Flexibility in European gas markets

Jean-Marc Leroy
Managing Director, Gas Chain

Agenda

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Chapter 4 — Flexibility valuation

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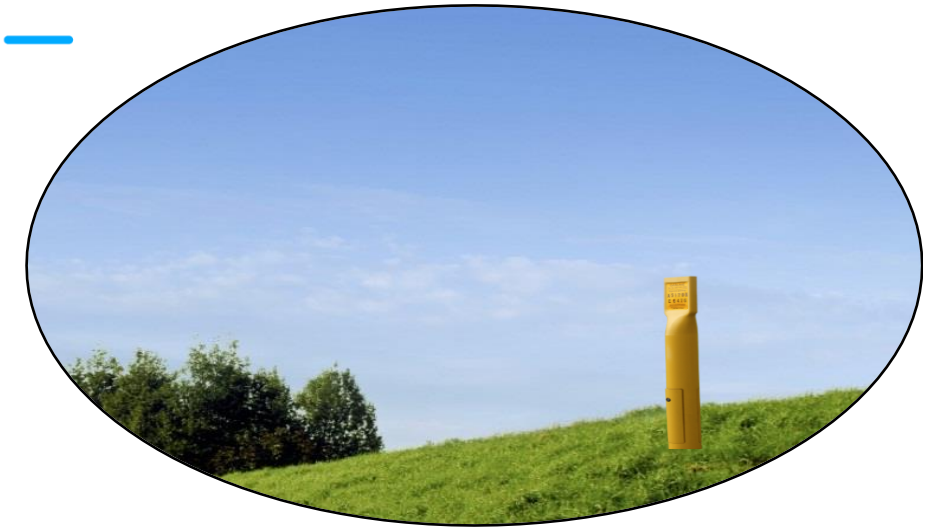
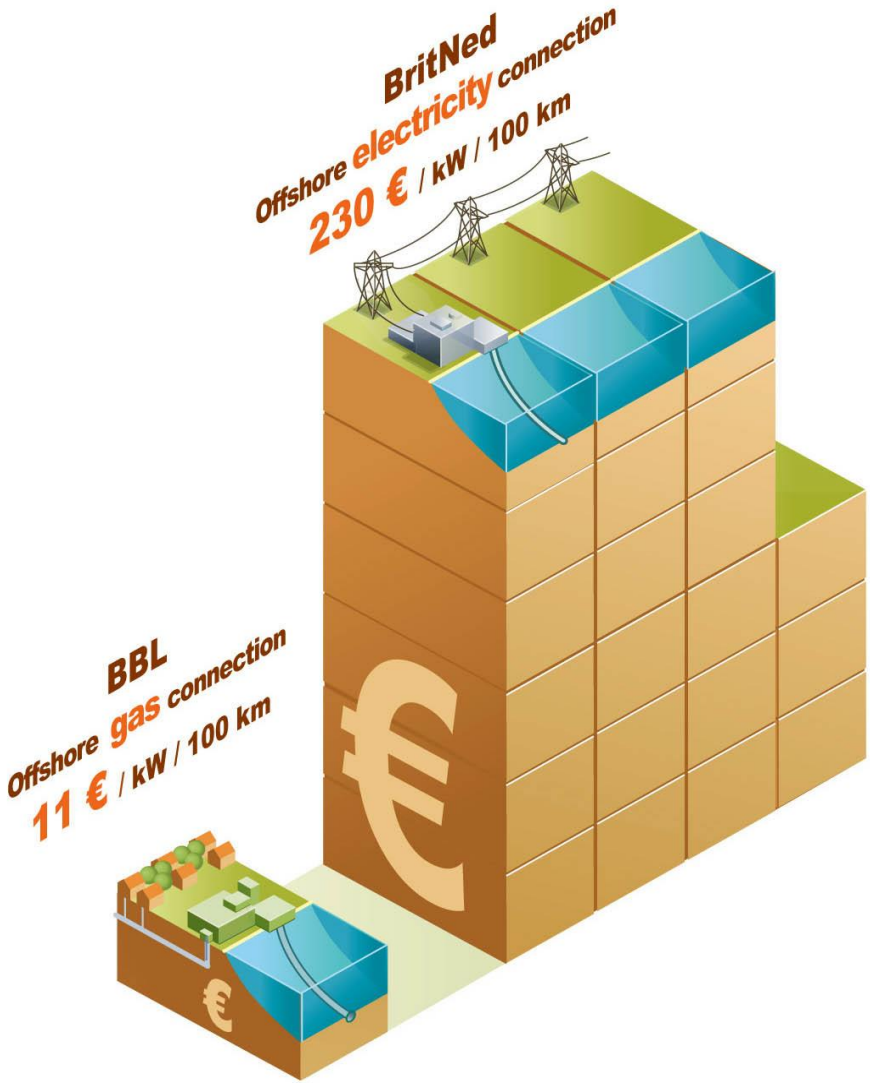
Introduction

Transmission gas and electricity infrastructures





The Power Market Model

In ***most*** EU countries the following Power Market model applies:

- Total EU market is divided into ”market areas”
- In each market area there is an hourly price setting calculated daily from demand and supply (by Exchanges) [Day ahead of operation]
- Including full import / export with neighbouring countries
- Thus the allocation of capacity on interconnection points is a result of the market, given by the pricing signals in the two relevant pricing areas (electricity always flows toward high price areas)
- Within the day, TSO’s balance the market from market based toolbox. ”Shippers” cannot impact.

Characteristics of the Power Market

The following statements are valid for most EU power markets:

- Majority of production capacity is located **within geographic demand areas**
- **Due to the size** of the interconnectors (1-2.000 MW) delivery of demand varies significantly
- On an annual basis **more than 80%** of consumption is covered by domestic production
- Trade occurs **mainly between neighbouring** countries
- Consumers **do not know** producer (anonymous, as power is traded at PX)
- **Physical flows are ”decided”** by the laws of electricity (Kirchoff etc.)

