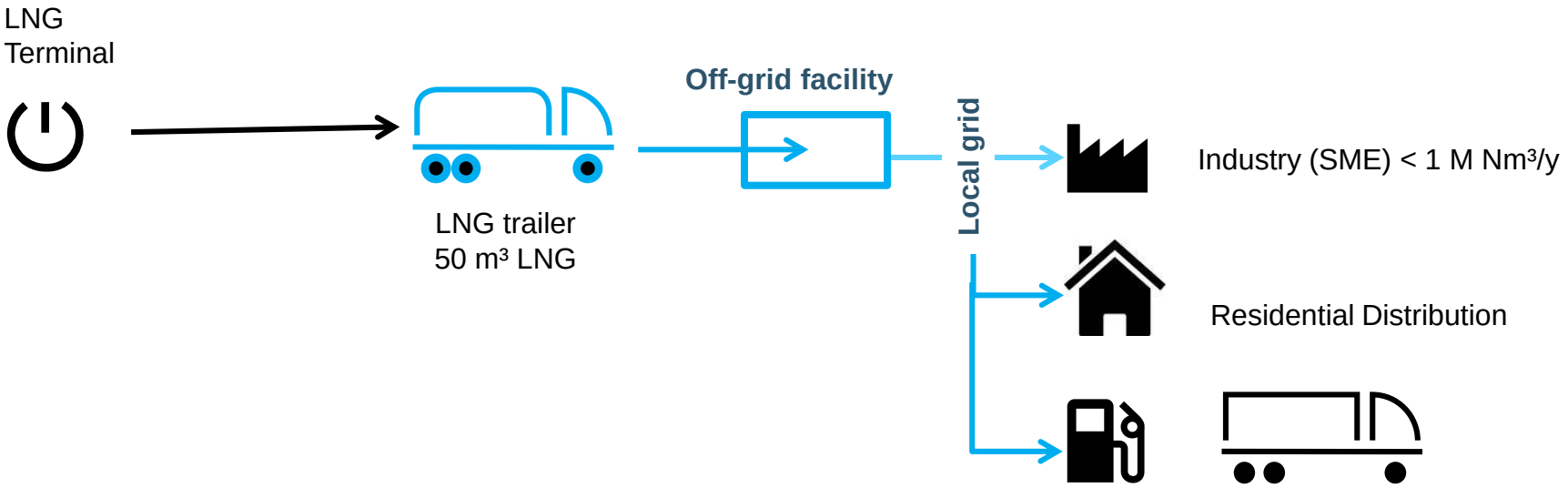
FLUXYS


molgas
molgas

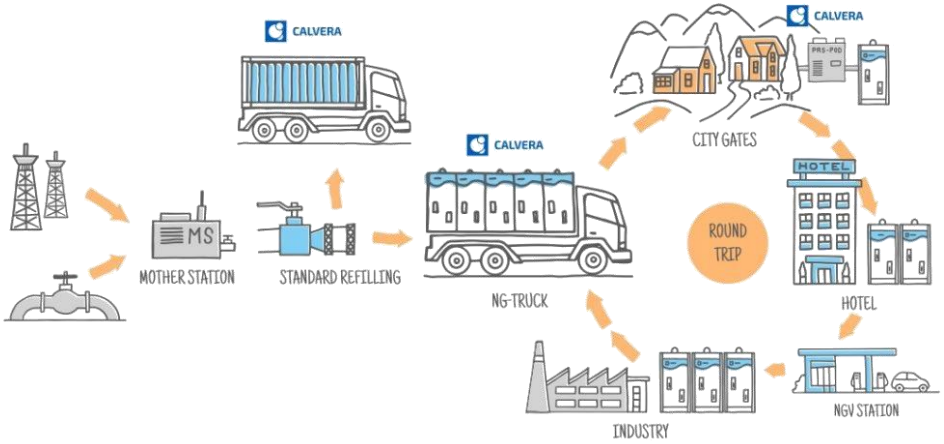

Natural Gas
Green carrier
CO_2
Off-grid gas
LNG for ship
Innovative appliances
Biogas
Power to gas
Carbon capture

FLUXYS

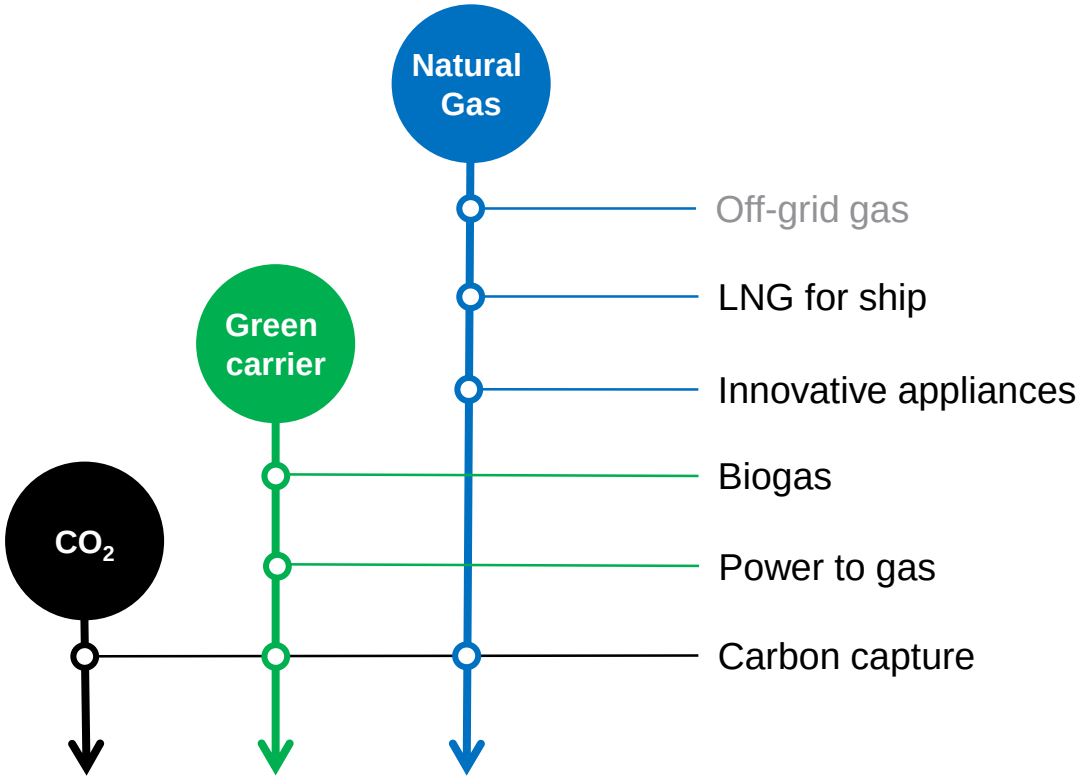
off-grid LNG



OFF-GRID CNG

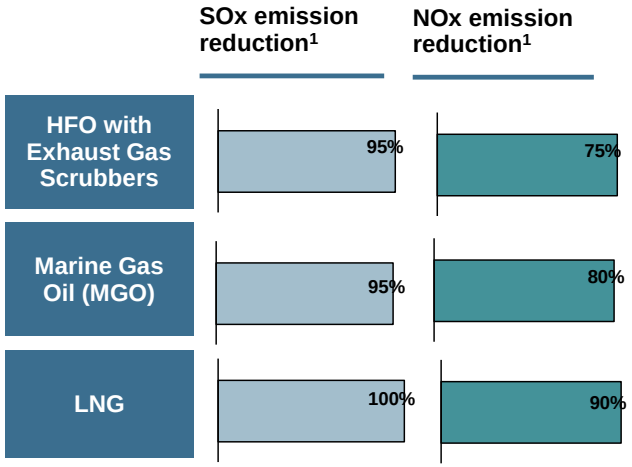


FLUXYS


Natural Gas
Green carrier
CO_2
Off-grid gas
LNG for ship
Innovative appliances
Biogas
Power to gas
Carbon capture

FLUXYS

LNG OFFERS A SUSTAINABLE MARINE FUEL SOLUTION



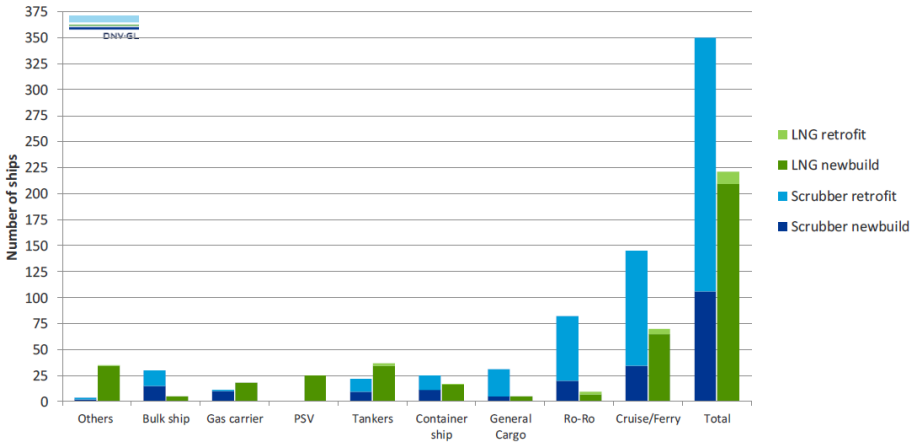
1) Reduction based on current emissions by HFO

Source: DMA; DNV; Wärtsilä; Germanischer Lloyd; Roland Berger

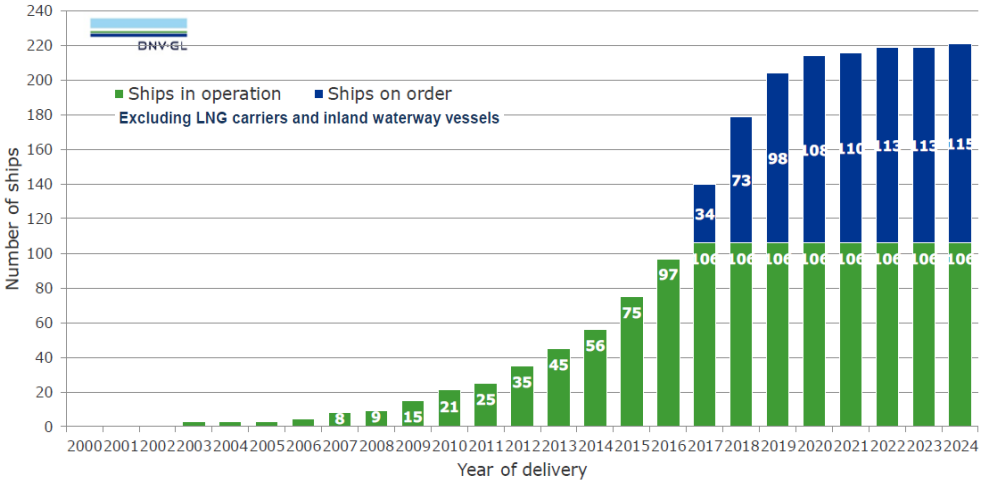
Marine emission control is tightening around the world
LNG is a sustainable alternative to Heavy Fuel Oil

FLUXYS

LNG AS MARINE FUEL IS GROWING



Higher LNG newbuilds indicate a more durable long term commitment to LNG

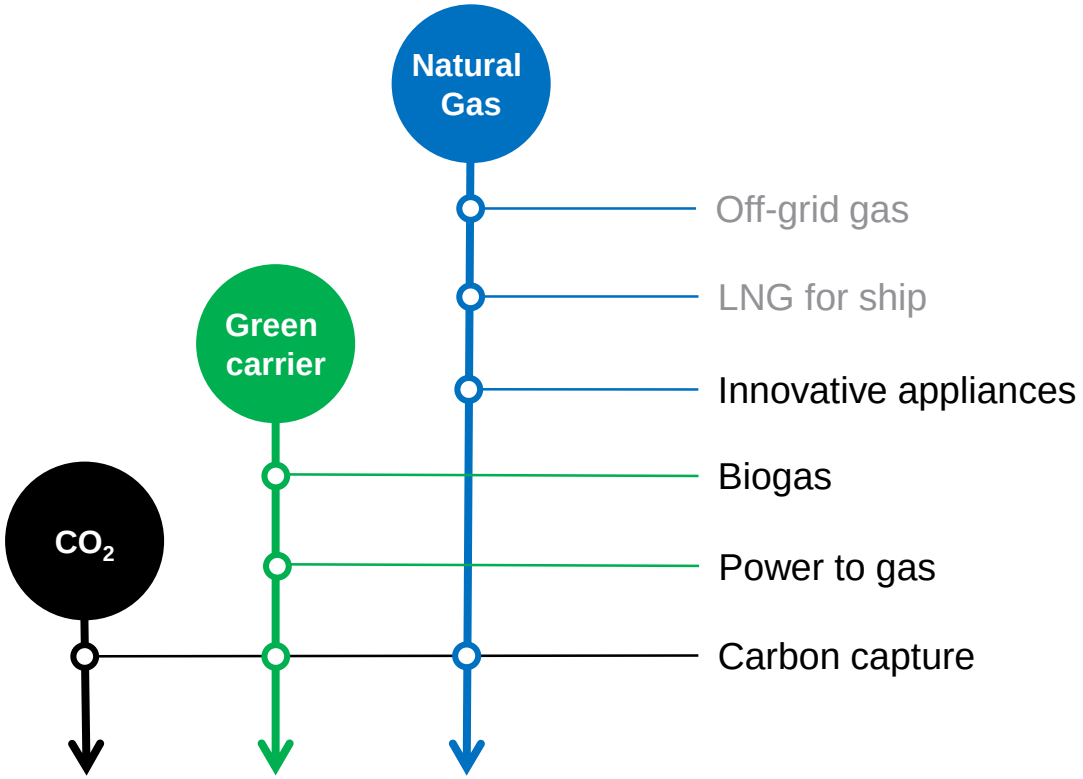


Marine emission control is tightening.
LNG is a clean alternative to Heavy Fuel Oil

Number of LNG-fueled ships are increasing year by year!

Fluxys is looking at bunkering infrastructure developments

FLUXYS


Natural Gas
Green carrier
CO_2
Off-grid gas
LNG for ship
Innovative appliances
Biogas
Power to gas
Carbon capture

FLUXYS

Innovative appliances: Micro CHP

- Micro-CHP allows the supply of both heat and electricity from a single energy source
- Lower energy bills for energy customers
- Security of supply enhanced by reducing reliance on centralized power production
- Micro-CHP also allows gas to be used more efficiently
- Carbon emissions are reduced by generating electricity at the point of use – avoiding the system losses associated with central power production

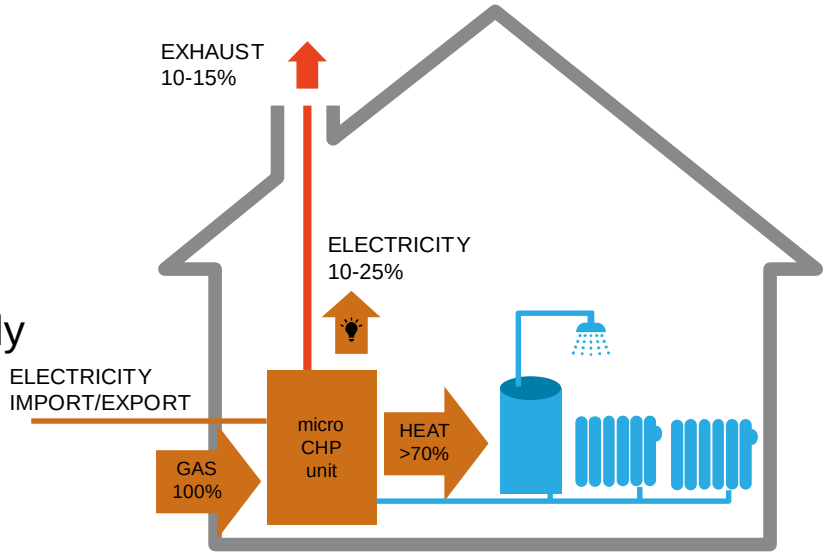


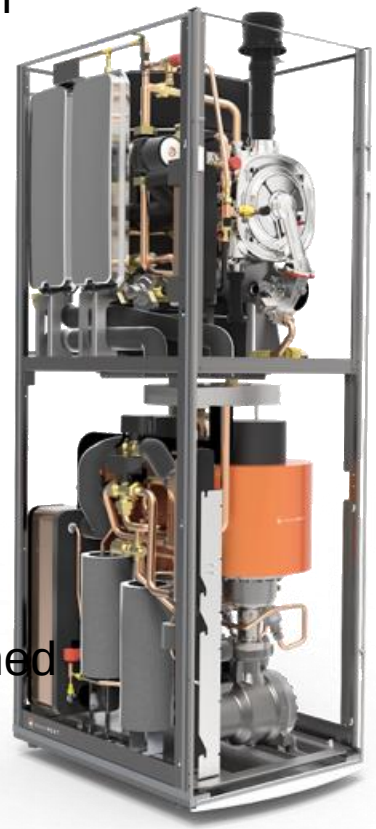
Fig. COGEN Europe

→ Micro-CHP can be a key enabler for the EU to deliver on its energy objectives

FLUXYS

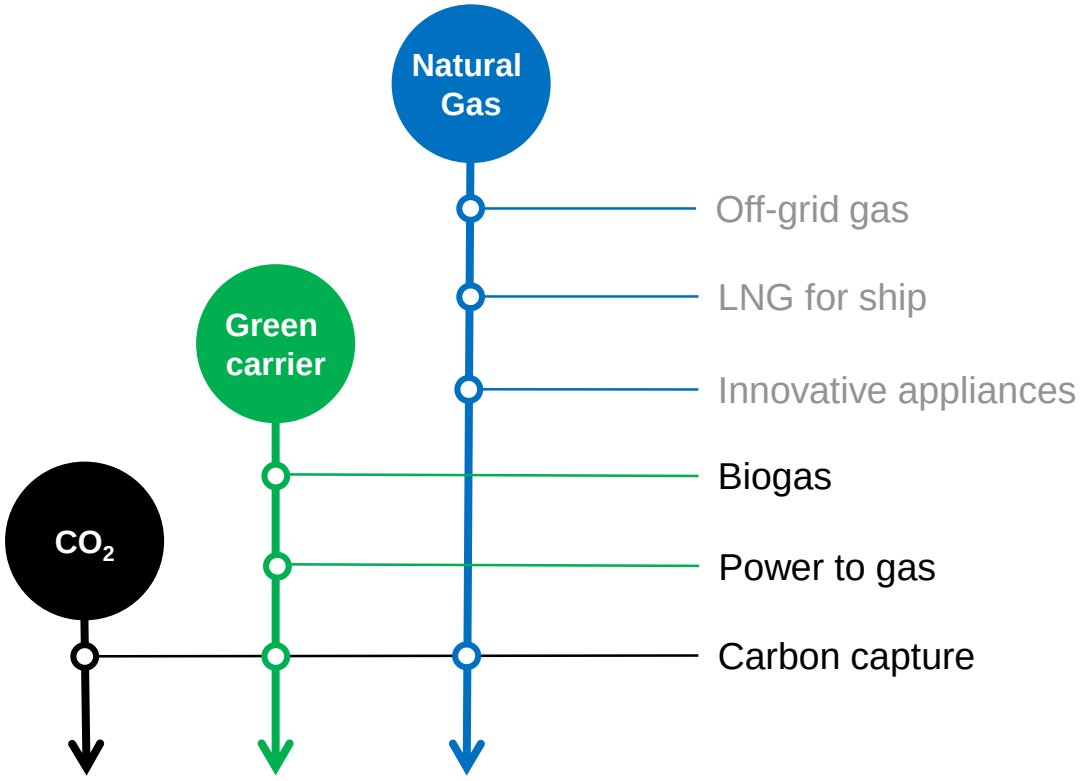
Innovative appliances: Gas hEAT PUMPs

- Revolutionary low carbon technology appliance
- Gas powered heat pump with thermodynamic compressor (the core of the innovation)



