Natural gas markets

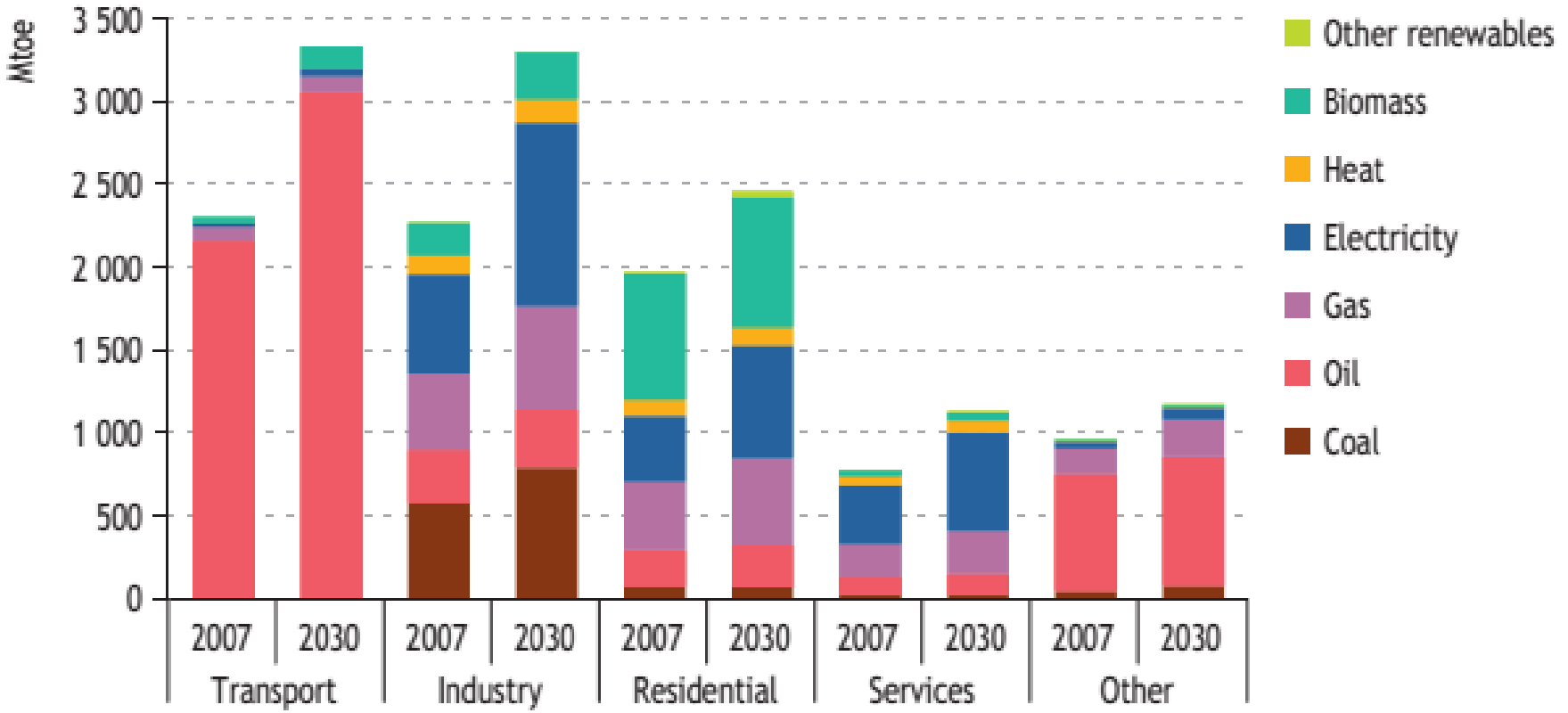
Jan Osička

Natural gas and oil

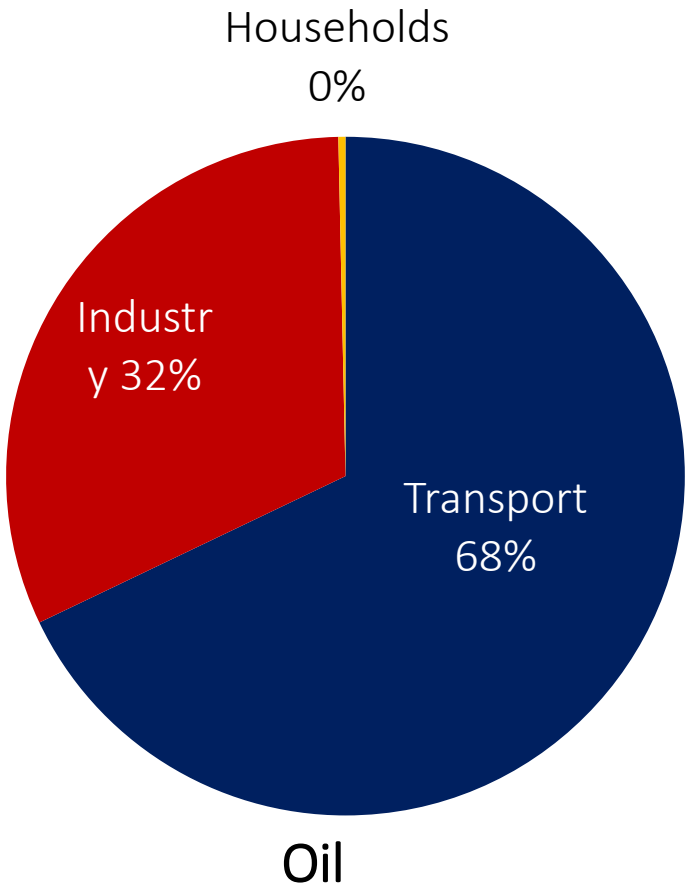
- Production: complements
- Consumptions: substitutes