TSOs are responsible for system balancing

The Gas Market Model

In most EU countries the following model applies:

- Most Networks codes are finalised, and partly implemented
- Most countries have entry-exit model, with sale of capacity on common Platform with regional neighbours (annual, monthly, daily, within-day)
- Shippers plan, book and pay for each transport-segment
- Shippers nominate their transport on entry/exit points (including hubs, storage, exchanges)
- Within day, Shippers decide / renominate their use of infrastructure. Thus, commercial players choose their own efficient supply of gas

Characteristics of the Gas Market

The following statements are valid for ***most*** EU gas markets:

- **Majority** of production is located outside EU
- **Many large** interconnectors (10-50.000 MW) can deliver (in many countries) all of the demand
- Min. 90% of consumption crosses 1 border
- On an annual basis **less than 20%** of consumption is covered by domestic production
- Trade occurs over **long distances** (1000-4000 km) through multiple countries
- Many large consumer **know** their actual producer
- **Different competing transport routes** of molecules can be chosen

Shippers are responsible for system balancing
TSOs are responsible for residual balancing

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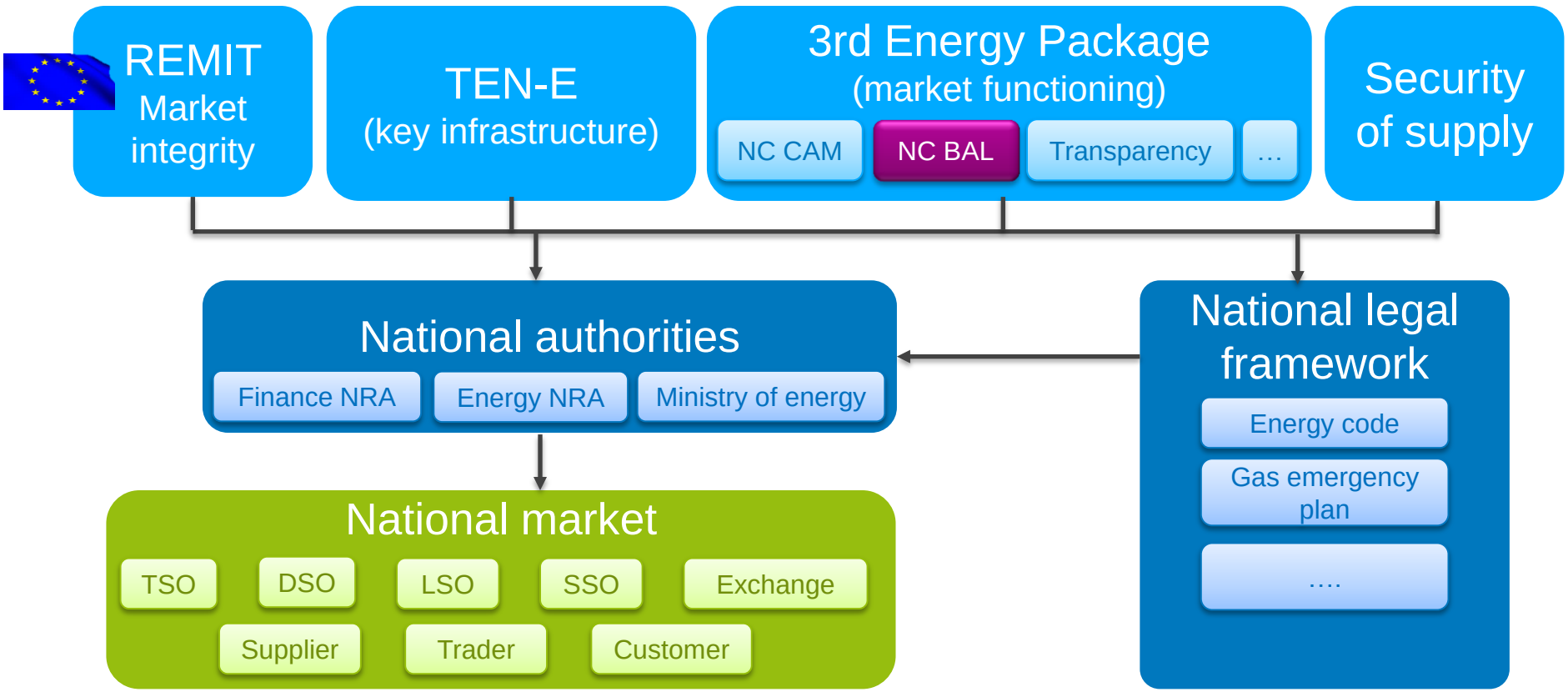
What is flexibility