- Company developing in line with commercialization planned for end 2018
- Fluxys invested in boostHEAT to support industrialisation

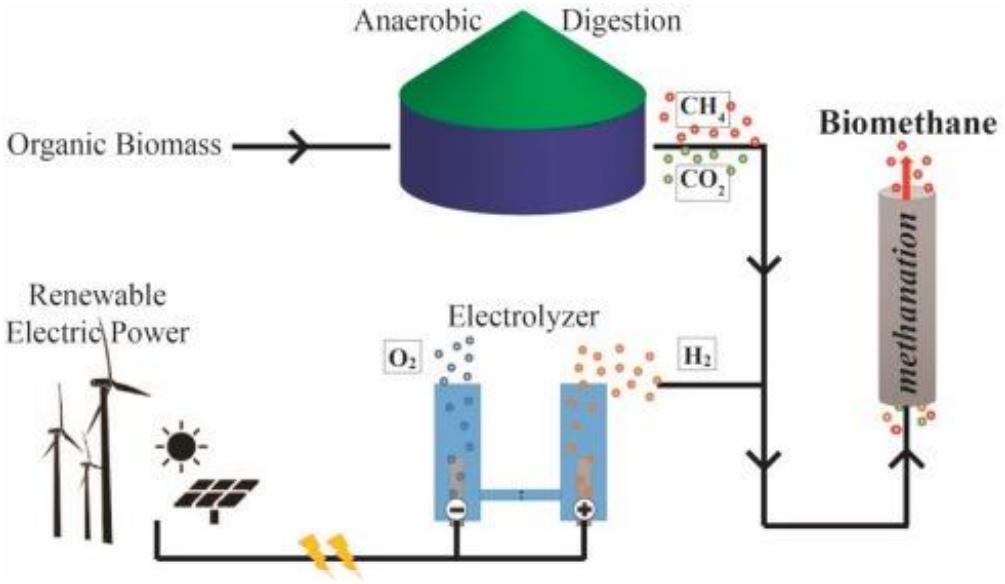
FLUXYS


Natural Gas
Green carrier
CO_2
Off-grid gas
LNG for ship
Innovative appliances
Biogas
Power to gas
Carbon capture

FLUXYS

Innovation avenues for Bio-methane

New Holland methane-powered tractor



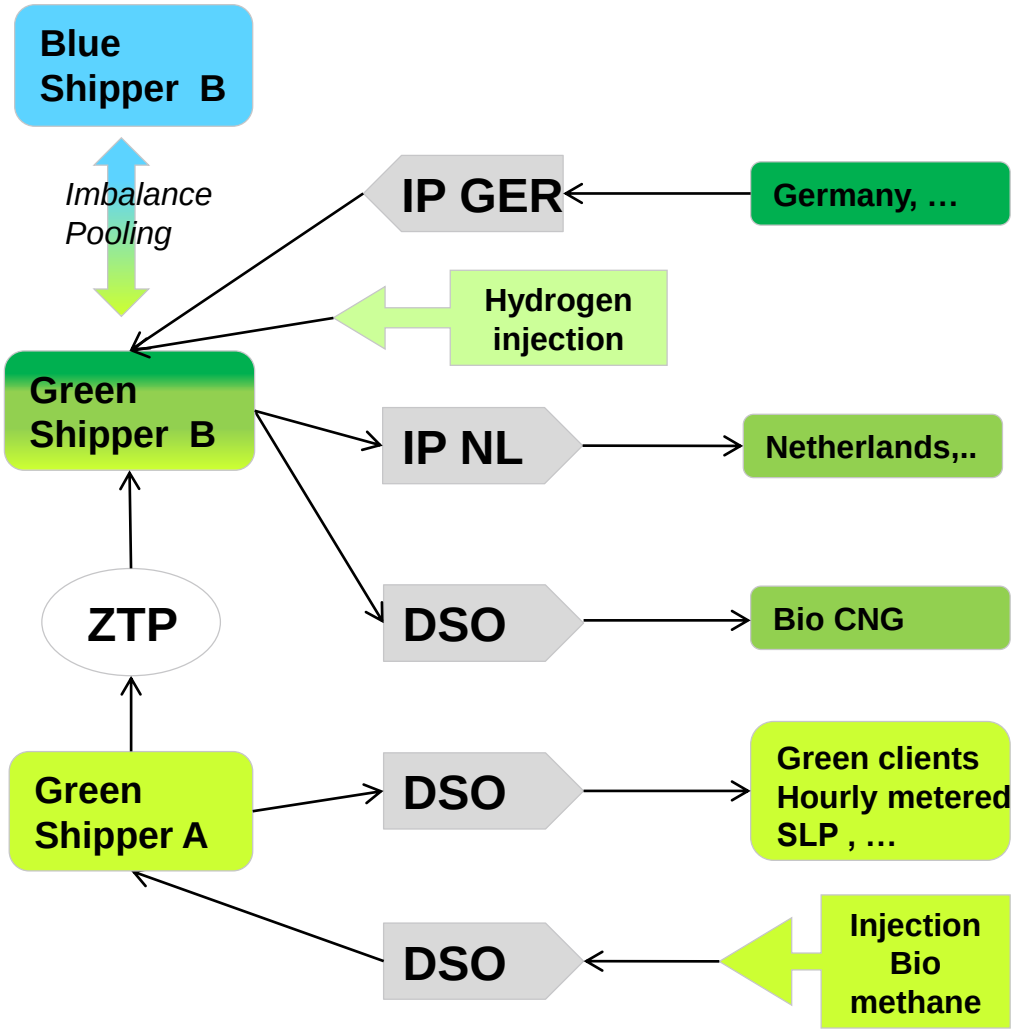
MicrobEnergy: combining biogas and power-to-gas

Low density energy carrier
→ Decentralized units

Biogas could be injected into the natural gas grid or used locally

FLUXYS

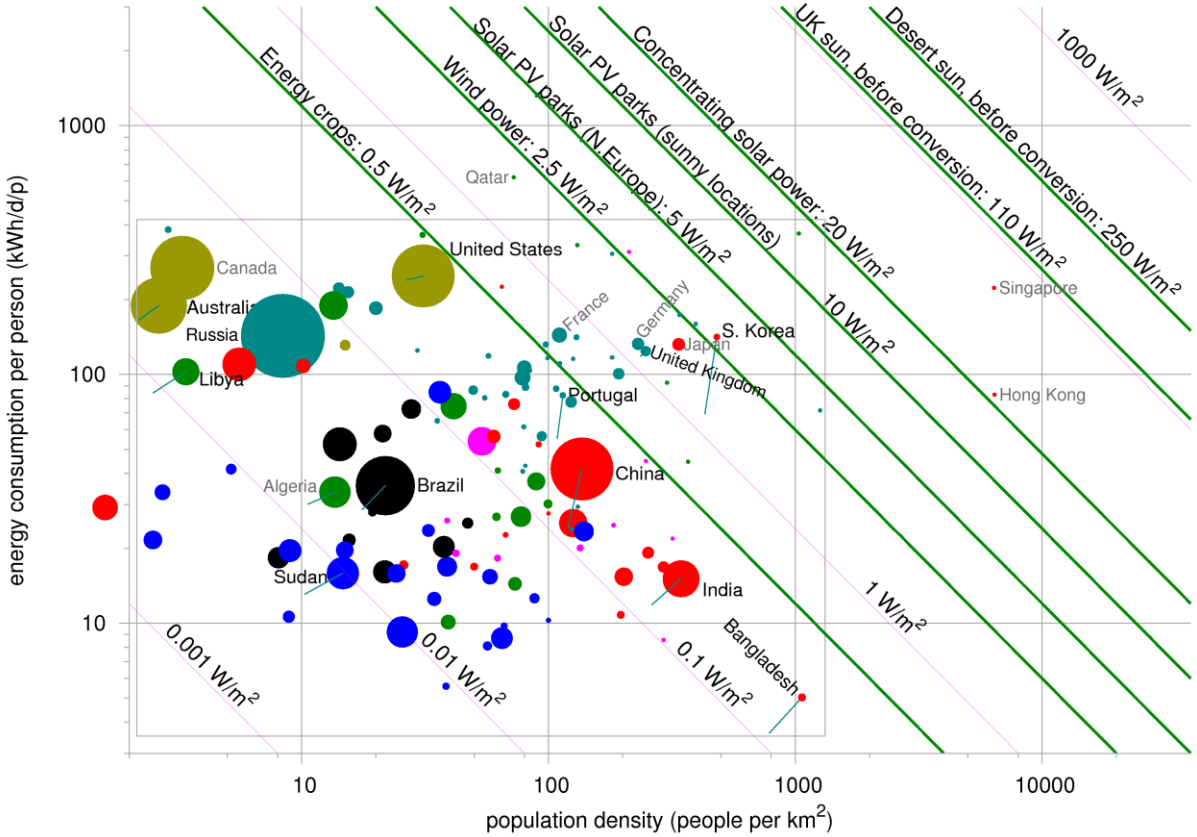
Fluxys Belgium prepares for Green gas injection



- Market Model update
- Biogas registry for Belgium
- Cross Border trade

FLUXYS

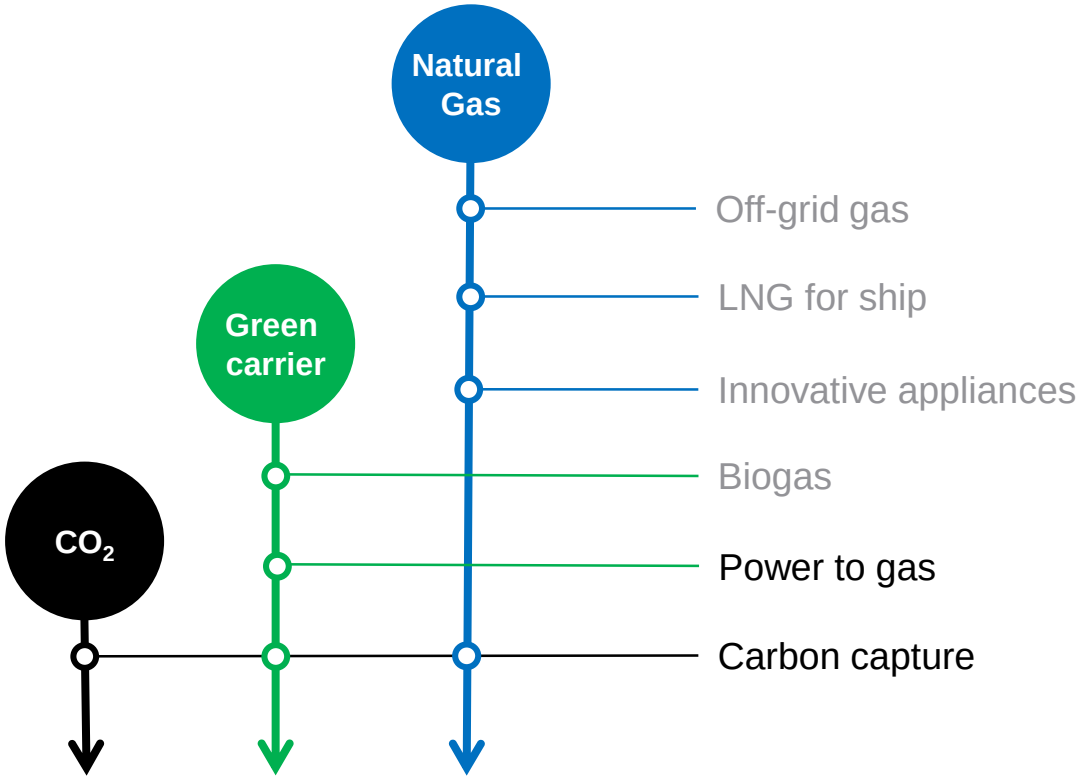
Will the future system be centralized, decentralized or both?



Potential of biofuels is limited

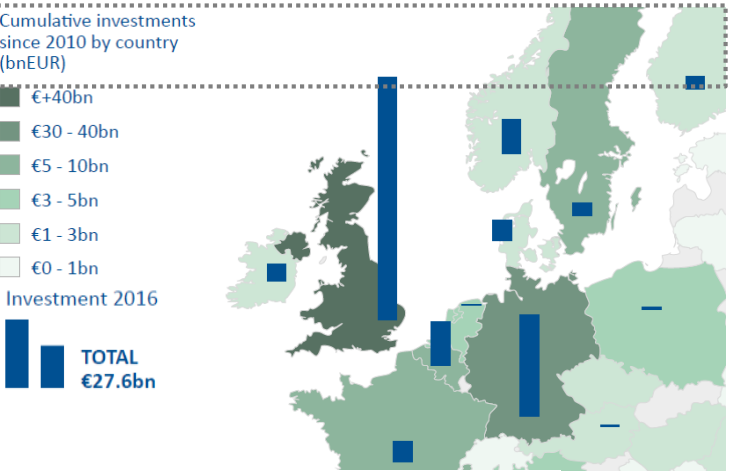
Complete decentralized/local renewable power generation is currently not possible in NW-EU

FLUXYS


Natural Gas
Green carrier
CO_2
Off-grid gas
LNG for ship
Innovative appliances
Biogas
Power to gas
Carbon capture

FLUXYS

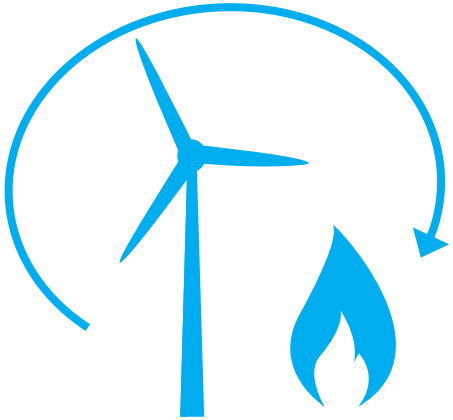
POWER-TO-GAS (P2G) INFRASTRUCTURE to complement renewables



Wind energy investments

- As renewable power generation base grows, challenge of matching demand and production increases
- Shortfall: case for gas-fired generation
- Excess: need to valorize the energy

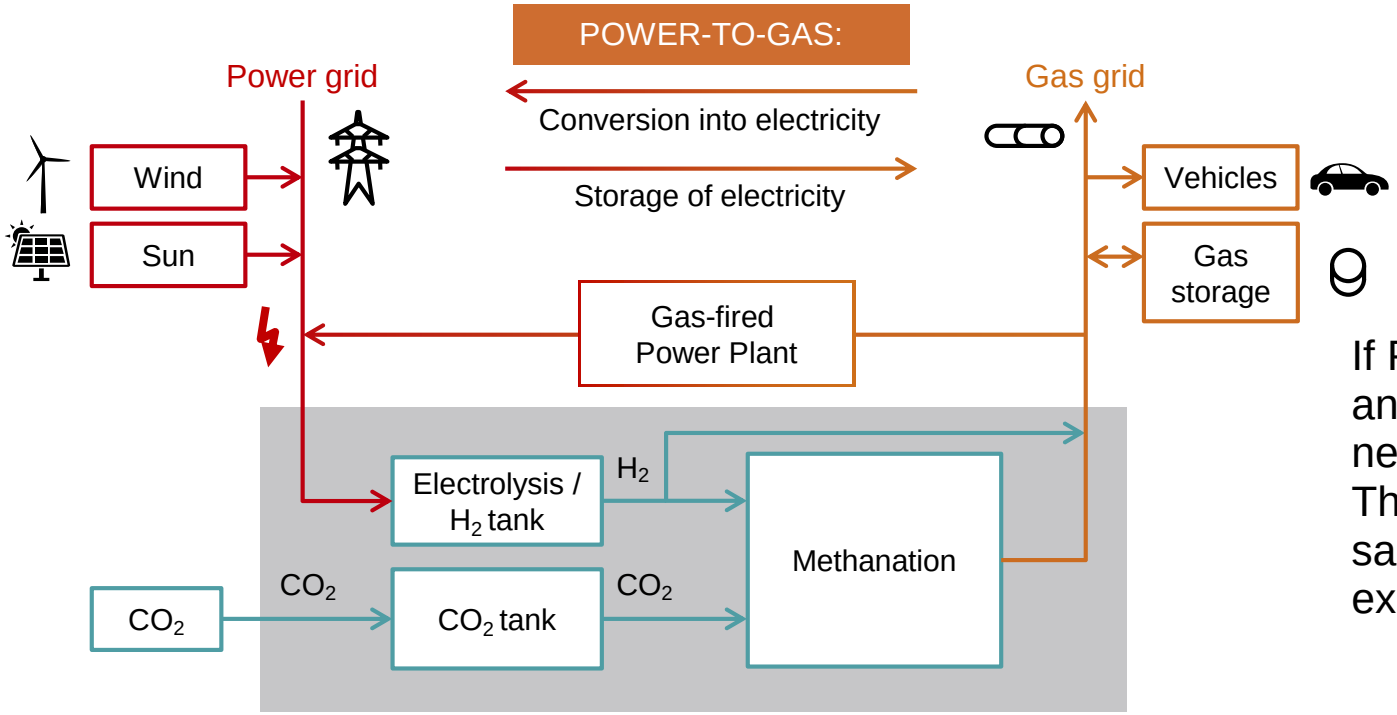
- Renewable power generation base set to further increase substantially
- Northwest-Europe at the forefront of wind power development
- New developments in wind power expected to further reduce cost



- P2G to valorize excess energy
- P2X only existing technology to store renewable power
- P2G must now move beyond demonstration projects

FLUXYS

P2G facilitates an integrated energy system



If P2G further develops, an **hydrogen grid** will be needed.
This grid should offer the same services as the existing NG grid.