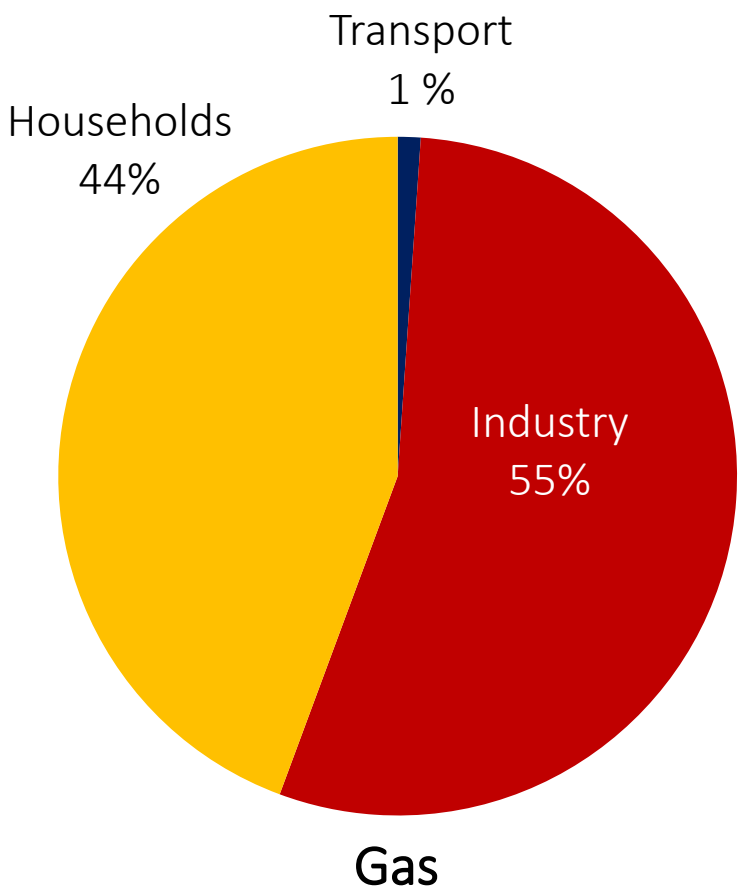
- End use consumption:
  - Industry (heat + feedstock)
  - Residential and commercial (heating)
  - Electricity generation