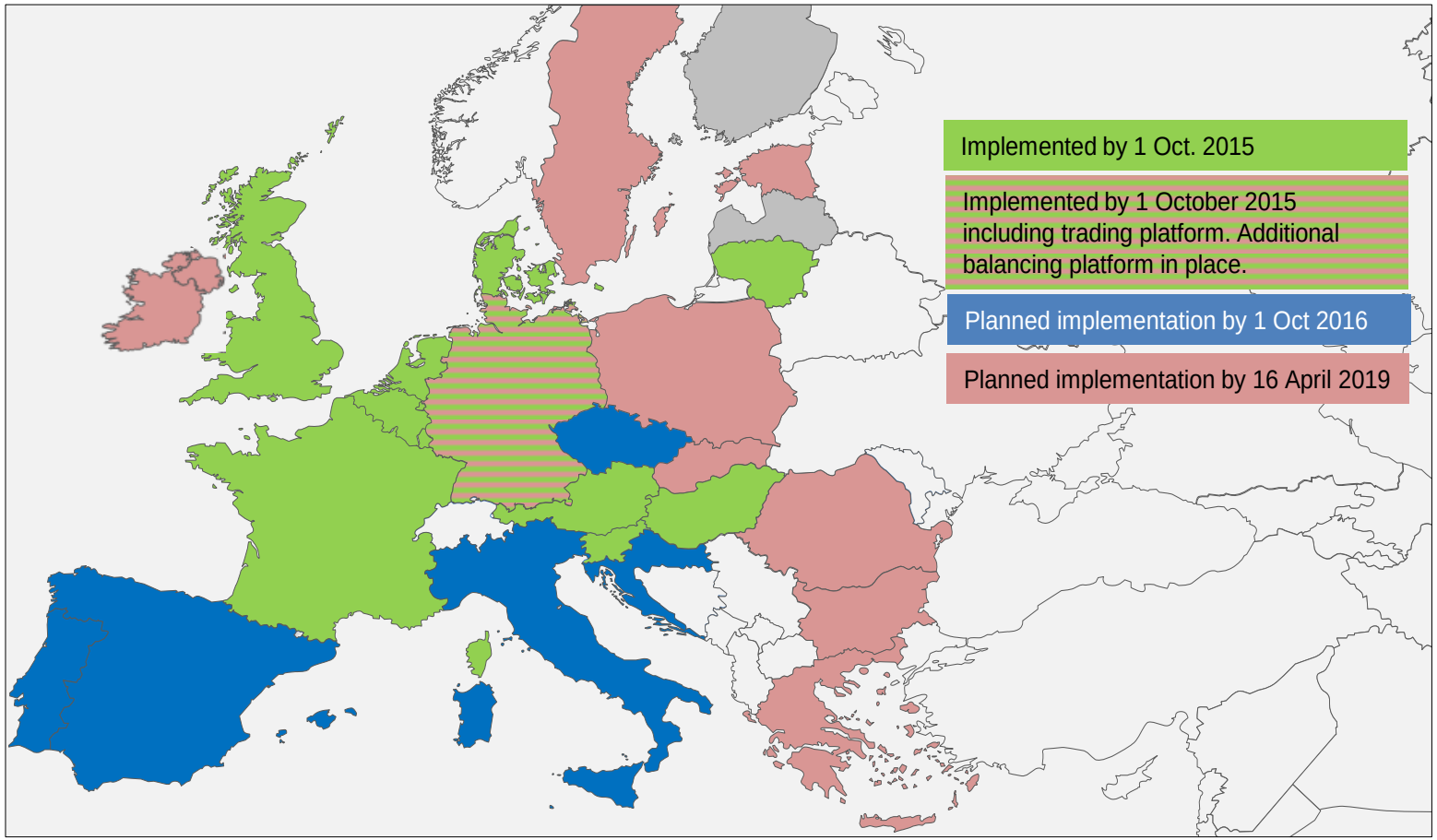
Outlook of EU and national legal framework



Balancing Network Code: creation of market based balancing

- Network users (shippers) are responsible of balancing their inputs/offtakes
- TSO is responsible for the residual balancing, if any
  - ✓ TSO has the obligation to supply flow to answer to each shipper demand (nomination) at each network exit point
  - ✓ TSO maximizes the amount of gas balancing needs purchased through short term gas market
- Daily balancing regime is applied.
  - ✓ With the possibility to introduce intraday constraints for shippers
- NC Balancing provides adaptation possibilities for TSOs and NRAs in national implementation
  - ✓ Gas networks and markets differ from each other in their characteristics