Fluxys studies possible commercial size Power-to-gas unit

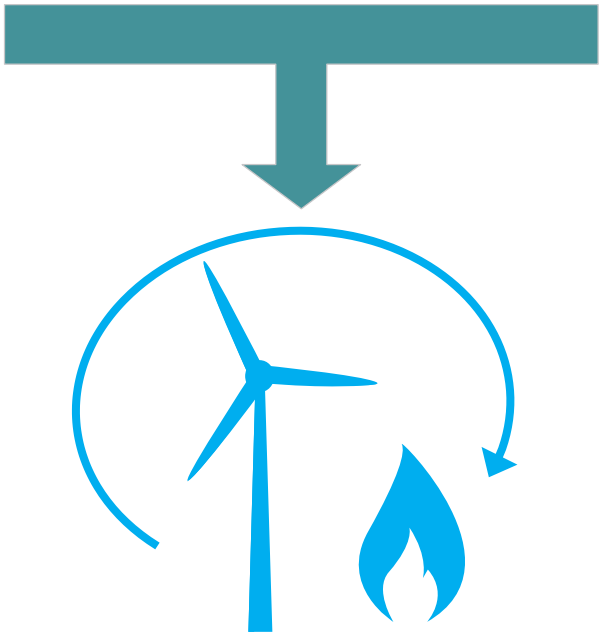
FLUXYS

Centralized renewable power generation is needed

8% of the existing desert surface could supply the global energy need

source: IEA

Noor 1 Power Station in Morocco



Enormous potential & available space for wind energy at sea

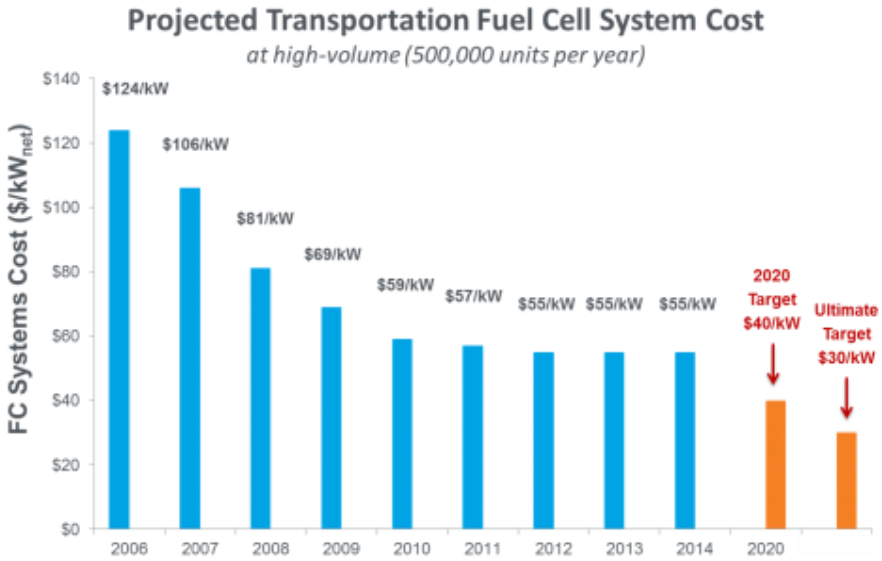
North Sea Wind Power Hub

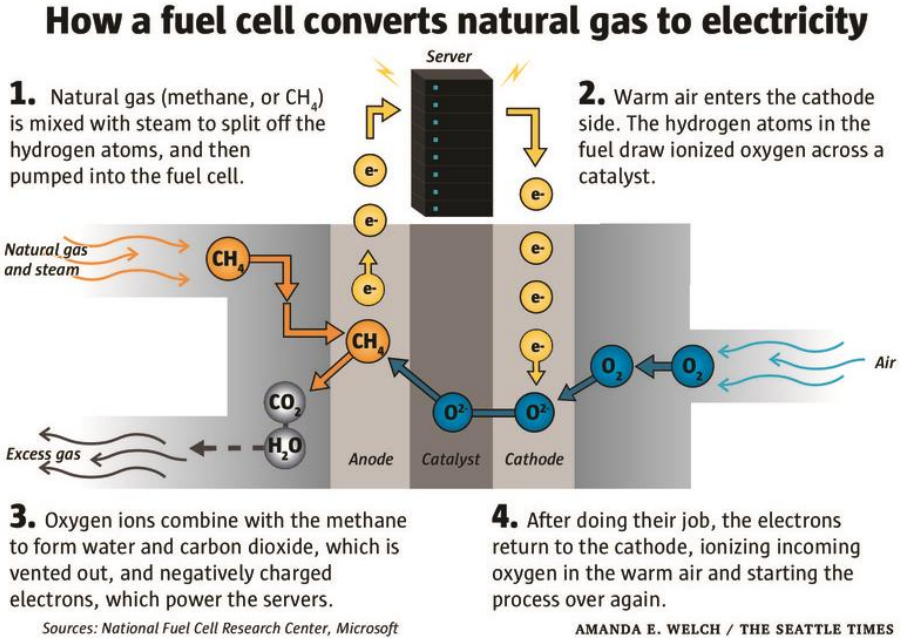
Why not convert this green energy to H_2 and transport; store & use it in the same way & with the same flexibility as the current NG system?

FLUXYS

Fuel cells

- Some fuel cells can run on natural gas (ex Microsoft)
- Fuel Cell benefits
  - High electrical efficiency (>60%)
  - Limited maintenance (no moving parts)
- FC for mobility – prices are falling

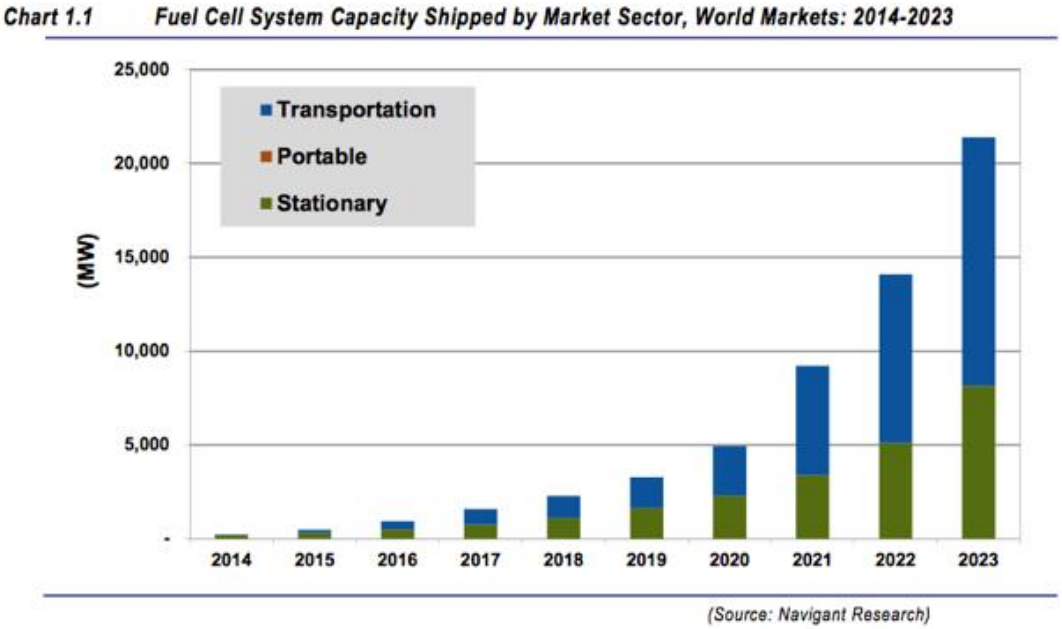


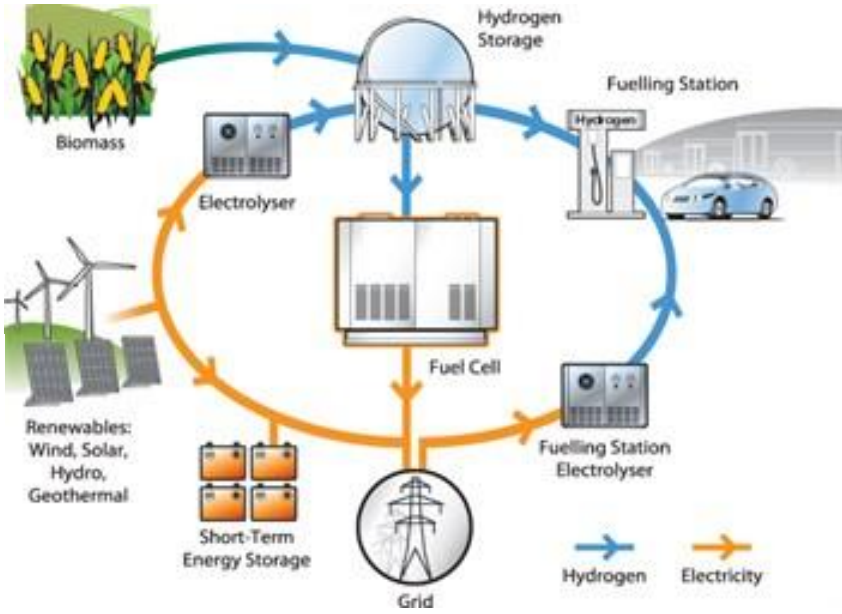


FLUXYS

Fuel Cells

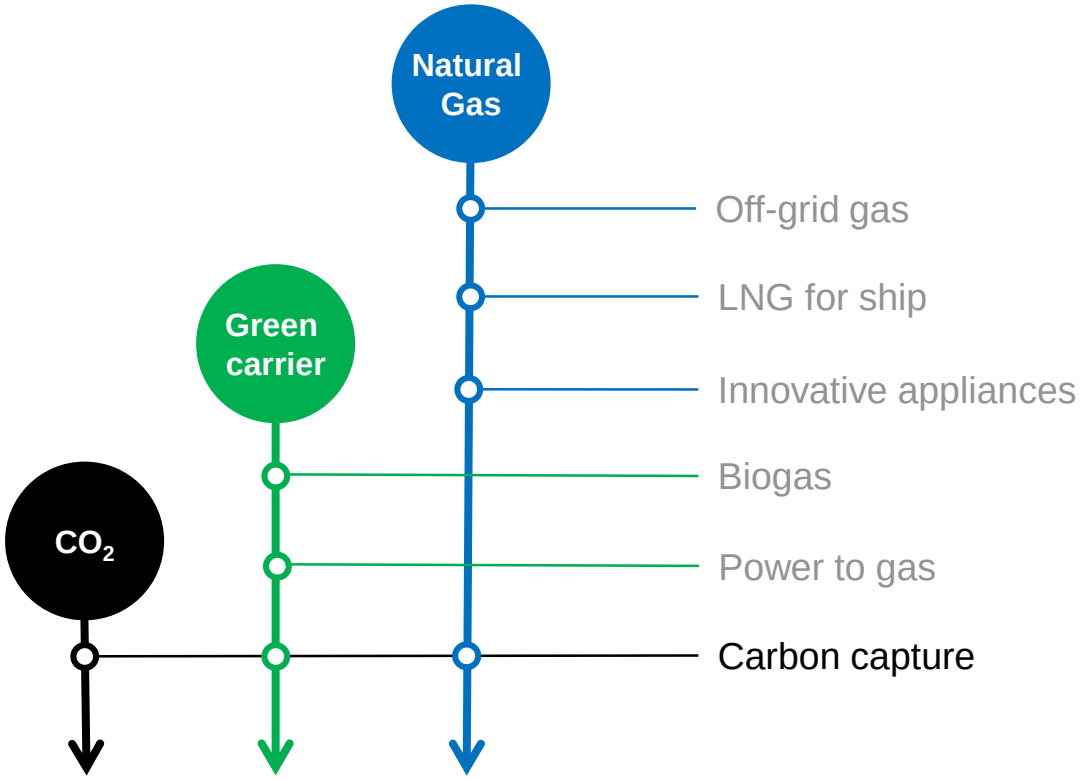
- Fuel Cells enable the connection between gas and electricity grid
- Rapid market growth forecasted
  - Japan: 190000 units in 2017, 5 000 000 by 2030 forecasted
  - EU: 3000 units in 2017





Source http://www.fuelcelltoday.com

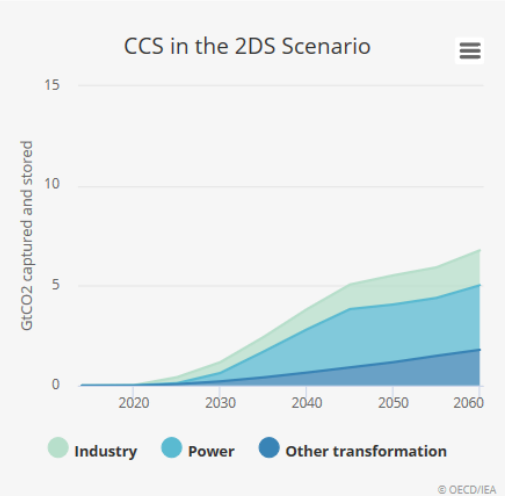
FLUXYS

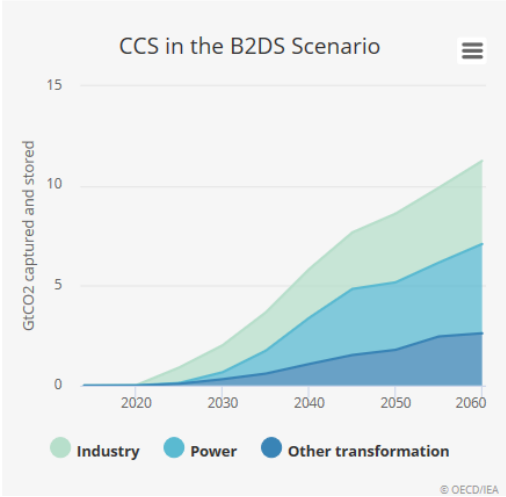

Natural Gas
Green carrier
CO_2
Off-grid gas
LNG for ship
Innovative appliances
Biogas
Power to gas
Carbon capture

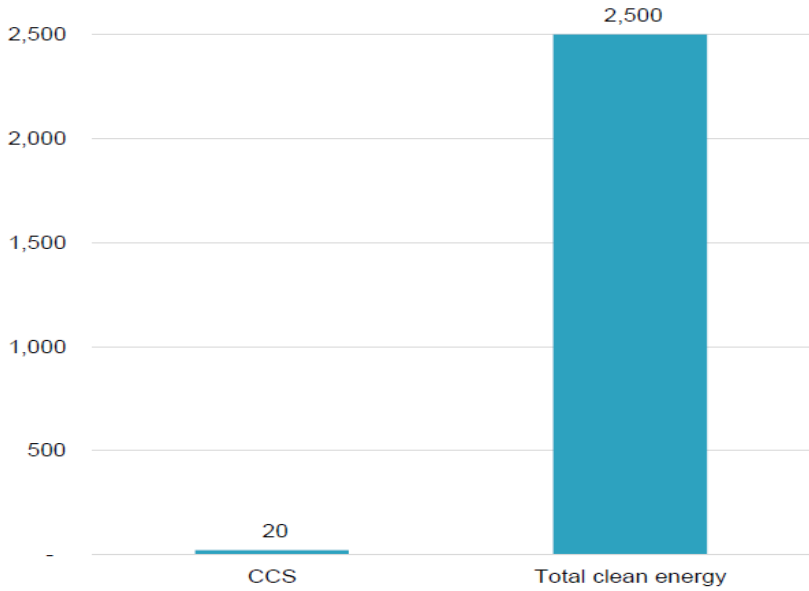
FLUXYS

Ccs is vital to reach climate goals

- CCS has not enjoyed same support as REN
- CCS is part of the EU 2030 climate and energy policy framework
- Part of IEA 2DS & B2DS scenarios
- Only way to produce clean chemicals, plastics, steel, fertilizers, cement
- Policy essential to realize these opportunities





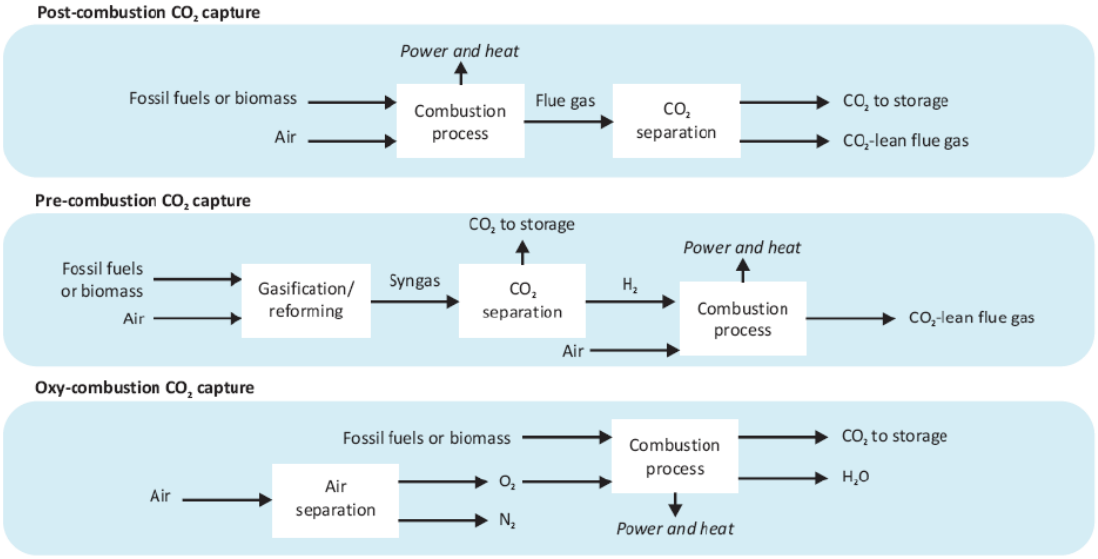


Data source: IEA 2015 "Tracking Clean Energy Progress". Bloomberg New Energy Finance "Clean Energy Investment By the Numbers –End of Year 2015" fact pack.