IEA 2009: End use consumption



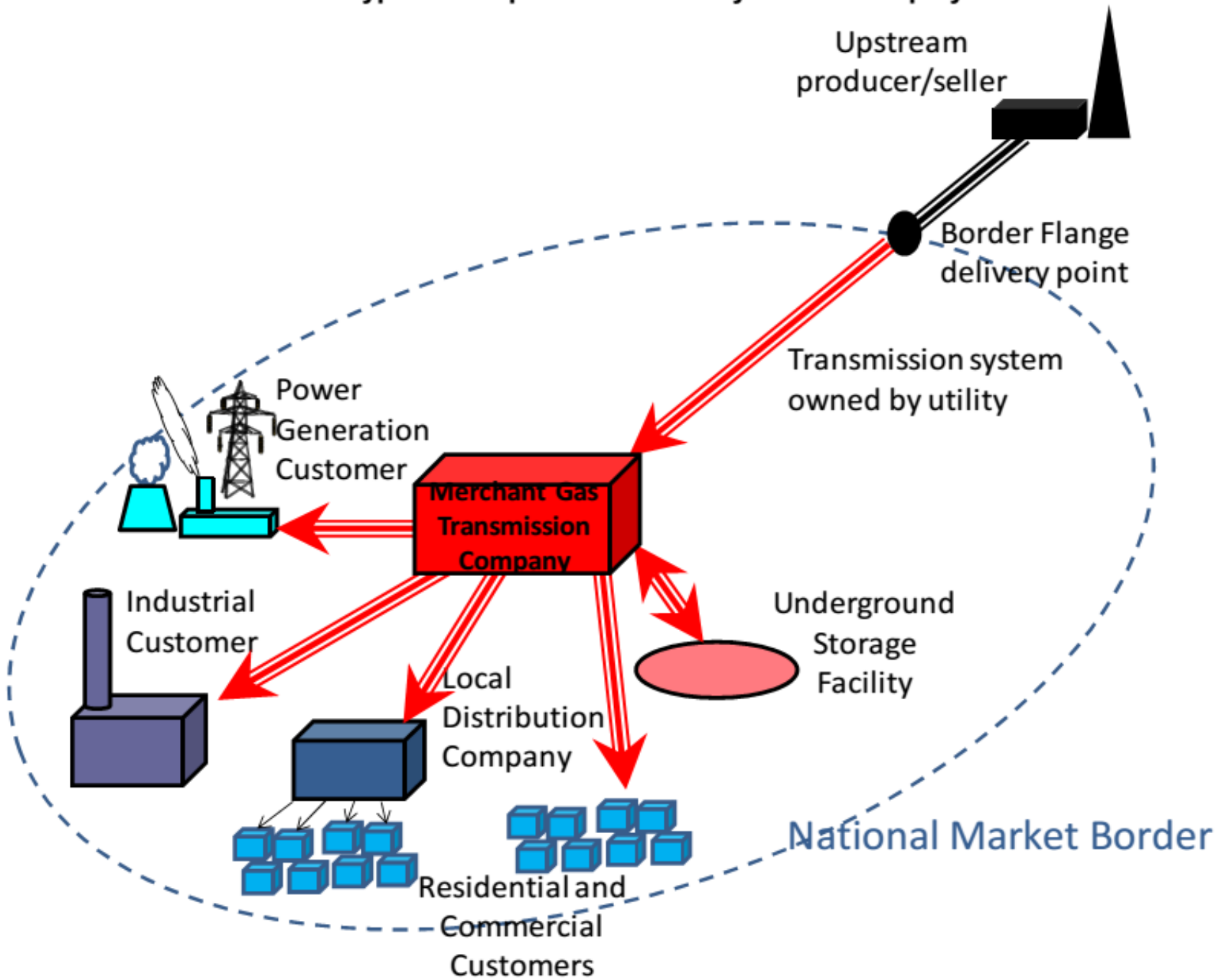
IEA 2009: End use consumption in CZ 2007