NC Balancing implementation

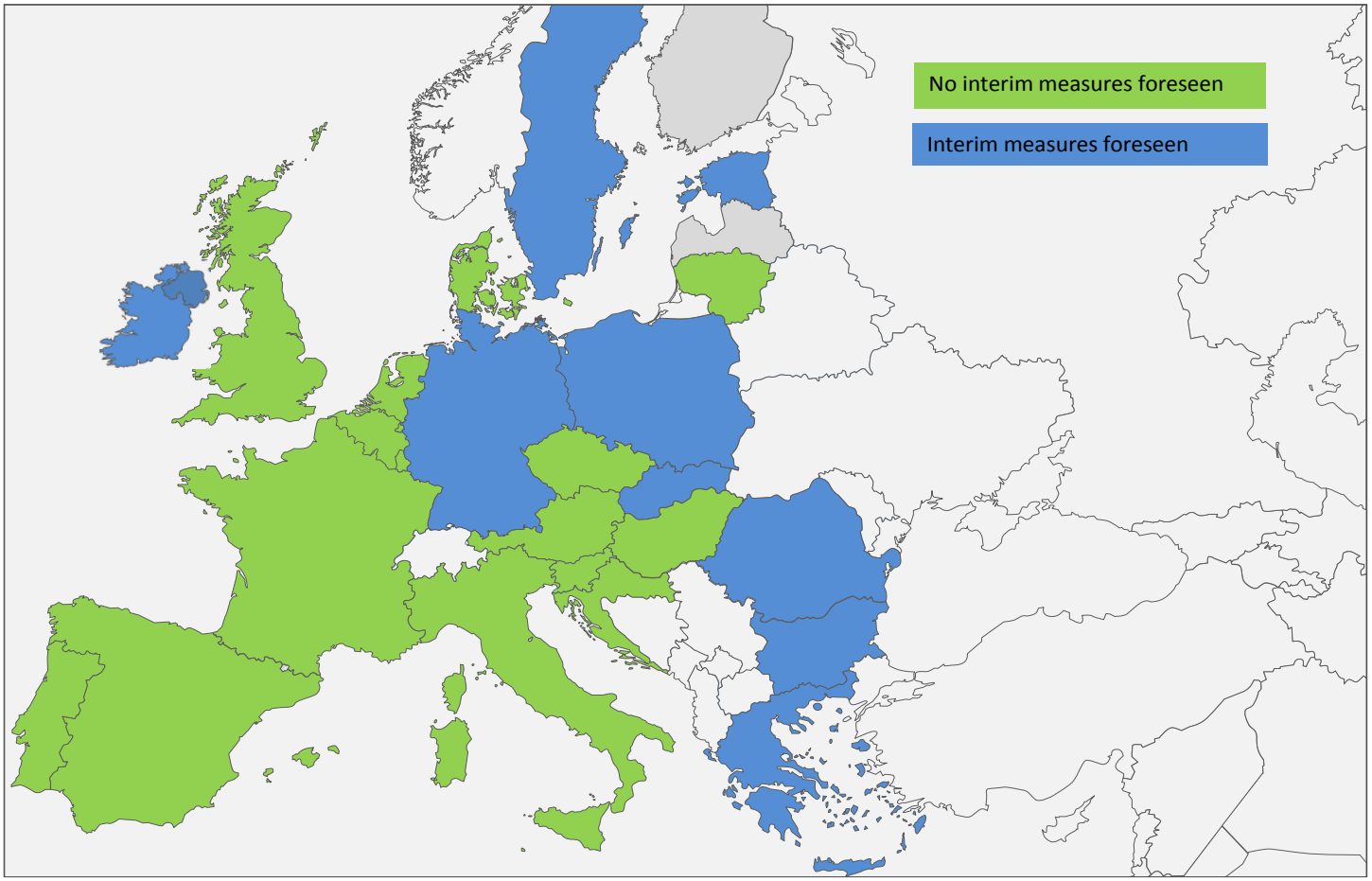


- 10 Member States reported to have implemented the Code by 1 October 2015.
- 5 Member States will apply transitory measures and implement the Code by 1 October 2016.
- 9 Member States and NI will apply interim measures (2019)

NC Balancing implementation

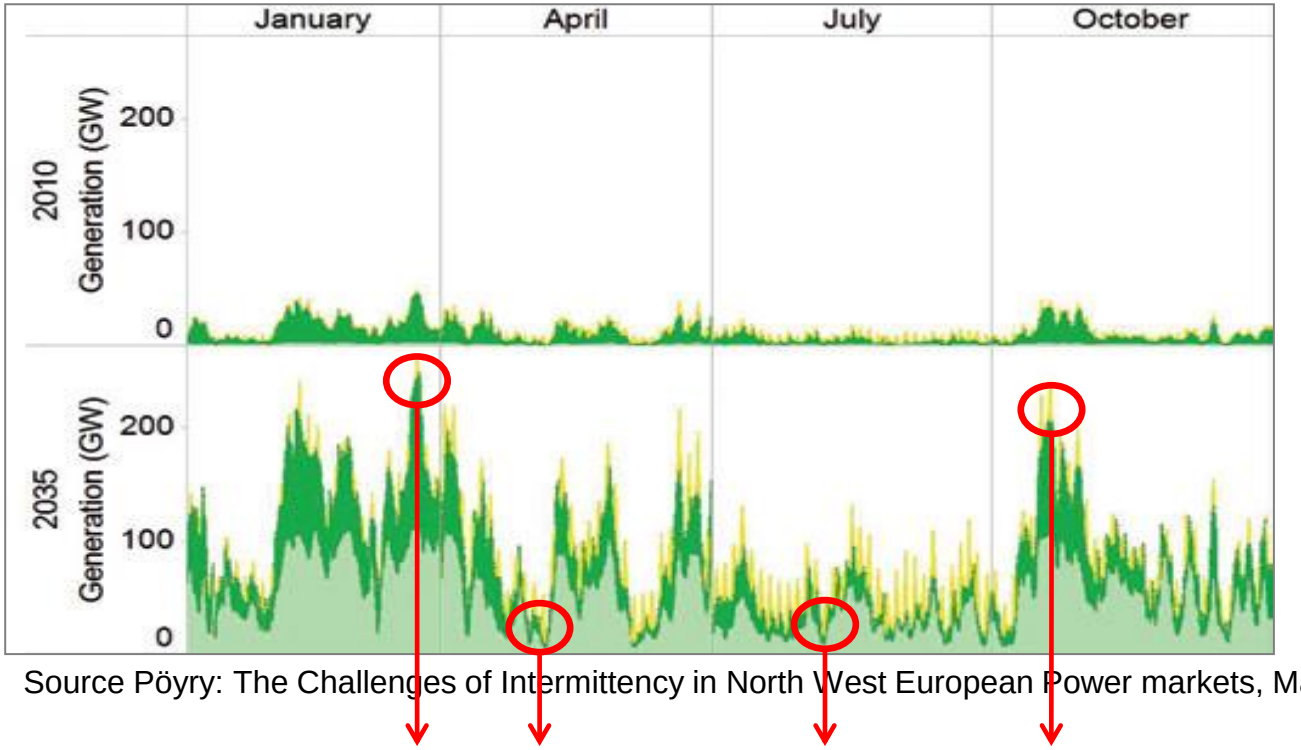
9 MSs and **UK-NI** apply **interim measures**