Fluxys watches closely for CCS opportunity

FLUXYS

Carbon capture techniques

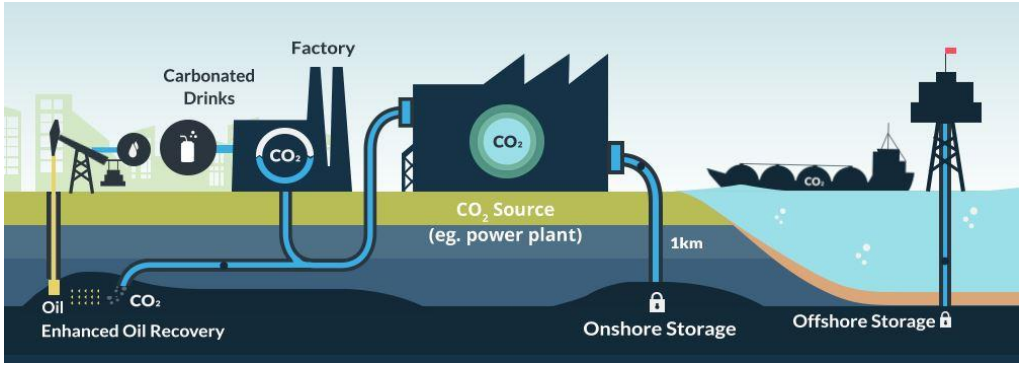


Source: IEA (2012a), *Energy Technology Perspectives 2012*.

Example: coal & gas power plants
→ Mature add-on technology

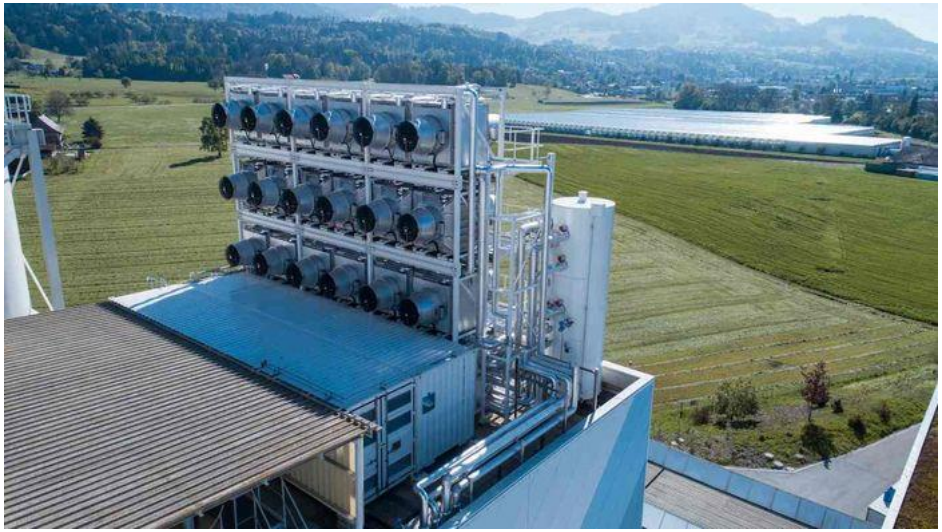
SMR H2 production to supply gas power plant, heating,…
→ Mature technology

Easier CC after combustion
→Needs further R&D



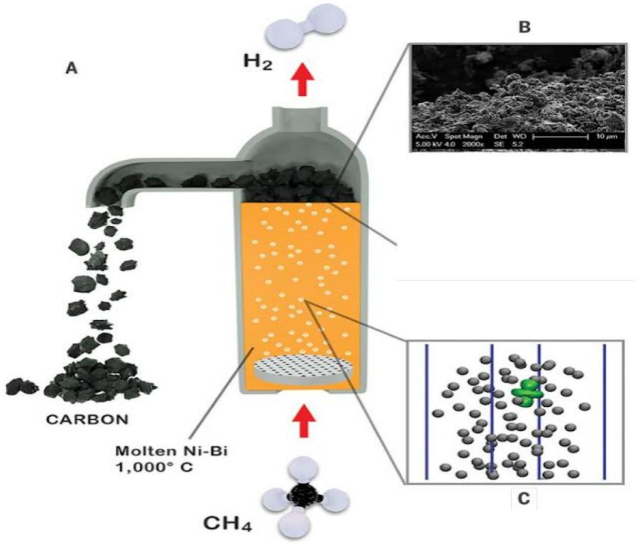
FLUXYS

What's NEXT : Disruptive technologies



In Switzerland, a giant new machine is sucking carbon directly from the air
(Science, June 1, 2017)

"UC Santa Barbara team develops catalytic molten metals for direct conversion of methane to hydrogen without forming CO2"
(Green Car Congress 17 Nov. 2017)



In de metaalreactor A gaat methaan, dat regaeert in de metaallegering (B), de vrijgekomen koolstof drijft bovenin (B).

Source : https://www.deingenieur.nl

FLUXYS

The future will be complex but Fluxys is ready to take on the challenge

- Added value through extensive experience with

- Value through
  - O&M expertise
  - Existing experience in gas asset construction
  - Envisioned commercial synergies (Unbundled; Entry-Exit market model;…)

FLUXYS

AGENDA

08h30: Welcome	
09h30: Gas supply and demand outlook	**Arno Büx**
10h15: Focus on Belgium	**Huberte Bettonville**
11h00: Break	
11h15: Innovative use of “natural” gas	**Nicolas Gielis**
11h45: L/H Conversion	**Denis Bawin**
12h00: Directive SOS gas	**Denis Bawin**
12h15: Lunch	
13h45: The role of natural gas in the future energy mix	**Prof. Samuele Furfari**
14h45: Consultation Connection Agreement	**Ludo Hanot**
15h00: *Break*	
15h15: Maintenance ground exits	**Tim De Vil**
15h45: Planning works	**Ivan Brysens**
16h15: Drink	

FLUXYS

CONVERSION L/H

Denis Bawin
Public Distribution Interface Manager

FLUXYS

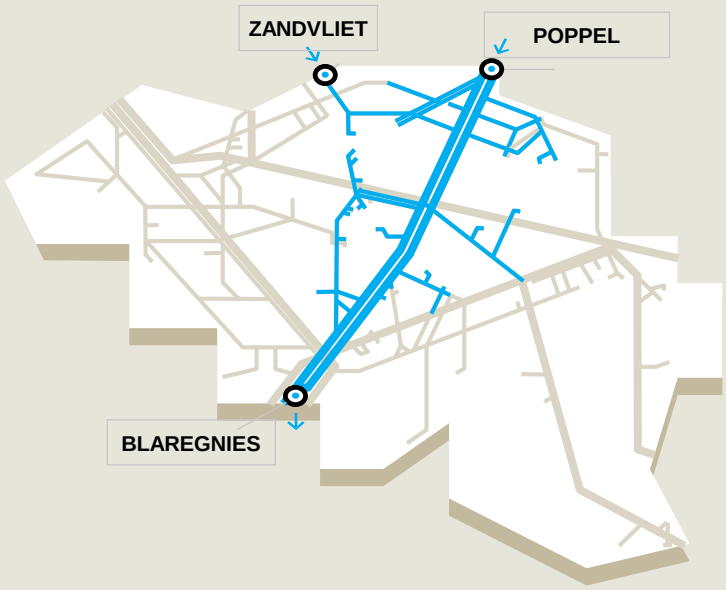
Conversion L/H Agenda

1. **L gas in Belgium**
2. Situation in NL
3. Conversion L-H in Belgium: planning

FLUXYS

Coexistence of two types of gas in Belgium

- The natural gas from the Netherlands (L-gas) is the first natural gas imported in Belgium (1966)
- Due to the increase of natural gas consumption, Belgium imported H-gas as from end 1970 also from other sources (Algeria, Norway, United Kingdom, Qatar, etc) → existence of two types of natural gas: L-gas (single source) and H-gas

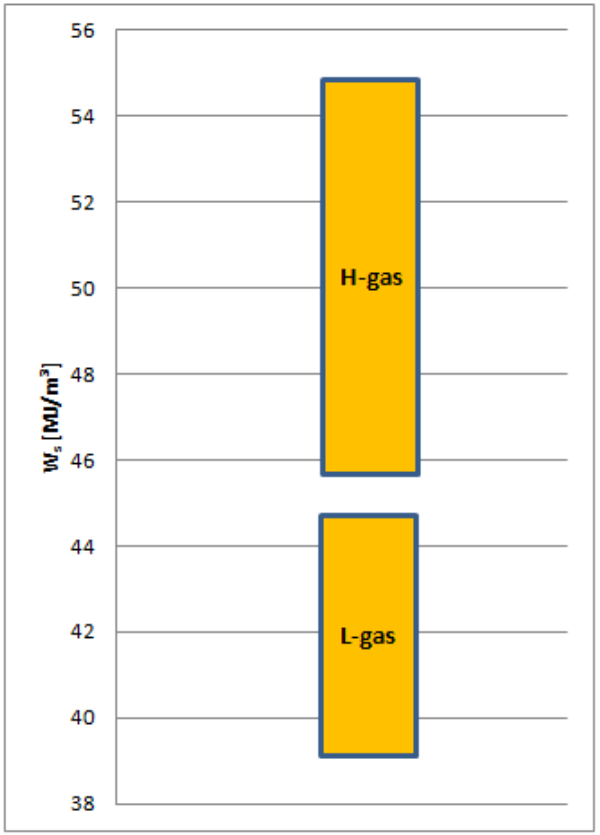


- Annual consumption of L-gas : 5 bcm
- 1/3 of the total Belgian consumption
- 50% of the public distribution consumption
- 36 industrial clients connected to the transport network
- 1.6 million connections on L
- 100% provisioning of the French L-market
- No production, no storage

FLUXYS

H-gas / L-gas

- H & L gas groups are defined by European Norm EN437
- High calorific gas contains more energy by cubic meter
- Low calorific gas contains more nitrogen and therefore less energy by cubic meter
- The technical conditions for distribution are different (H-gas : 21 mbar, L-gas : 25 mbar)



The Wobbe Index (Ws) is an indicator of the interchangeability of fuel gases
Values are given for 15°C and 101 325 Pa (from EN437)

FLUXYS

L Gas : Stakeholders

	GRT	DSO	Regulators/Authorities	Shipper & suppliers
NL	gas transport services	ENEXIS, Liander, …	Autoriteit Consument & Markt Autorité néerlandaise	GasTerra **LT supply contracts**
BELGIUM	FLUXYS	eandis, infrax, ORES, resa, Sibelga	CREG Belgian federal Authorities Regional Authorities brugel, CWaPE, vreg	18 shippers + suppliers DSO
FRANCE	GRTgaz	GrDF, …	Commission de Régulation de l'Énergie French Authorities	Shipper & suppliers

FLUXYS

Conversion L/H Agenda

1. L gas in Belgium

2. **Situation in NL**

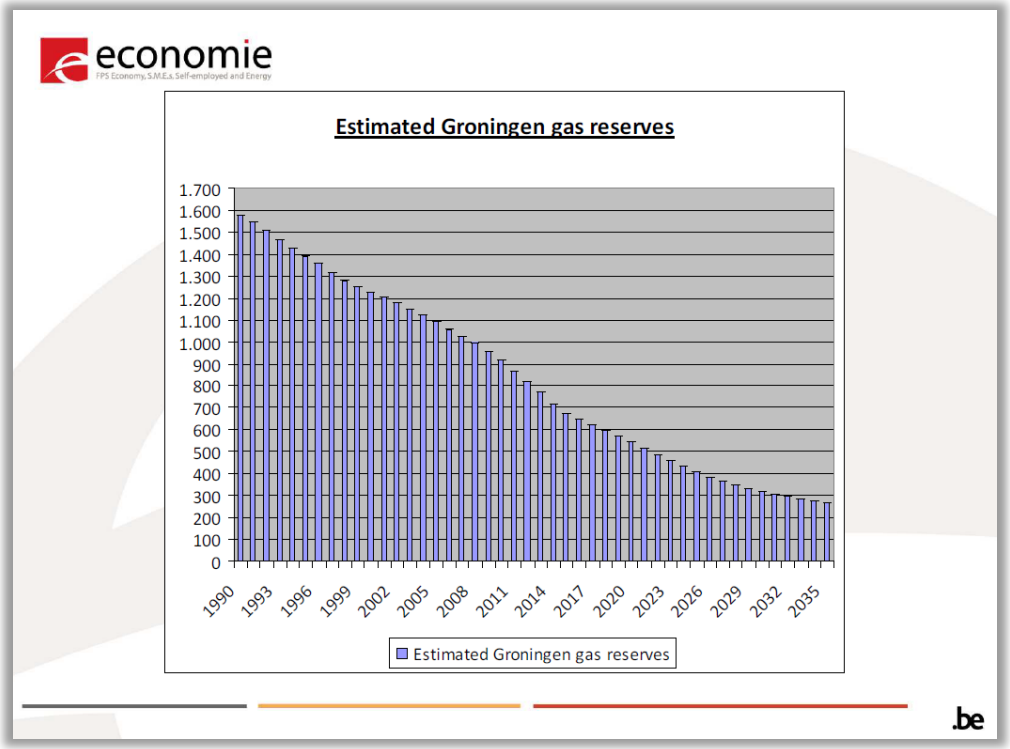
3. Conversion L-H in Belgium: planning

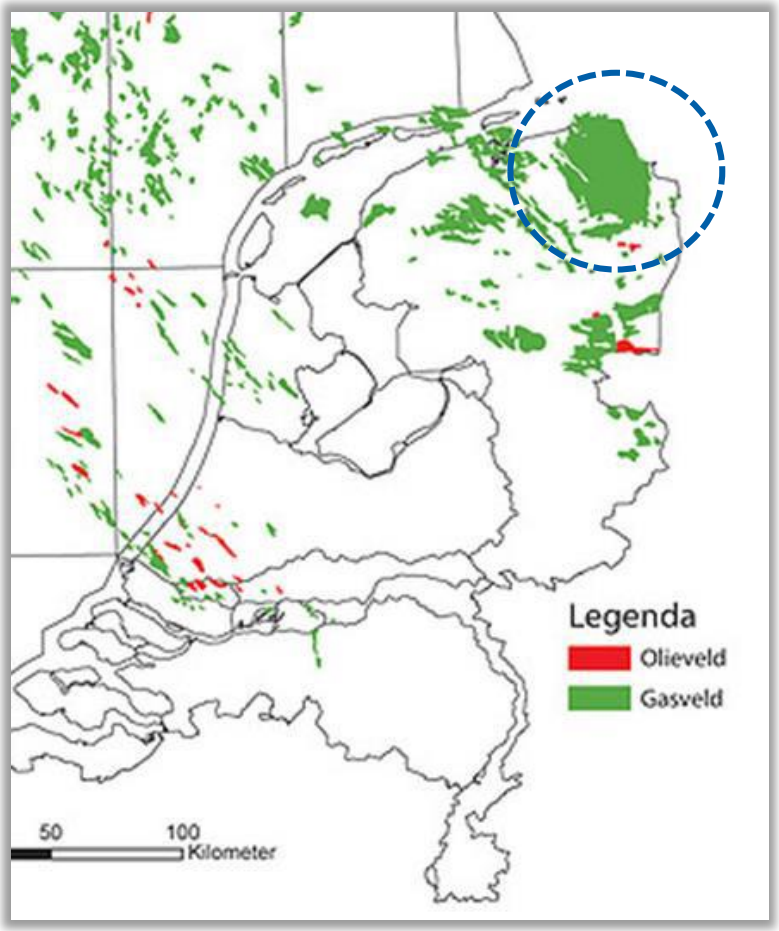
FLUXYS

The decline of the L-gas Groningen gas field

Gas field is 75% depleted

(from 2800 bcm initial in 1963 to 680 bcm currently left)





bcm = billion cubic meter

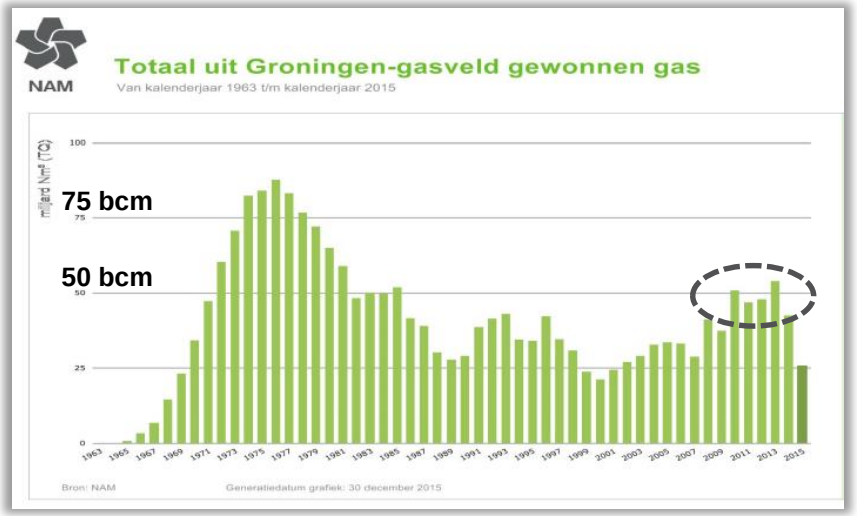
L-gas future in the Netherlands

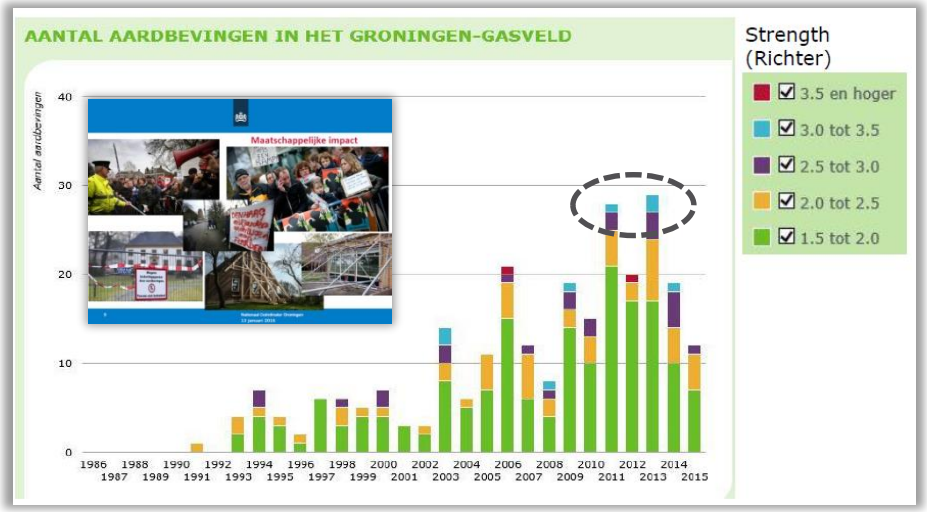
- The NL authorities announced* in December 2012 that :
  - Market conversion is the chosen solution for the decline of Groningen (no further investments in L-gas storages and quality conversion)
  - Market conversion to start first in DE, BE, FR
  - Current contracts will be respected (no disturbance of the commercial processes)
  - Exports will progressively decline and be stopped by 2030

*Member States Gas Platform, 12/12/2012

Earthquakes are accelerating the process

- 2010-2013 : Highest yearly production volumes since 1985 (relatively cold years)
- Increase of earthquakes (amount and intensity) during the same period
- Increase of social and political pressure to limit the Groningen production





Begin 2018, parts of Groningen were shaken by earthquakes measuring 3.4. (biggest tremor since 2012)

Update from NL authorities

- Letter from Energy Minister to Parliament 29/03/18 (main elements)
  - As of 2030 no production from the Groningen field
  - The gas extraction level is set to fall below 12 billion $m^3(n)$ by no later than October 2022
  - Let GTS build the nitrogen installation and purchase the additional nitrogen at a blending station
  - Convert 200 industries in NL to either sustainable energy or H-gas
  - Discuss with the L-gas countries to reduce the L-gas export as fast as possible.
    - » Germany, the conversion of an electricity plant in Cologne and a blending facility by EWE/GTG Nord are mentioned.
    - » France and Belgium, blending facilities and the reversed conversion are mentioned (L inject)
  - Convert households and greenhouses to sustainable energy (50,000-200,000 households per year)
- Next steps
  - June 2018 : “ontwerpinstemmingsbesluit” for consultation (how and how much Groningen production is allowed)
  - September 2018 : final decision (instemmingsbesluit)

FLUXYS

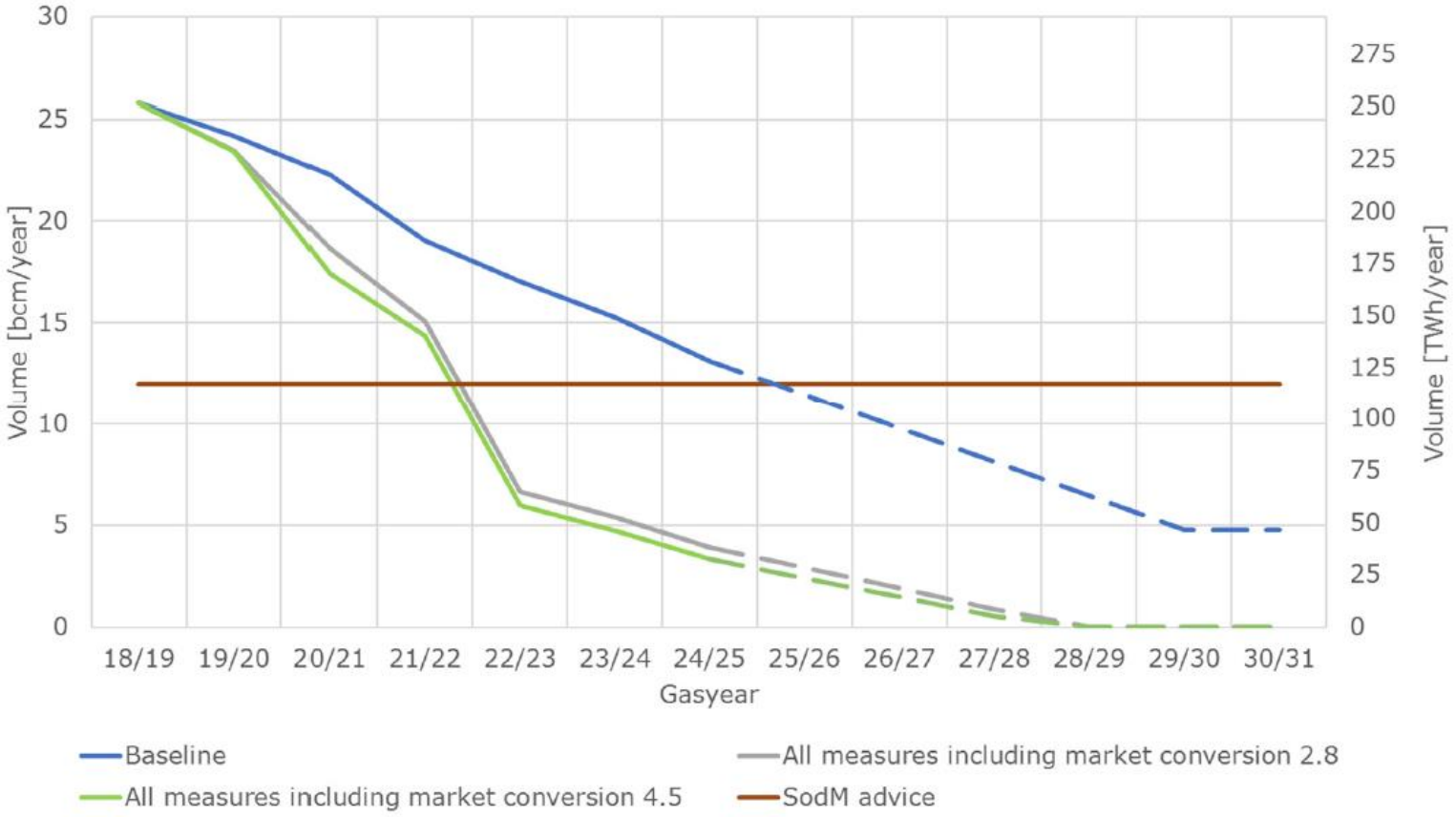
Update GTS Investment plan (NOP2017-addendum)

	Contribution to volume reduction [bcm]	Investment costs payable by GTS [mln €]	Annual operating costs [mln €]	Operational by	Estimated tariff increase [%]
Nitrogen plant Zuidbroek	7	500 ± 30%	30	Q1 2022	5 – 10%
Conversion large consumers	8 main consumers: 2.3	55 ± 40%	< 1	Between 2020 and 2022	< 1%
	next 45 consumers: 1.1	165 ± 40%	< 2	Between 2020 and 2022	Between 1 and 2%
Additional nitrogen	1-1.5	10 ± 40%	6	Earliest 2019/2020	< 1%
Total	**10.3 – 11.9**	**730 ± 30% to 40%**	**< 39**		**Between 7 and 13%**

Source : GTS, NOP2017-addendum

Update GTS Investment plan (NOP2017-addendum)

Expected effect of all measures on Groningen production



Source : GTS, NOP2017-addendum

FLUXYS

Conversion L/H Agenda

1. L gas in Belgium

2. Situation in NL

3. **Conversion L-H in Belgium: planning**

FLUXYS

Federal communication

- Federal communication campaign launched by Minister Marghem on 02/10/2017
- General information website available and presented to stakeholders
- Website includes search by postcode application leading to “impacted/non impacted” identification
- If case of “impacted”, link to specific DSO and list of professionals for gas appliances compatibility checks is provided
- Communication toolkit available to reinforce visual identity

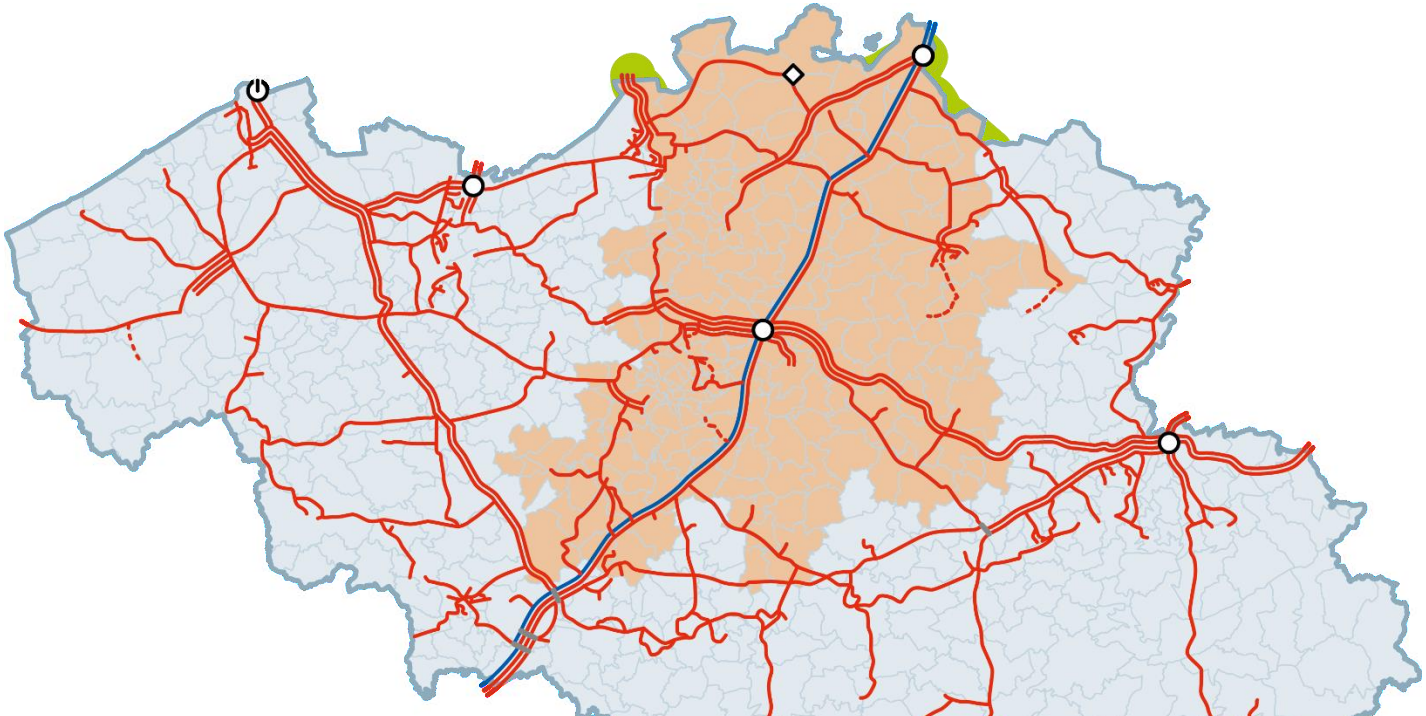
www.gasverandert.be/nl
www.legazchange.be/fr

Indicative conversion planning

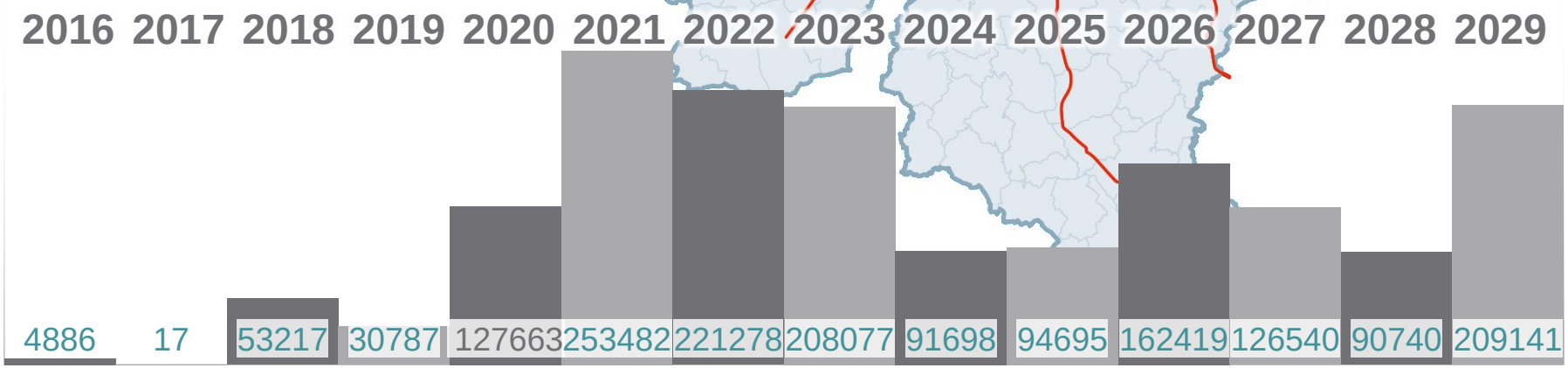
The main criteria used to develop the indicative planning are :

- Ensuring the availability and continuity of the transport and distribution capacity for the market (including transit capacities to France)
- Maximum re-use of existing transport and distribution infrastructure (cost efficiency)
- Progressive conversion of clusters up to ~250 000 clients per year
- Have the L-market completely converted to H-gas by the end of the summer 2029

→ First significant conversion step planned on 1/06/2018



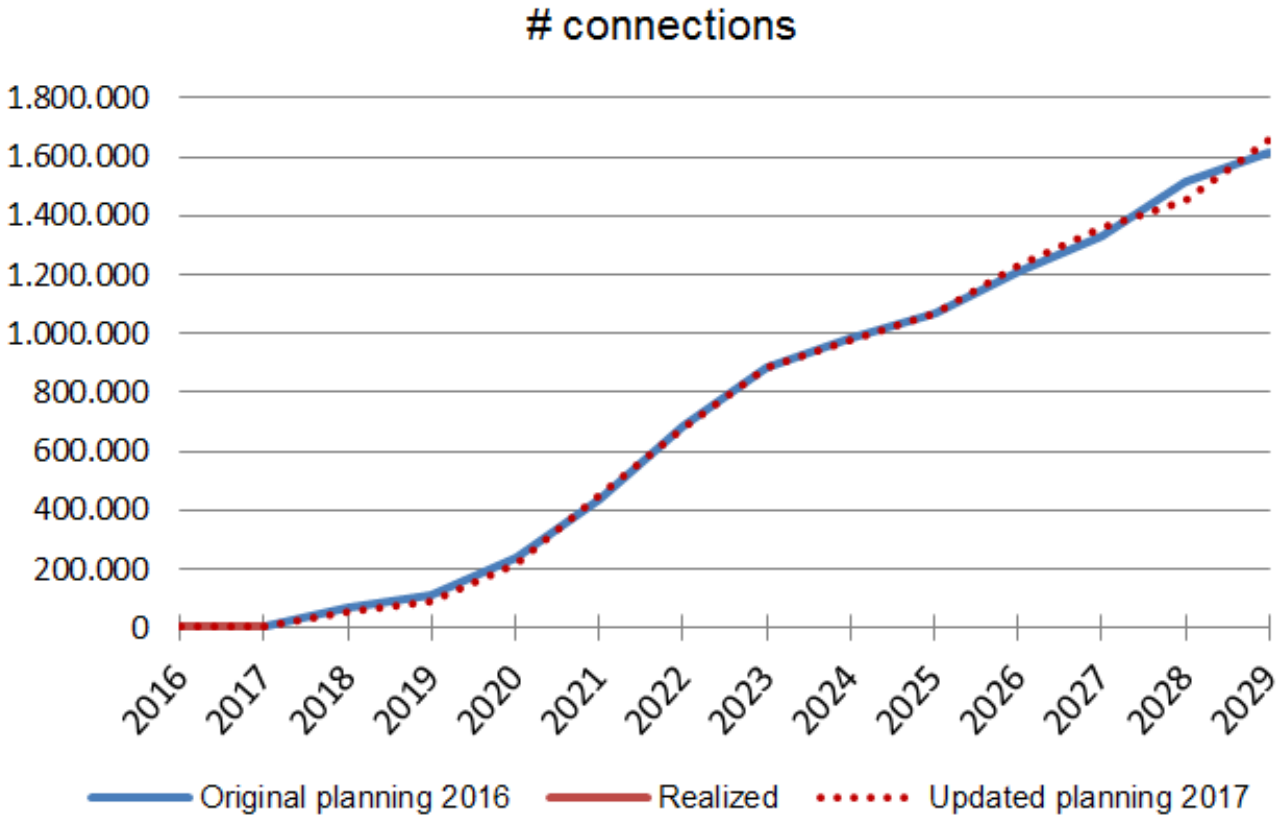
amount of clients to be converted by year