» BG, DE, EE, EL, IE, PL, RO, SE, SK, UK-NI



Supply in a volatile renewable world

North European power production from wind and sun



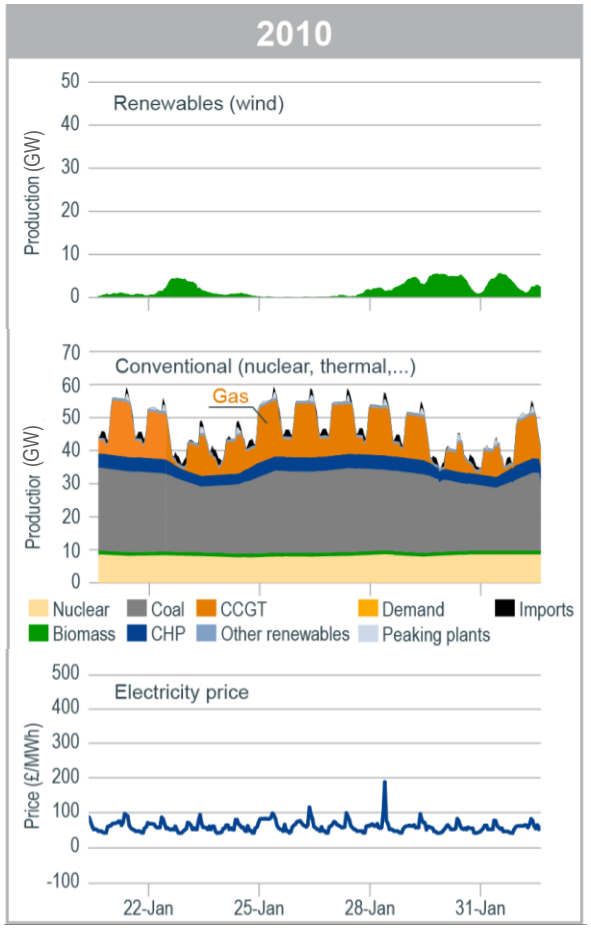
Solar
Onshore
Offshore

Source Pöyry: The Challenges of Intermittency in North West European Power markets, March 2011

- Wind and sun will **not balance** themselves
- Wind supplies max . **~ 2.000 full load hours** per year >> triggers **massive shortfalls** and **overproduction**

Supply in a volatile renewable world

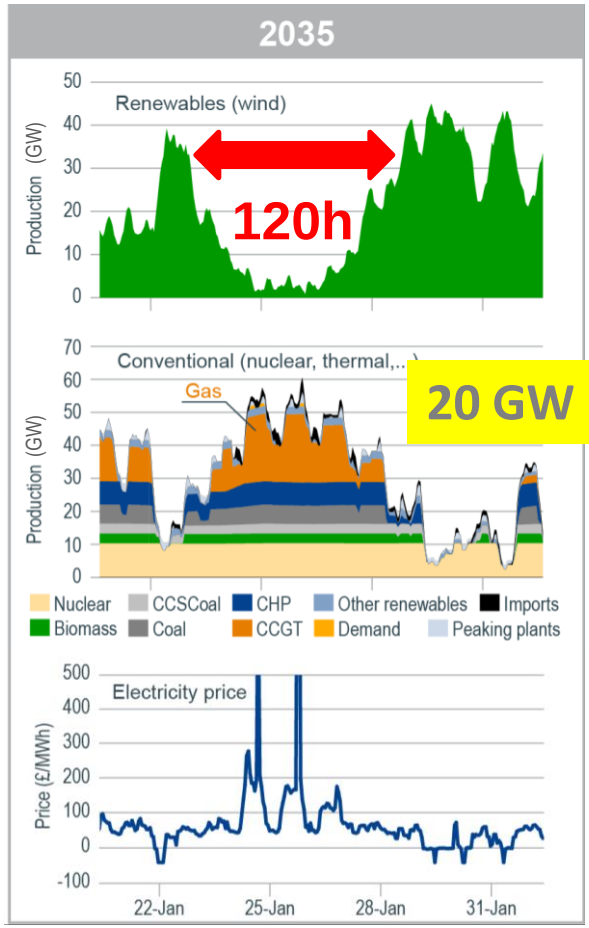
UK model 2035 - based on January 2010 weather conditions



Significant fluctuations in power generation from wind due to weather influences

Volumes will decrease significantly while required capacity/ **flexibility will double**

Volatile prices, especially during extreme weather conditions



Source: Pöyry Energy Consulting
Adapted by RAG

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Flexibility tools

Balancing needs / Sources

Seasonal balancing needs (for SoS & final customers)	• Storage • Production swing • LNG interruptible clients	Suppliers/shippers
Daily balancing needs	• Storage • LNG (if available) • Supply contract flexibility • Interruptible clients	Suppliers/shippers TSOs
Intraday balancing needs	• Storage (salt caverns) • Linepack • LNG (if available)	Suppliers/shippers TSOs

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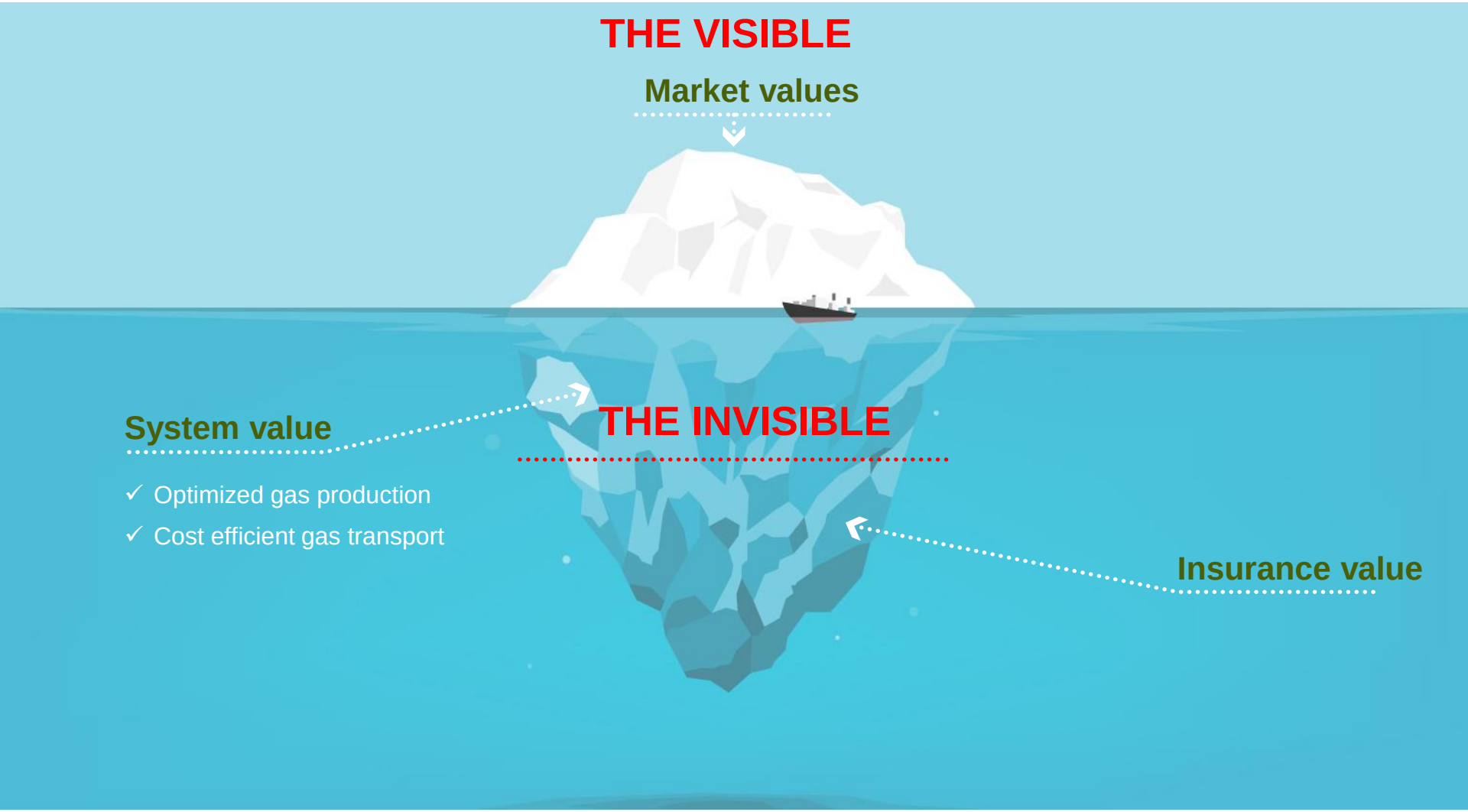
Flexibility valuation

The value of gas storage is like an iceberg



System values of storage

Cost efficient transport

- Avoided investment thanks to lower peak load requirement.:
  - Europe: avoided CAPEX of up to 16%*
  - France : avoided CAPEX of ca. 3 bn €
  - UK : annual savings of up to £ 300m**
- Reduced operating and maintenance costs thanks to optimized gas compression: ca. 20-25%
- Reduction of local transport bottlenecks.

Optimized gas production

- Avoided investment in wells and surface facilities of up to 80% depending on expected swing.
- Optimization of operations and maintenance (plateau vs. swing) allowing to prolong the lifespan of production fields.
- Enhanced ultimate recovery: avoided loss of reserves of ca. 10-15% depending on reservoir characteristics.

Source : * Pöyry 2012 / ** Waters Wye 2014

Insurance value of storage (1/2)

A number of issues - or a combination of those - may trigger a gas supply risk :

Weather conditions

- Cold wave in the US: winter 2013/2014
- Cold snap in Europe in February 2012
- Prolonged winter end 2013 in Europe
- Rough sea causing Skikda (Algeria) liquefaction train shutdown in January 2015
- …

Technical issues

- Technical issue at Rough (UK) in March 2015 resulting in storage output reduction
- 6-month shutdown of Transitgas pipeline in 2010 due to a landslide in Switzerland.
- …

Geopolitical and social risk

- Russia - Ukraine tensions; partial supply disruption in 2009
- Interruption of Greenstream (Libya-IT) flow following the outbreak of the Arab Spring in Libya in February 2011
- …

Environmental issues

- Gas production induced earthquakes in Groningen (NL)
- …

Insurance value of storage (2/2)

Gas shortage can be costly…

UK

Cost estimate of a 6-week gas disruption to industry in the UK: up to £10bn (*Ilex Energy Consulting, 2006*)

Australia*

- September 1998: disruption of supply to Melbourne for 19 days
- Affected 1.4 million households and 90.000 business places
- Total commercial and industry cost assessed at AU$1.3 billion

OFGEM has recognized the potential impact of supply disruption through the emergency cash-out price - “Value of Lost Load” - of £20 per therm (i.e. ca 800 EUR/MWh)

Gas storage helps to avoid such economic and social risk exposure

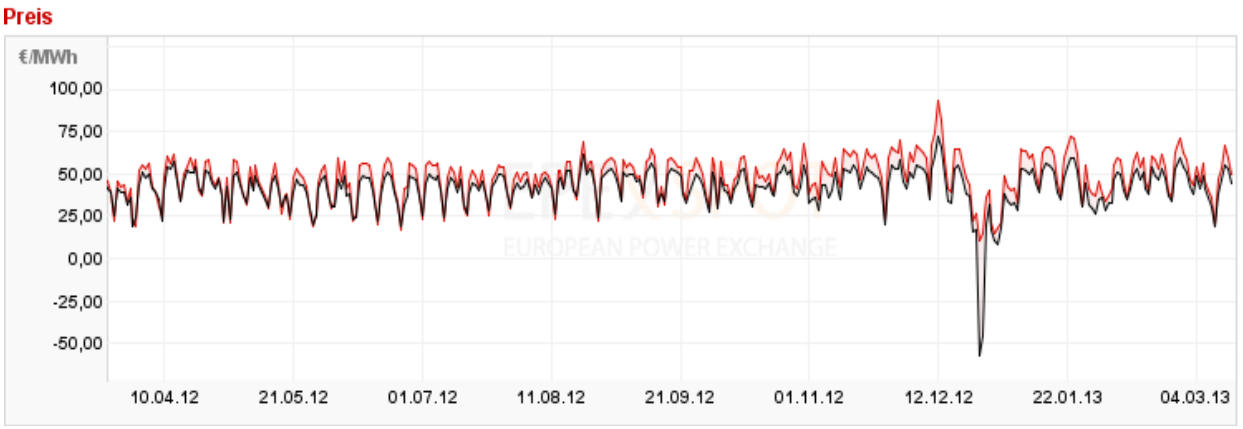
“…storage is a very real, physical and practical expression of energy security…”