L-net Conversion

FLUXYS

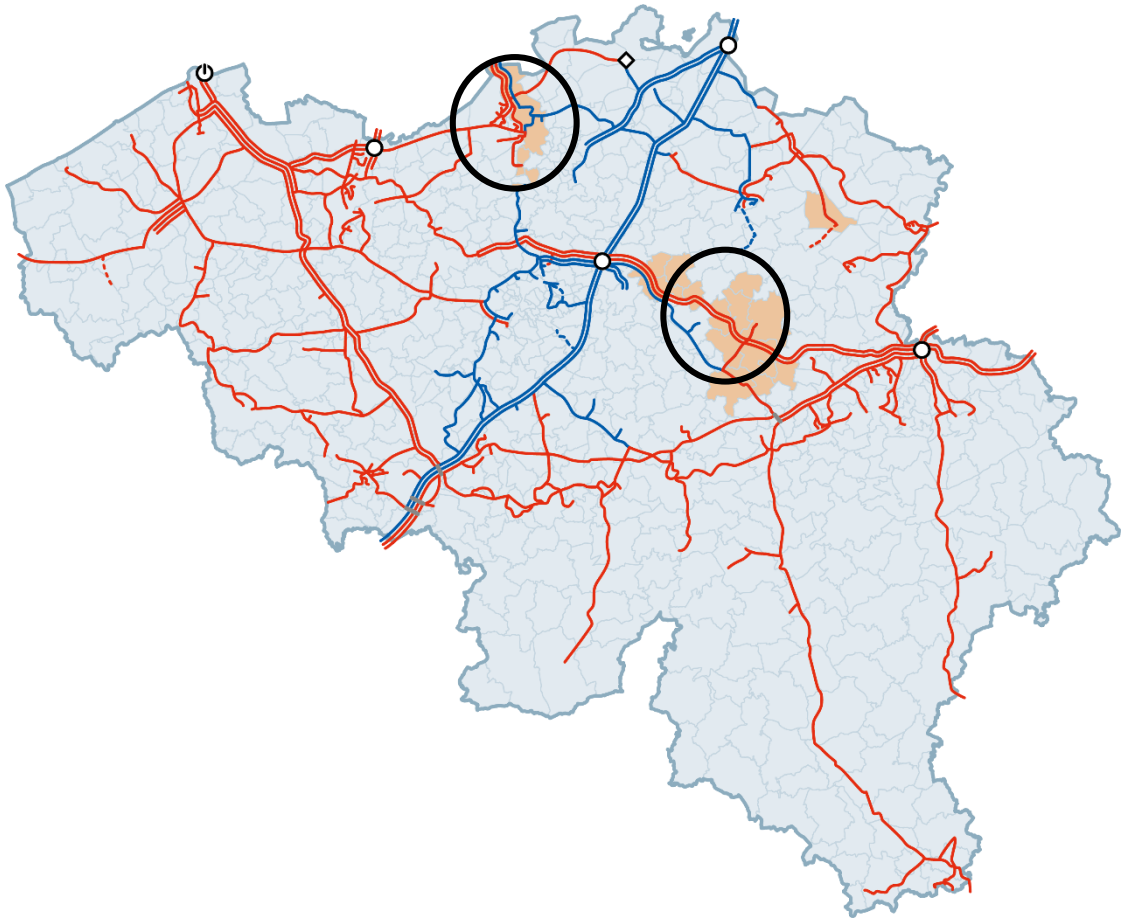
Synergrid planning & progress



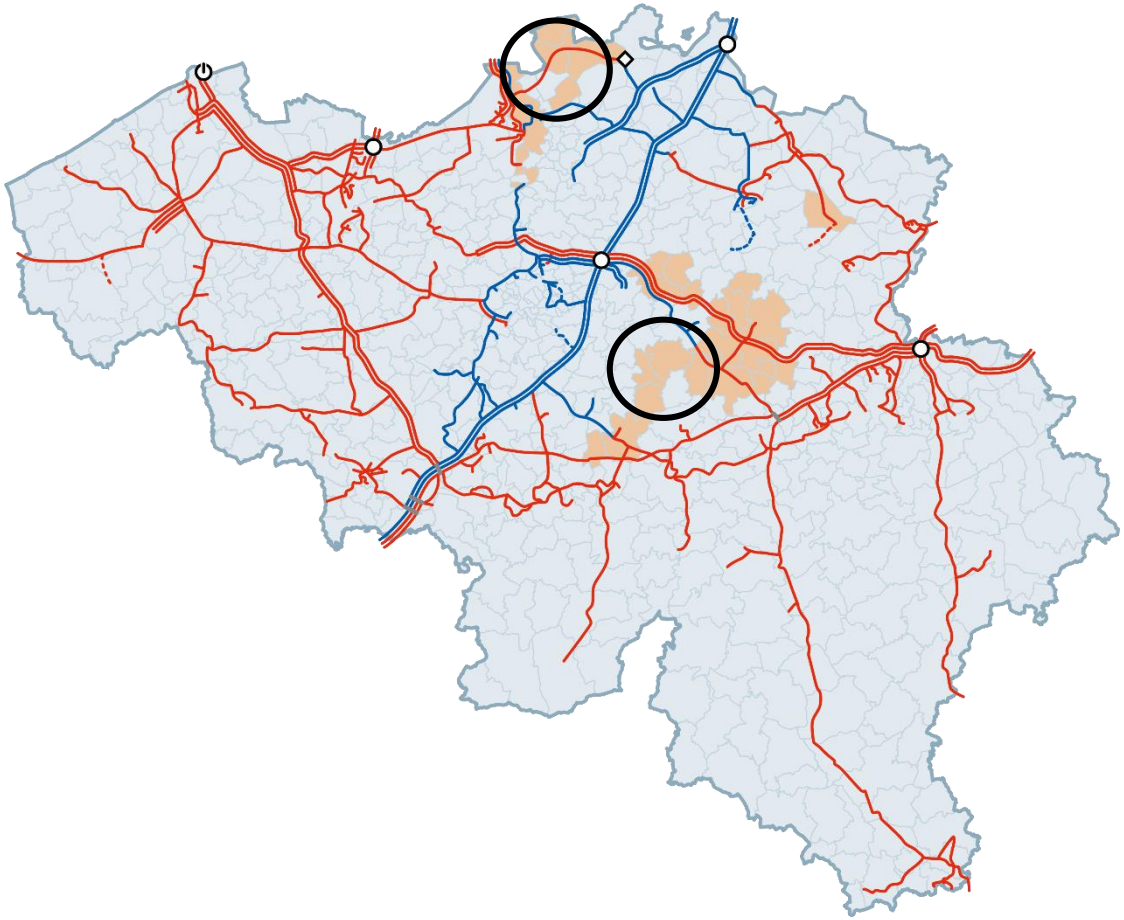
Note : Planning 2020 currently under approval within Synergrid

Active & non active connections

Conversion step 01/06/2018
about 50.000 connections
+ 3 Fluxys industrial clients



Planning 2019
about 30.000 connections
+ 1 Fluxys industrial client



Timing & Switch of entry

- The indicative planning has started in 6/2016 and will finish by end 2029
  - The precise timing of the conversion of each end user depends on the localisation on the Fluxys network.
- Fluxys organised a specific info session for the end users connected on its L-network in September 2016 and sent a letter mentioning the indicative date of conversion
- Fluxys contacts proactively each concerned end user minimum 1 year before the date of its conversion
- Shippers have the possibility to switch Entry L → Entry H capacity once a year in accordance with the converted Exit capacity thanks to L/H Capacity Switch Service

AGENDA

08h30: Welcome	
09h30: Gas supply and demand outlook	**Arno Büx**
10h15: Focus on Belgium	**Huberte Bettonville**
11h00: Break	
11h15: Innovative use of “natural” gas	**Nicolas Gielis**
11h45: L/H Conversion	**Denis Bawin**
12h00: Directive SOS gas	**Denis Bawin**
12h15: Lunch	
13h45: The role of natural gas in the future energy mix	**Prof. Samuele Furfari**
14h45: Consultation Connection Agreement	**Ludo Hanot**
15h00: *Break*	
15h15: Maintenance ground exits	**Tim De Vil**
15h45: Planning works	**Ivan Brysens**
16h15: Drink	

FLUXYS

UPDATE NEW SOS REGULATION

Denis Bawin

Public Distribution Interface Manager

FLUXYS

UPDATE NEW GAS SOS REGULATION

NEW SOS REGULATION (EU) 2017/1938

- After 3 years of proposals, discussions and debates, the new SoS regulation has been approved and published in the EU Official Journal : Regulation (EU) 2017/1938 of 25 October 2017 concerning measures to safeguard the security of gas supply.
- Introduction of a solidarity principle: in the event of a severe gas crisis, neighbouring Member States will help out to ensure gas supply to households and essential social services, such as healthcare and security services, in the case of a severe crisis.
- Closer regional cooperation: regional groups facilitate the joint assessment of common security of supply risks and the development of an agreement on joint preventive and emergency measures.
- Greater transparency: Natural gas companies will have to notify long-term contracts that are relevant for security of supply (28 % of the annual gas consumption in the Member State).

UPDATE NEW GAS SOS REGULATION

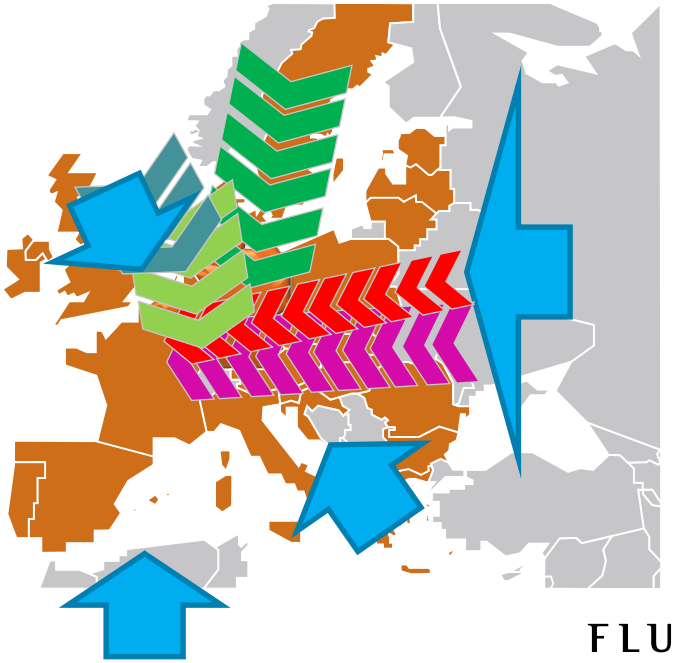
THE REGIONAL COLLABORATION : REGIONAL RISK ASSESSMENTS

- By 1st of November 2017 ENTSOG has performed a Union-wide simulation of gas supply and infrastructure disruption scenarios, as defined in the Regulation.
- Based on the scenarios developed in this simulation, regional risks groups have to elaborate common risks assessments and these also have to be added in their respective national risks assessments (deadline: 01/10/2018).

Supply corridor concept consisting of 4 main corridors (each consisting of multiple supply routes)

> *example: routes impacting Belgium:*

- Eastern gas supply corridor :
  - » Belarus route
  - » Baltic Sea route
- North Sea corridor:
  - » Norwegian supply
  - » Low calorific gas
  - » UK production
- North-African corridor;
- Southern gas corridor;



FLUXYS

UPDATE NEW GAS SOS REGULATION

THE REGIONAL COLLABORATION : REGIONAL RISK ASSESSMENTS

- Belgium part of 5 supply routes :
  - **Belarus route** (Czech Republic, Belgium, Estonia, Germany, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Slovakia)
  - **Baltic Sea route** (Austria, Belgium, Czech Republic, Denmark, France, Germany, Luxembourg, Netherlands, Slovakia, Sweden)
  - **Norwegian supply** (Belgium, Denmark, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom)
  - **Low calorific gas** (Belgium, France, Germany, Netherlands**)**
  - **UK production** (Belgium, Germany, Ireland, Luxembourg, Netherlands, United Kingdom)
- Discussions and first draft results in the different risks groups leaded by Poland (Belarus), Germany (Baltic Sea), France (Norwegian supply), UK (UK production) and The Netherlands (Low calorific gas).
- Lot of work and coordination to achieve the target requested by the Regulation.

UPDATE NEW GAS SOS REGULATION

SOLIDARITY : PRINCIPLES

- Art. 13 of Regulation introduces new solidarity principle where A Member State connected to another Member State having requested the solidarity shall take the necessary measures to ensure that gas supply to customers other than solidarity protected customers is reduced as long as the gas supply to solidarity protected customer in the MS which requested the application of the solidarity measure is not satisfied.
- To build solidarity principle between Member States, technical, legal an financial arrangements have to be agreed in their respective Emergency Plans → need closer cooperation with all stakeholders (MS, TSO, DSO, NRA, gas undertakings…).
- The solidarity also put some new challenges:
  - Protected customers in case of solidarity ≠ with definitions of protected customers → split to be done between households and SME's on DSO level !
  - Critical gas-fired power plants can be prioritised above protected customers in case of solidarity → need concertation with the electricity TSO

FLUXYS

UPDATE NEW GAS SOS REGULATION

SOLIDARITY : way forward

- EU has published Recommendations (EU) 2018/177 on 2 February 2018 on the elements to be included in the technical, legal and financial arrangements between Member States for the application of solidarity mechanism (with 3 months delay on the initial planning).
- By 1 December 2018, the Member States must adopt the necessary measures, including those agreed in technical, legal and financial arrangements, to ensure that gas is supplied to solidarity protected customers in the requesting Member State.
  - If no agreement between Member states by 1/10/2018 => Commission may propose framework
- FPS Economy already took some actions to align its position with neighbouring countries. Legal discussion on the juridical form of the arrangement and its content : gas price, gas volume (min and max), financial arrangement and compensations.
- Need lot of coordination and interactions between Competent Authorities to be successful in this challenging timing! All arrangements must be part of their respective Emergency Plans (deadline : 01/03/2019).

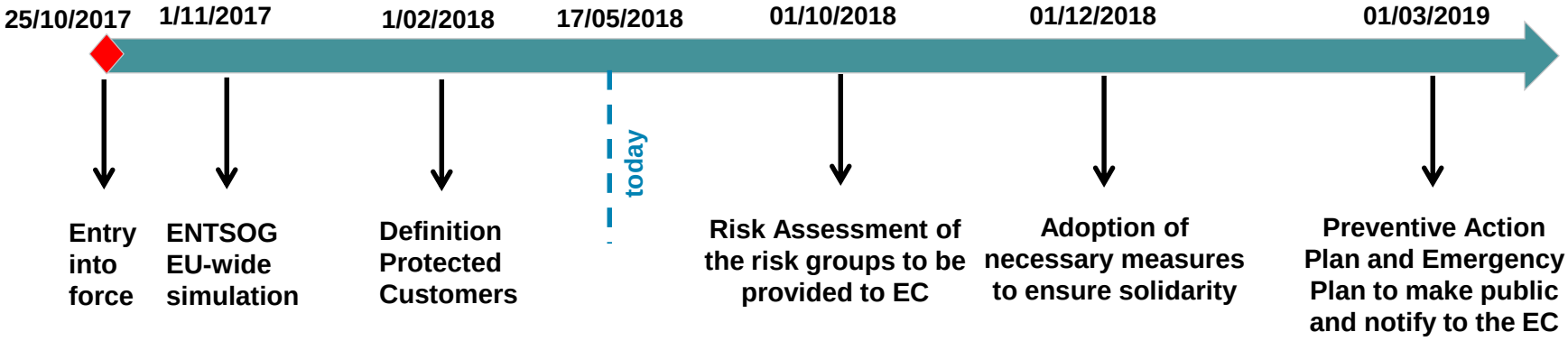
UPDATE NEW GAS SOS REGULATION

Preventive action plan and emergency plan

- The Preventive Action Plan mainly contains the results of the Risk Assessment and the measures to prevent the risks, while Emergency Plan mainly contains the measures to take in case of crisis declaration.
- The Plans shall contain regional chapters (with appropriate and effective cross-border measures) for each risk group where the Member State is involved → 5 regional chapters for Belgium in both documents.
- For non-market based measures adopted after the entry into force of the Regulation, Commission can ask impact assessment in case of endanger of SOS of other Member States of possible market distortion.
- Spill-over effect gas/electricity must be taken into account in the Plans (with possible CCGT included in protected customers).
- Emergency Plan must contains the legal, technical and financial arrangements linked to solidarity.
- Plans must be notified to EU Commission on 01/03/2019.

UPDATE NEW GAS SOS REGULATION

Challenges ahead



- The implementation of the new Regulation will ask new regional cooperation, even if SOS clearly stays a national competency.
- Solidarity stays a challenging pinpoint to implement in due time, given that Belgium must conclude bilateral agreements with all neighbouring countries.
- Risk Assessments, Preventive Action Plans and Emergency Plans shall be developed in accordance with the templates contained in Annexes V, VI and VII of the new Regulation.
- These documents have to be reviewed every 4 years (or even in less than 4 years in case of changes circumstances).

FLUXYS

AGENDA

08h30: Welcome	
09h30: Gas supply and demand outlook	**Arno Büx**
10h15: Focus on Belgium	**Huberte Bettonville**
11h00: Break	
11h15: Innovative use of “natural” gas	**Nicolas Gielis**
11h45: L/H Conversion	**Denis Bawin**
12h00: Directive SOS gas	**Denis Bawin**
12h15: Lunch	
13h45: The role of natural gas in the future energy mix	**Prof. Samuele Furfari**
14h45: Consultation Connection Agreement	**Ludo Hanot**
15h00: *Break*	
15h15: Maintenance ground exits	**Tim De Vil**
15h45: Planning works	**Ivan Brysens**
16h15: Drink	

FLUXYS

Consultation Connection Agreement

Ludo Hanot
End User Interface Manager

FLUXYS

Consultation Connection Agreement: Agenda

- Why?
- Consultation Process
- Connection Agreement : main changes
- Operational Procedures (annex 1) : main changes
- Summary

FLUXYS

Consultation on Connection Agreement

- Why ?
  - Some main changes in the agreement i.e.:
    - In case of shipper default, Fluxys takes over the role of shipper
    - Introduction of a calibration interval for gasmeters
    - Possibility by Fluxys to disconnect after 3 years of unused connection
  - Some main changes in annex 1 Operational Procedures i.e.:
    - Structure : chronological / separation of the commercial, metrological, construction and operational topics
    - Pressure Equipment Directive
    - Calibration interval of gasmeter / correction curve in the flow computer
- When : June 2018

FLUXYS

Consultation Connection Agreement : Process

- Launch of the consultation : 4th June 2018
- End of the consultation: 29th June 2018
- During the consultation period you are free to give your remarks, comments, etc. to Fluxys Belgium
  - » Mailadress : marketing@fluxys.com
- After the consultation and the analysis of all remarks,…, Fluxys Belgium will bundle them and hand them to the Regulator, together with the proposal of the adapted connection agreement
- The Regulator will decide on the approval of the document or ask for a new consultation

FLUXYS

Main changes in Connection Agreement (1/3)

- 1. Definitions
  - New
    - (7) Ultrasonic Measuring Device
    - (29) Pressure Equipment Directive
    - (40) Natural Gas Price: reference price
  - Modifications
    - (25) m^3(n) cubic meter under **base** conditions (0°C, 1,01325 bar)
    - (37) M**A**OP maximal **allowed** operational pressure

FLUXYS

Main changes in Connection Agreement (2/3)

- 3.1.1. Obligations (reference to annex 1 : Operational Procedures)

  - Applicable for new built or modified parts of the receiving station
  - Calibration of each meter at least every 15 years :
    compliance by 01/01/2023
  - Introduction of the correction curve in the volume conversion device
    compliance by 01/01/2030
  - New built parts have to be compliant with the PED

FLUXYS

Main changes in Connection Agreement (3/3)

- 3.4. Default Shipper
  - If Fluxys finds that the measures described in the Code of Conduct are not followed or if Fluxys suspends the transport services according to STA, Fluxys may ask the End User to find a new Shipper within a maximum period of 10 working days
  - During the period of max 10 days, the End User agrees to pay to Fluxys
    (1) Quantity of natural gas consumed by its site (Reference price)
    (2) Transport capacity subscribed by Default Shipper
  - After 10 days, in case no new shipper has been assigned by End User, Fluxys has the right to close the general inlet valve
  - If End User buys directly on ZTP and Default Shipper subscribes only the transport capacity, appropriate measures will be implemented
- 7.5. Disconnection of unused connections
  - Fluxys has the possibility to terminate the connection agreement and to disconnect an unused connection after 3 years without a gas transport contract

FLUXYS

Main changes to annex 1
Operational procedures

- Previous version dated 2011

- New version : sequence more chronological

- Main changes :
  1. Compliance with Pressure Equipment Directive
  2. Introduction of calibration period for the gasmeters
  3. Introduction of correction curve in the flow computer

FLUXYS

Annex 1 Operational procedures : Conformity with **P**ressure **E**quipment **D**irective (1/3)

- Applicable : immediately after formal approval by the CREG
- For new projects and modifications started after the formal approval: as from the formal approval of the CREG
- The current Operational Procedures remain applicable for projects and modifications started prior to the date of the formal approval