Maria van der Hoeven, IEA

* http://en.wikipedia.org/wiki/Esso_Longford_gas_explosion

Security of Price

Electricity spot prices 2012/2013 – PHELIX market area



Amplitude:
⌀ ~30 €/MWh
max ~ 150 €/MWh

Source: EEX

Gas spot prices 2012/2013 – NCG market area

Amplitude:
⌀ ~ 1 €/MWh
max ~ 10 €/MWh

Source: EEX

Evolution of the French regulatory framework

- **The French Ministry of Energy (DGEC) has decided to change the regulatory framework of the gas storage activity in France towards the regulation** of the activity as already exists for the other gas infrastructures companies of ENGIE in France.
- **A project of ordinance** (“ordonnance”) has been approved on February 2nd by the *Conseil Supérieur de l’Energie* and **is expected to be submitted shortly to the Council of State**.
- Different steps have already happened

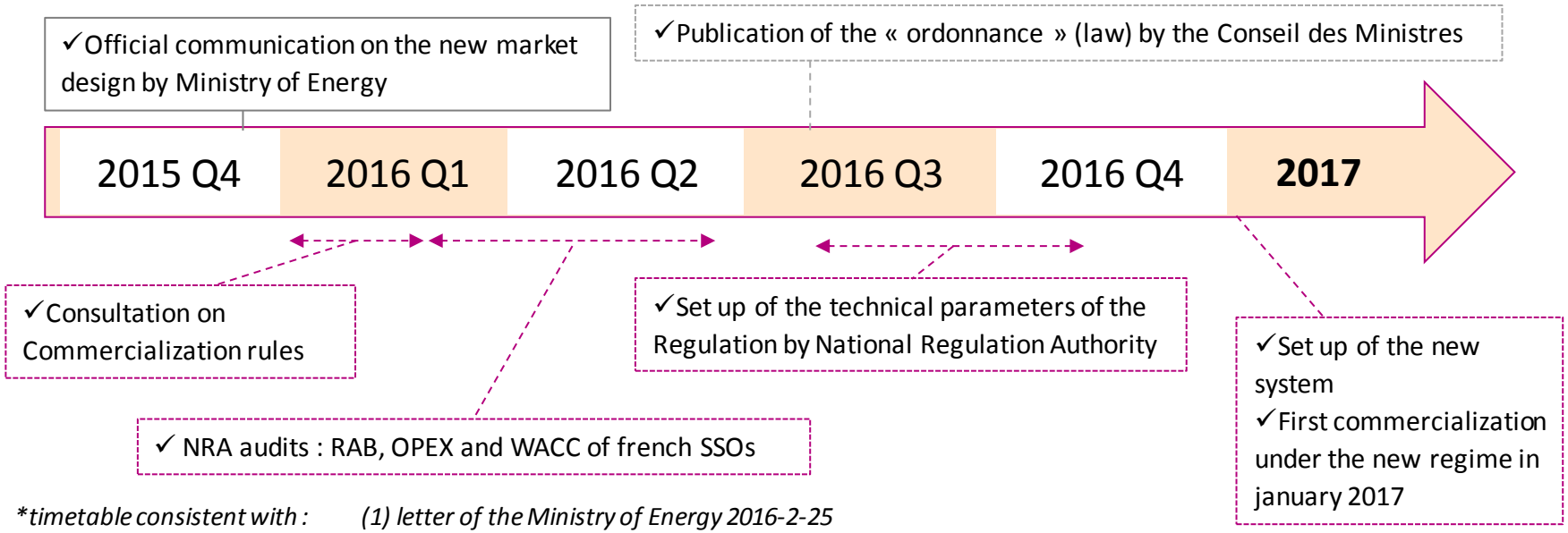
April 2015	Consultation of the stakeholders => towards a financial regulation of costs of storage operators under 2 approaches: 2 regulation schemes (a classical regulation vs a « market based » regulation) + statu quo
July 2015	Legislation on the energy transition (article 167)
Nov. 2015	Draft ordonnance circulated by DGEC in November 16th => the « market-based » option … and discussed in committee in November 27th
Jan 2016	Start of the work and exchanges with the French NRA (CRE) for commercialisation process, definition of the authorised revenue, remuneration rate.

A «market-based» regulation scheme

In the project of ordinance (“ordonnance”) **scheme :**

- **All the storage sites are part of the initial regulated perimeter.**
- **A minimum level of subscription and filling of the storages** will be defined on a yearly basis by Decree (~storage obligations);
- **The allowed and guaranteed revenue of the storage operators will be a fixed amount set by the French regulator (CRE)** in order to cover normative capital costs for the whole perimeter (RAB with a regulated rate of return), OPEX and RAB depreciation. **This allowed revenue is not known yet and will be set by the CRE by end-2016**
- **The sales process will be conducted through auctions** – modalities to be set by the French regulator (CRE);
- In case the revenues from auctions are lower than this allowed revenue**,** **a compensation will be collected through the transmission tariff and paid to the storage operators in order to reach the allowed revenue set by the CRE.**

Many deadlines still to come



**timetable consistent with :* *(1) letter of the Ministry of Energy 2016-2-25*
(2) French CRE communication to gas system stakeholders (2016-3-15)