FLUXYS

Annex 1 Operational procedures : Introduction of (re)calibration period of the gasmeter (2/3)

- Applicable as from 01/01/2023
- Today : no limit on the validity date of the last calibration of the meter

- Turbine Meter:
  - No series connection possible : 15 years
  - Series connection possible : 30 years
- Rotor Meters :

  15 years
- Ultrasonic meters:

  To be defined and function of tolerances in the applicable international directive

FLUXYS

Annex 1 Operational procedures : Introduction of the correction curve in the flowcomputers (3/3)

- Applicable for meters with a working pressure > 4 barg
- Only turbine and ultrasonic meters

- Applicable :
  - New projects and replacement of existing devices: as from formal approval by the CREG
  - Existing devices :
    - device can be reprogrammed and the correction curve is available:

      12 months after formal approval by the CREG
    - Other devices : by 01/01/2030

FLUXYS

Summary

- We invite you to post your remarks, comments, …. on the proposed changes of the connection agreement and its annexes to

marketing@fluxys.com

FLUXYS

AGENDA

08h30: Welcome	
09h30: Gas supply and demand outlook	**Arno Büx**
10h15: Focus on Belgium	**Huberte Bettonville**
11h00: Break	
11h15: Innovative use of “natural” gas	**Nicolas Gielis**
11h45: L/H Conversion	**Denis Bawin**
12h00: Directive SOS gas	**Denis Bawin**
12h15: Lunch	
13h45: The role of natural gas in the future energy mix	**Prof. Samuele Furfari**
14h45: Consultation Connection Agreement	**Ludo Hanot**
15h00: *Break*	
15h15: Maintenance ground exits	**Tim De Vil**
15h45: Planning works	**Ivan Brysens**
16h15: Drink	

FLUXYS

Maintenance ground exits

Tim De Vil
Sector Officer

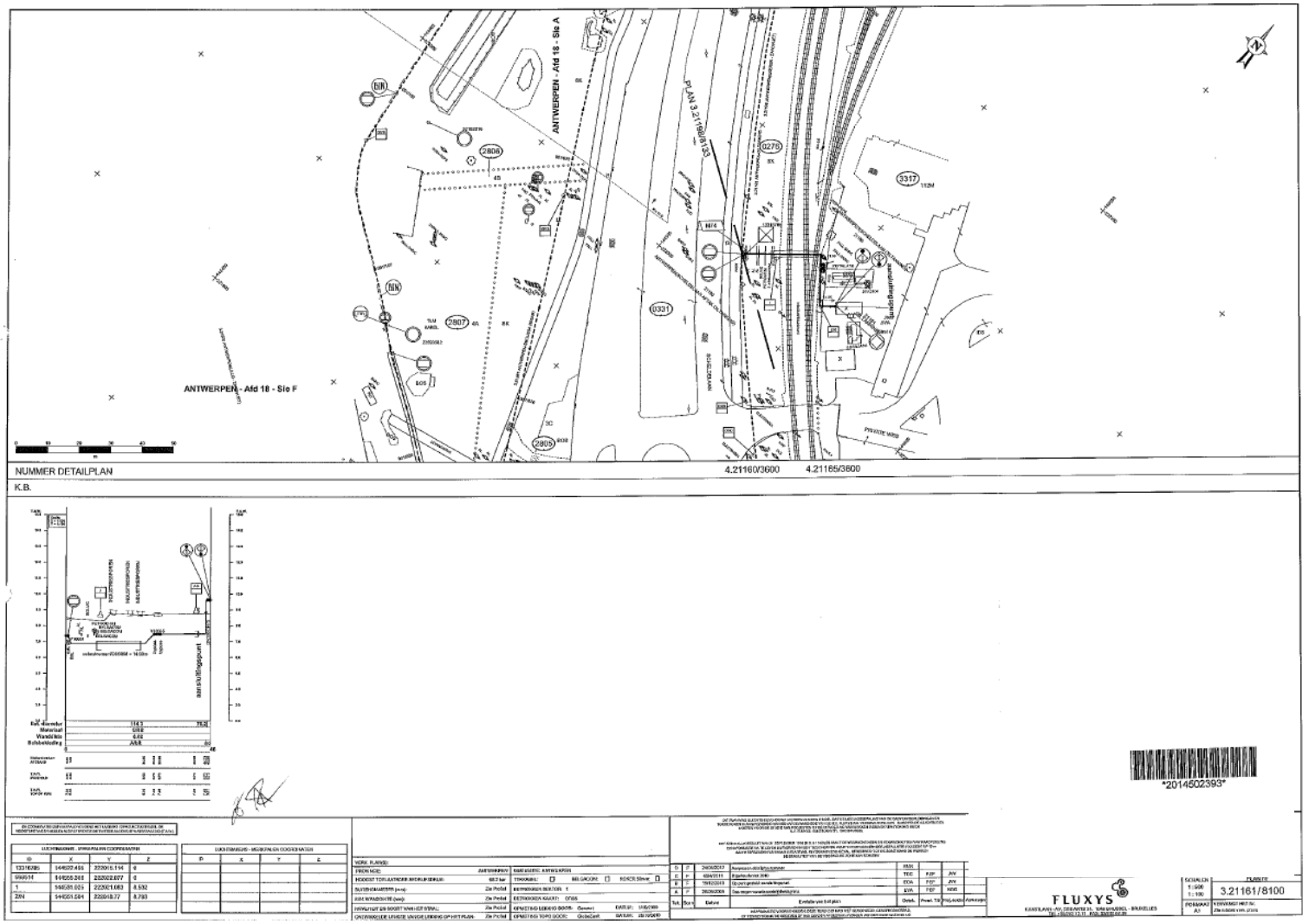
FLUXYS

Agenda

- Connection point
- Corrosion details and installation history
- General issue
- Fluxys' maintenance program for ground exits

FLUXYS

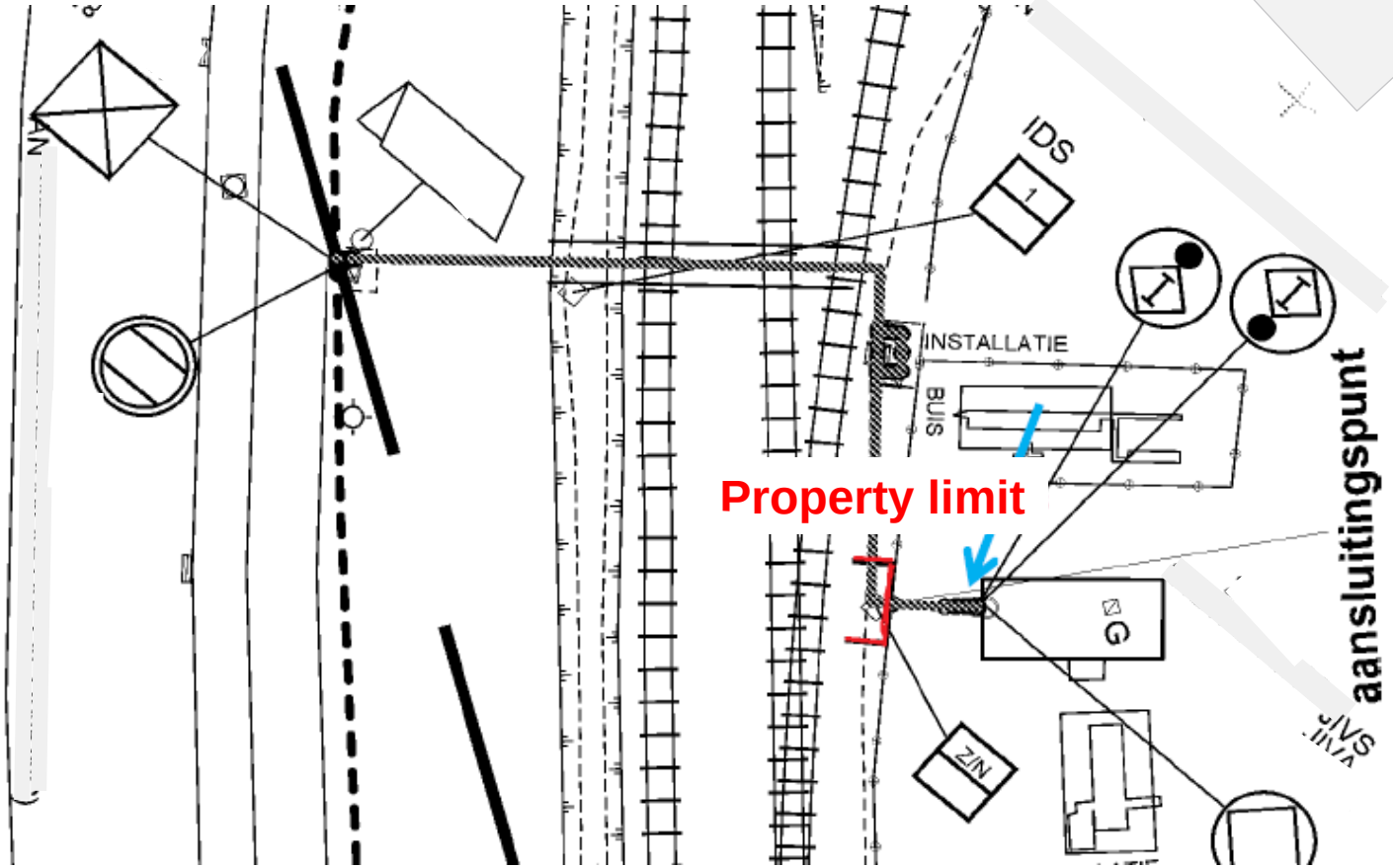
Connection point (responsibility limit): Annex A.3 from connection agreements (example)



FLUXYS

Connection point : Annex A.3 Example

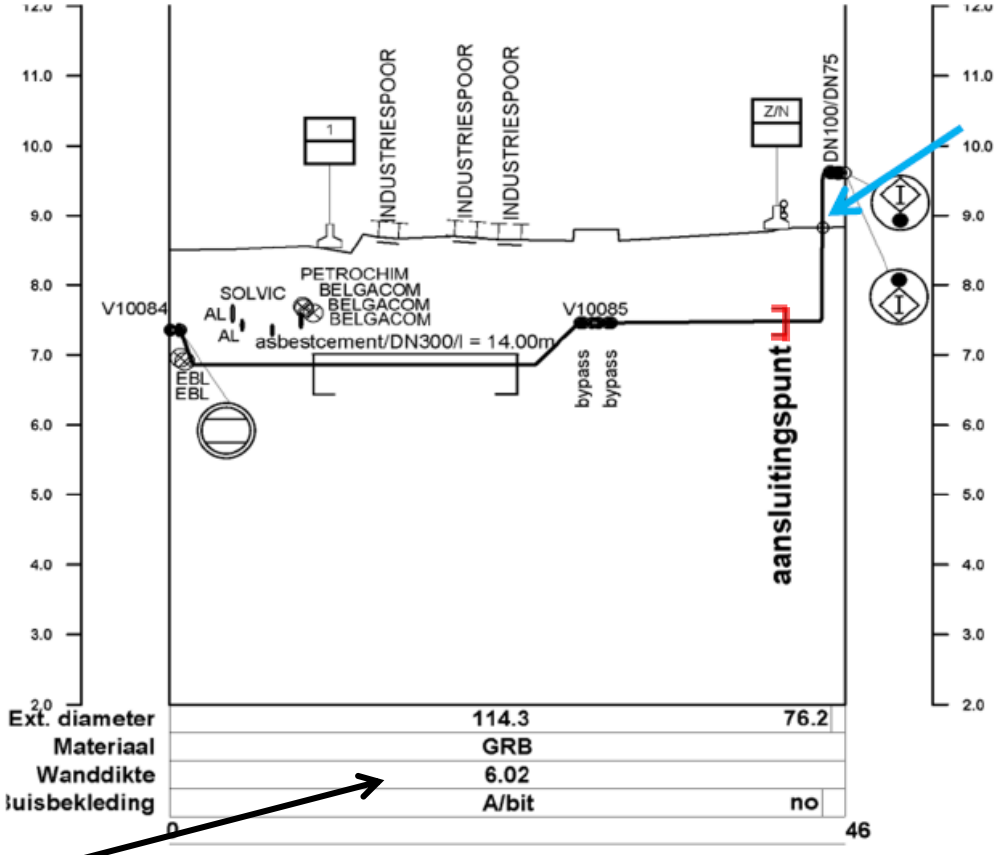
→ Top view



FLUXYS

Connection point : annex A.3 Example

→ Profile



Depth

Material specifications

FLUXYS

Connection point – Pipeline inspection

- Beacons and inspection by Fluxys BE:
  - Inspection by Fluxys BE Metering: Yearly visit metering equipment in End User receiving station. (Only metering equipment is inspected)
  - Inspection by Fluxys BE Cathodic Protection. (Only Fluxys BE pipeline till connection point is inspected)
    - » Physically the protection continuous in underground part till first insulation joint.
  - Inspection by Fluxys BE GRID-patrollers. (Only Fluxys BE pipeline till connection point is inspected)
  - Beaconing with orange markers (concrete and or PVC-PP) only on Fluxys BE pipeline sections. Downstream the connection points the orange beacons are removed or replaced by yellow beaconing.
  - Sticker “Connection Point” on last Fluxys BE marker Fluxys BE since 2017.

FLUXYS

Connection Point

Sticker “Connection Point” on last Fluxys BE marker since 2017.

FLUXYS

Detailed analysis leak

- Protection against corrosion:
  - Above ground: painting system(visual)
  - Under ground:
    1. Coating (bitumen or PE)
    2. Cathodic protection
- Bad adherence of above ground coating caused by long term exposure on UV.
- Water infiltration in first part of coating
- Ideal corrosion environment:
  - Painting system continuously wet and degradation invisible.
  - No ground contact → no functioning of Cathodic protection. Protection only by coating.
- Corrosion velocity 0,1 – 0,2mm per year.

General Issues

- Estimated **180**-**200** out of ca. 240 connected industrial end users with the same type of ground exit
- The life time of the coating of such a ground exit is estimated at 15 to 20 years
- Degrading adherence of the coating can lead to water infiltration and potential corrosion
- A mail concerning this issue was sent to all end users in February 2018

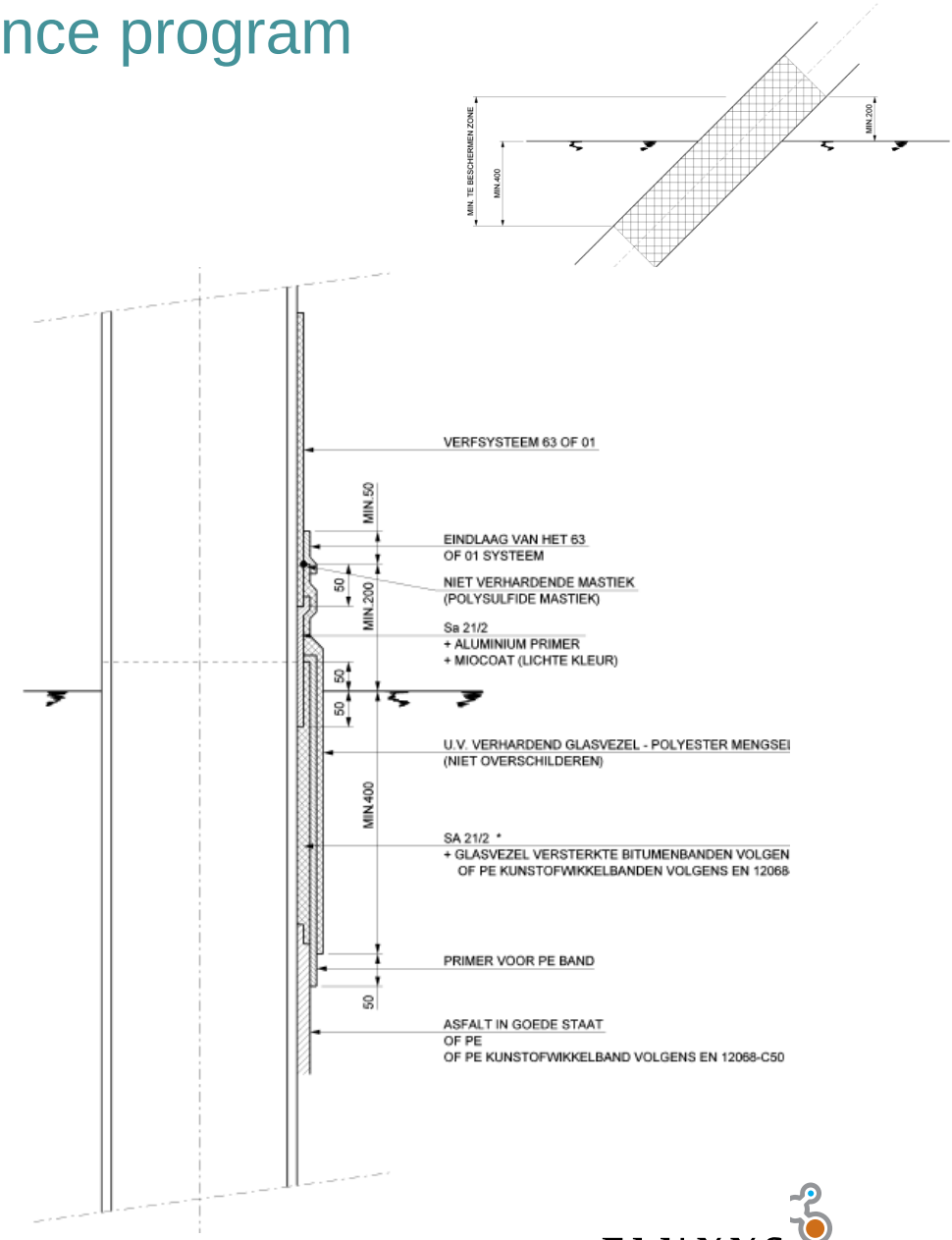
FLUXYS

Fluxys BE maintenance program for ground exits

- Screening of the coating and paint system by Fluxys BE and Vinçotte every 15 years
    - » Replacement within 3 years or re-evaluation after 3 years

- Replacement by certified coating companies (i.e.; Gravo, Etwal, …) after 15 till 20 years. Free up for a depth of 50cm, remove old coating, sandblasting the zone of the ground exit, repaint and recoat, terrain recovery

Fluxys BE maintenance program



FLUXYS

AGENDA

08h30: Welcome	
09h30: Gas supply and demand outlook	**Arno Büx**
10h15: Focus on Belgium	**Huberte Bettonville**
11h00: Break	
11h15: Innovative use of “natural” gas	**Nicolas Gielis**
11h45: L/H Conversion	**Denis Bawin**
12h00: Directive SOS gas	**Denis Bawin**
12h15: Lunch	
13h45: The role of natural gas in the future energy mix	**Prof. Samuele Furfari**
14h45: Consultation Connection Agreement	**Ludo Hanot**
15h00: *Break*	
15h15: Maintenance ground exits	**Tim De Vil**
15h45: Planning works	**Ivan Brysens**
16h15: Drink	

FLUXYS

GRID Maintenance

Ivan Brysens
SR Public Distribution Interface Officer

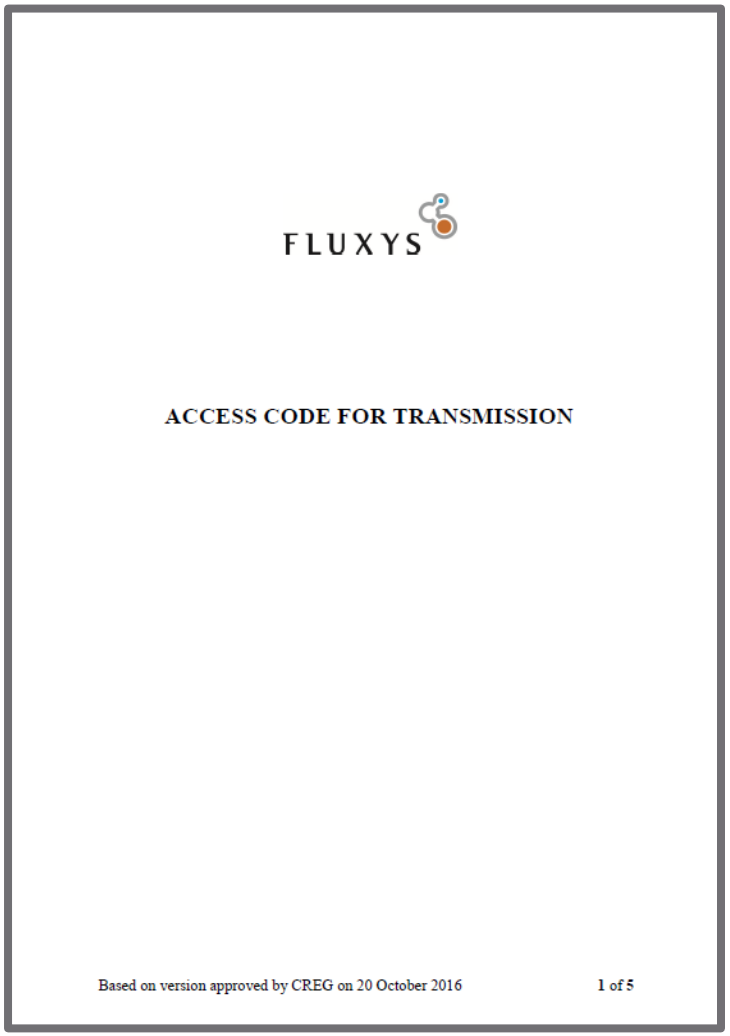
FLUXYS

AGENDA

- ✓ Different types of maintenance works
- ✓ Different kind of interventions
- ✓ Techniques to minimize or avoid impact on End User

FLUXYS

TYPES OF MAINTENANCE WORKS


FLUXYS

ACCESS CODE FOR TRANSMISSION

Based on version approved by CREG on 20 October 2016 1 of 5

Almost every day Fluxys is executing maintenance works in order to improve the GRID and guarantee gas supply

The maintenance procedures are described in the “Access Code For Transmission”

Three types of maintenance works are defined:

- Long Term Planned Works
- Short Term Planned Works
- Emergency

FLUXYS

LONG TERM PLANNED WORKS

In <u>September of each year</u>, information from Fluxys to Grid Users about:

- **Long Term Planned Works and associated constraints**
- **Timing and duration**

At Grid Users request, a discussion may be held with Fluxys to decide about timing and duration

All effort to provide the final planning not later than 15 December of the calendar year preceding the Long Term Planned works

Fluxys shall make every effort to respect the Grid Users' subscribed transmission service during maintenance, repair and replacement works insofar as possible from an operational and technical point of view

FLUXYS

SHORT TERM PLANNED WORKS

Fluxys may perform maintenance, repair or replacement works which are required to be promptly performed in order to maintain the safety and integrity of the Transmission System

Schedule and estimated duration will be notified as soon as possible and not later than 10 working days before the intervention

Fluxys shall use all reasonable efforts to limit the interruption of the subscription

FLUXYS

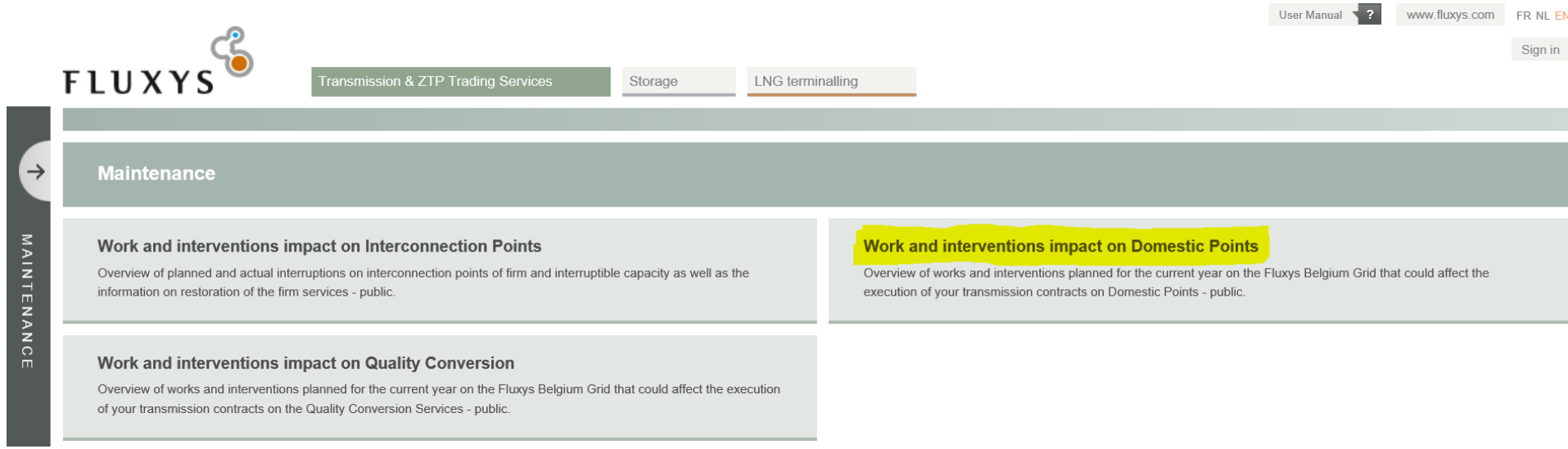
EMERGENCY WORKS

In case of Emergency, Fluxys shall have the right at <u>any time</u> to interrupt all or part of the subscription in order to safeguard the safety and integrity of the Transmission System and perform the necessary repair works

FLUXYS

Information on EDP Platform
Transmission - Storage - LNG

https://gasdata.fluxys.com/media/1231/maintenance-transmission-for-domestic-exit-points.pdf



Information on EDP Platform
Storage -Transmission - LNG

FLUXYS

Transmission & ZTP Trading Services | Storage | LNG terminalling

MAINTENANCE

Maintenance

Work and interventions impact on Interconnection Points

Détail des travaux et interventions réalisés sur le réseau de Fluxys Belgium en cours d'année ayant un impact possible sur l'exécution de contrats de transport aux points d'interconnexion - public.

Work and interventions impact on Domestic Exit Points

Détail des travaux et interventions réalisés sur le réseau de Fluxys Belgium en cours d'année ayant un impact possible sur l'exécution de contrats de transport aux points de Prélèvement Domestique - public.

Work and interventions impact on Quality Conversion

Détail des travaux et interventions réalisés sur le réseau de Fluxys Belgium en cours d'année ayant un impact possible sur l'exécution de contrats de transport aux services de conversion de qualité- public.

> Mentions légales

FLUXYS

Transmission & ZTP Trading Services | Storage | LNG terminalling

Maintenance

Work and intervention impact

Détails des travaux et interventions réalisés en cours d'année ayant un impact possible sur l'exécution des contrats de stockage - public.

FLUXYS

Transmission & ZTP Trading Services | Storage | LNG terminalling

MAINTENANC

Maintenance

Work and intervention impact on LNG Terminal Zeebrugge

Dans l'aperçu travaux et interventions, vous trouverez les travaux et interventions qui sont réalisés sur le réseau de Fluxys au cours de cette année et qui peuvent avoir un impact sur l'exécution de vos contrats de GNL - public.

> Mentions légales

Information on EDP Platform
Storage -Transmission - LNG

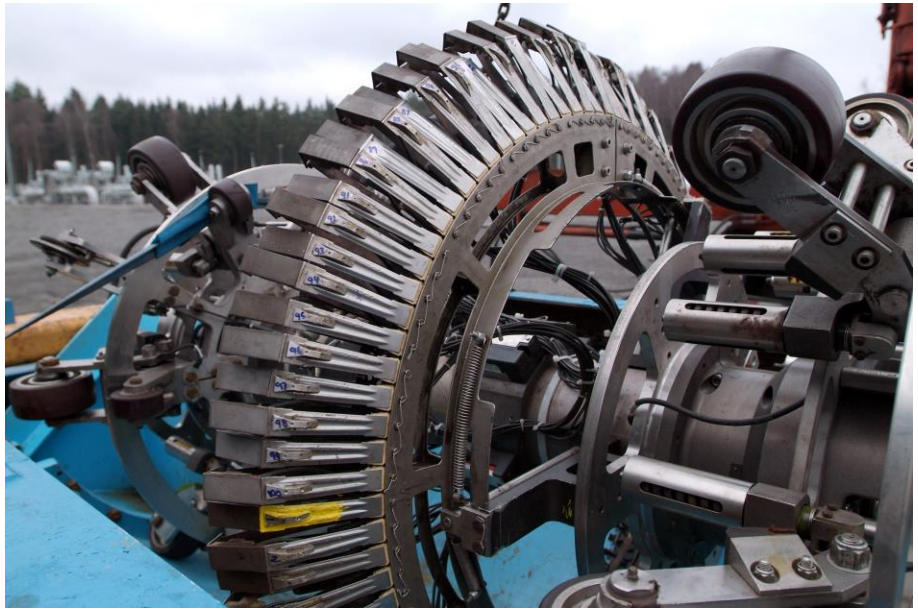
FLUXYS

FLUXYS BELGIUM SA
Planned Works and Interventions 2018
Transmission for Domestic Exit Points

Year	Month	Week	Concerned Installation	Task Description	Impact	Impact From	Impact To	Supply Points	Status	Impact on Quality Conversion	Impact on IP and E/E	Impact on Storage
2018	4	16	Loenhout	Intervention on Plant Operating System	No possibility for Injection & Send-Out. Nominations will be accepted, aggregated confirmations will be 0	16/04/2018	27/04/2018	Storage Loenhout	Scheduled			X
2018	4	17	Destelbergen	Restructuring grid	Capacity: impact	25/04/2018	25/04/2018	IMEWO Destelbergen (GOS IMEWO Gent)	Scheduled			
2018	4	17	Marche-Lez-Ecaussinnes	Replacement valve	Capacity: impact	26/04/2018	26/04/2018	Total Petrochemicals Feluy	Scheduled			
2018	5	18	Strombeek	Modification pressure reducing station	Capacity: impact	2/05/2018	8/09/2018	Sibelgas Strombeek Bever (GOS Sibelga Brabant), Sibelga Strombeek-Bever (GOS Sibelga Quai)	Scheduled			
2018	3	19	Drogenbos	Deconnection former enduser	Capacity: impact	8/05/2018	8/05/2018	PP/Drogenbos STEG	Scheduled			
2018	5	20	Dunkerque	Maintenance on GRTgaz grid (station Clipon)	Capacity: impact	15/05/2018	15/05/2018	Dunkerque LNG Terminal	Scheduled		X	
2018	6	24	Dendermonde	Build-in of a new valve junction	Capacity: impact	13/06/2018	22/06/2018	PP/CHP Oudegem Papier	Scheduled		X	
2018	9	39	Seneffe	Replacement valve	Capacity: impact	26/09/2018	26/09/2018	Syngenta Chemicals Seneffe	Scheduled			
2018	10	43	Loenhout	Maintenance on PLC system	No possibility for Injection & Send-Out. Nominations will be accepted, aggregated confirmations will be 0	22/10/2018	26/10/2018	Storage Loenhout	Scheduled			X
2018	12	1	Verlaine	Replacement valve	To be determined	31/12/2018	31/12/2018		Scheduled			

- **Long term planned works: mailing before 30-09-xx for works in xx+1**
- **Short term and Long term planned works: mailing every month**
- **Individual mailing to concerned End User**
- **Emergency: mailing and call dispatching center**

DIFFERENT KIND OF INTERVENTIONS: PIGGING OPERATIONS (planned works)

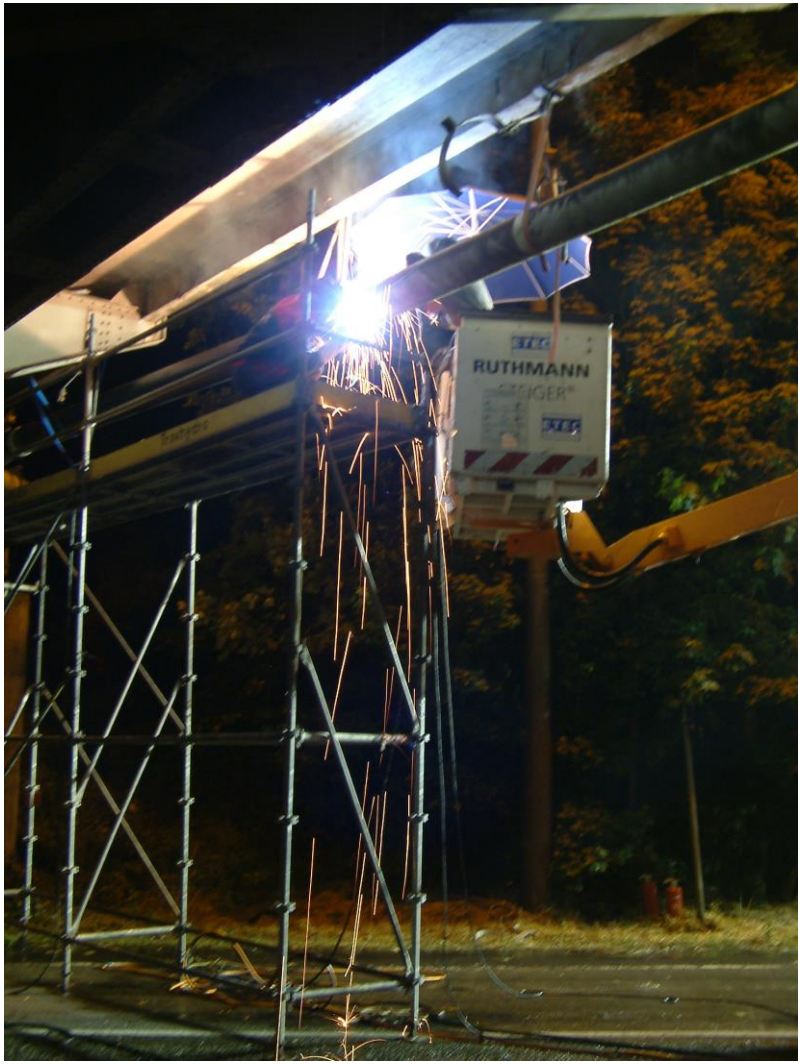


FLUXYS

DIFFERENT KIND OF INTERVENTIONS: MODIFICATION TRANSPORT INFRASTRUCTURE (PLANNED WORKS)

FLUXYS

DIFFERENT KIND OF INTERVENTIONS: REPAIR WORKS (UnPLANNED)



AVOID OR MINIMIZE IMPACT FOR END USER

In order to avoid or minimize the impact for the EU, Fluxys (Gas Flow Management) discusses the possible solutions with the EU.

FLUXYS

AVOID OR MINIMIZE IMPACT FOR END USER

Different possibilities to be analysed case by case:
0. Rerouting gas flow
1. During maintenance shutdown end-user
2. During partial maintenance shutdown end-user with alternative supply
3. During normal operation end-user with alternative supply
4. With alternative intervention techniques (stopple, …)

Important!

Extract “Code of Conduct” (article 132, § 1)

Fluxys has the right to interrupt or reduce the gas supply in order to guarantee “the system integrity and a safe and efficient functioning of the transmission system”.

FLUXYS

ALTERNATIVE SUPPLY BY CNG

Limited off-take (+/- 500 m³(n)/h)
1 tanker: 4000 – 7000 m³ (n)
Capacity impacted by pressure

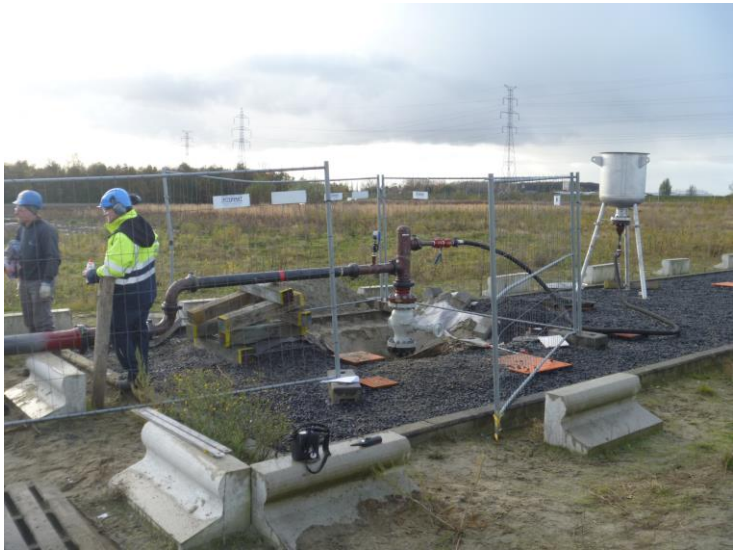
FLUXYS

ALTERNATIVE SUPPLY BY LNG

Limited off-take (+/- 2500 m³(n)/h)
1 tanker: 20.000 m³(n)
Pressure limited to 6 bar

FLUXYS

ALTERNATIVE WAY: TEMPORARY BYPASS



FLUXYS