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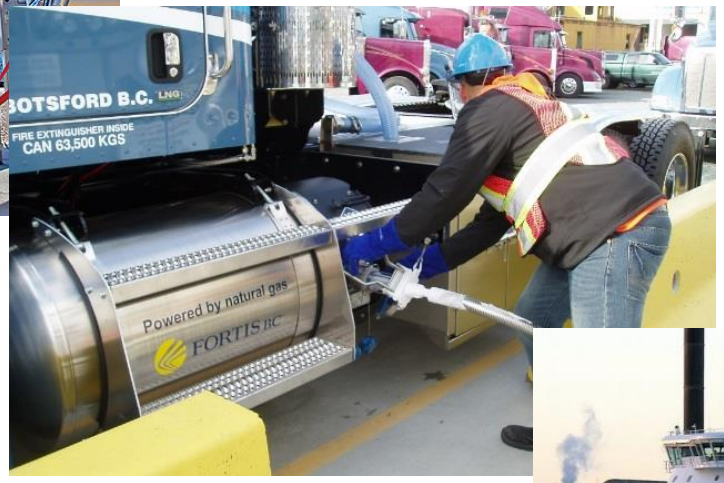
Concluding remarks

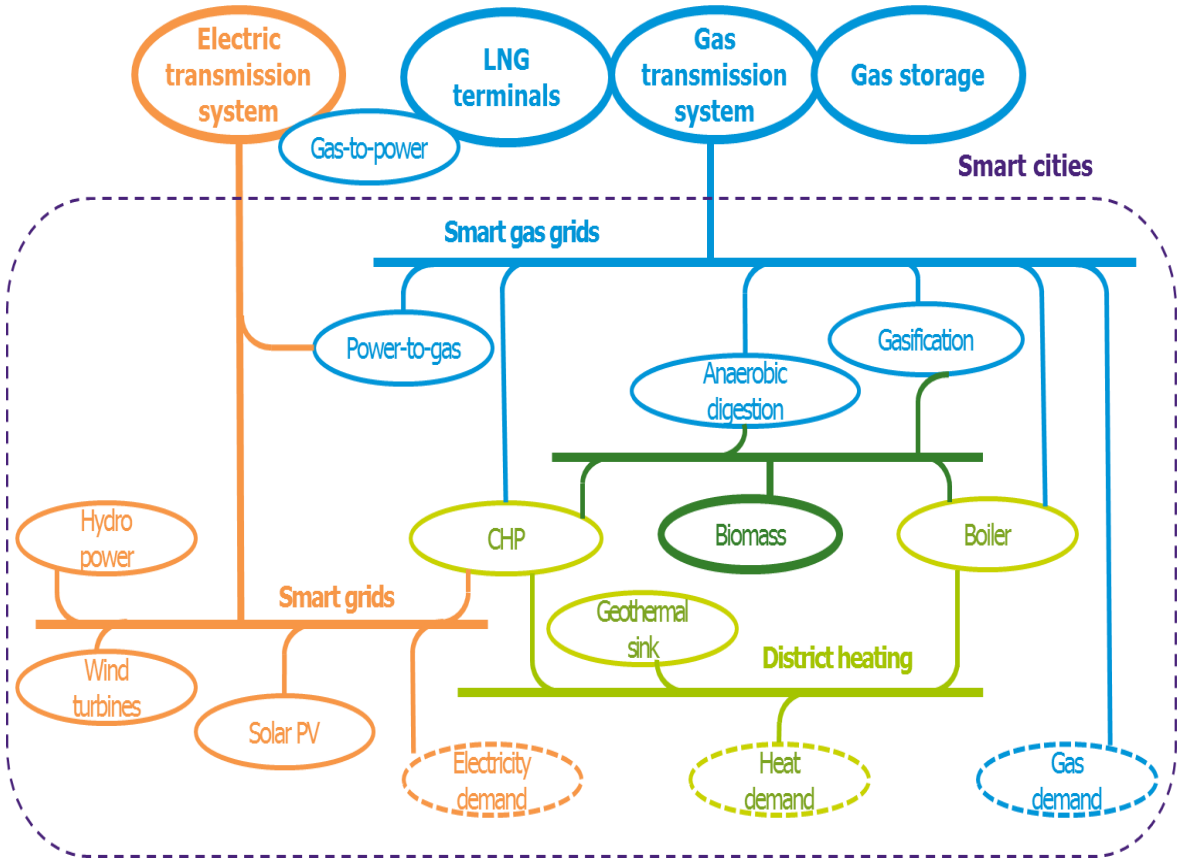
Small scale LNG: new solutions for mobility and remote areas



Renewable gas: fulfill essential needs from unexpected sources

- From fossil stock to lively resources: livestock farming, organic waste, forests, straw, algae..
- Injection of upgraded biomethane into existing infrastructures possible without any adaptation investments
- Global potential of 860 bcm green gas from agriculture and waste alone

Gas infrastructures: at the heart of optimized energy systems



→ Natural gas infrastructures deliver high storage and transmission capacities for smart energy systems

→ Natural gas infrastructures critical for RES back-up

→ Power-to-gas development open new systemic optimization

Back-up

Balancing Network Code

- The Code provides for a **high degree of flexibility** to TSOs and NRAs in the national implementation. Reasons: gas networks and markets differ from each other in their characteristics

- **Implementation options**:
  - 3 possible implementation dates (Oct 15, Oct 16, Apr 19)
  - 3 possible types of information models for forecasting non daily metered off takes (base case, variant 1, 2)
  - 4 possible types of interim measures (balancing platform, tolerances, interim imbalance charge, alternative to the balancing platform)
  - 4 possible types of short term standardised products to be procured by the TSO for balancing purposes on the trading platform (title, locational, temporal, temporal locational)
  - the possibility to continue procuring resources for balancing via balancing services
  - the possibility to provide additional linepack flexibility service
  - different lead times for trade notifications (30 min – 2 hrs with conditions)
  - the possibility to choose whether or not to apply within day obligations with 3 possible types of within day obligations (system wide, portfolio based, entry-exit)

- The implementation is progressing along multiple time schedules and along several regulatory options.
- Almost all of the possibilities offered by the Code have been used in the national implementations.
- **Yet, the focus should be the same: creation of market based balancing with residual TSO balancing**