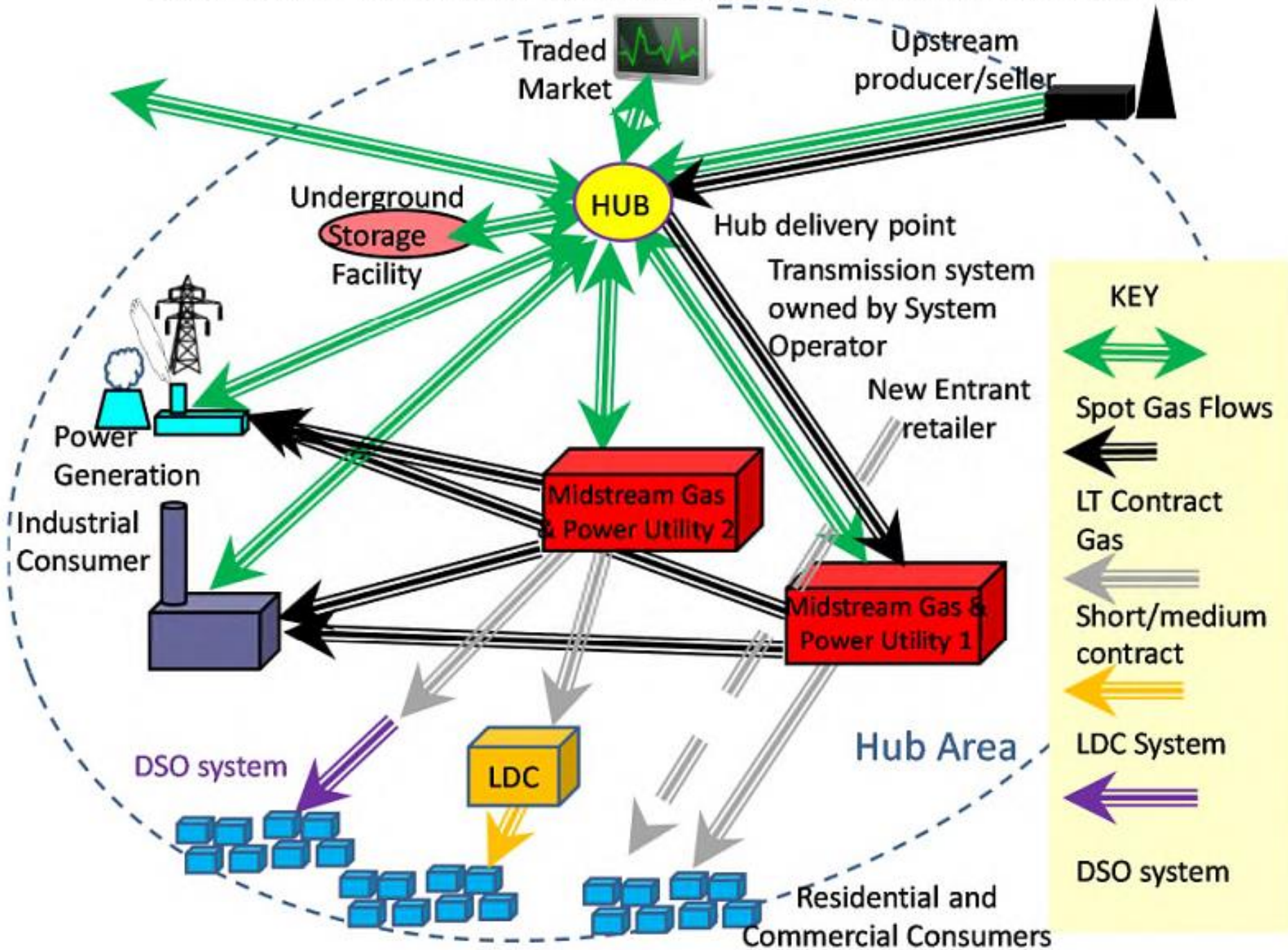


Actors and structure

Schematic of a Typical European Gas Industry in the Monopoly Era



Schematic of a Continental European Market with an Established Gas Hub



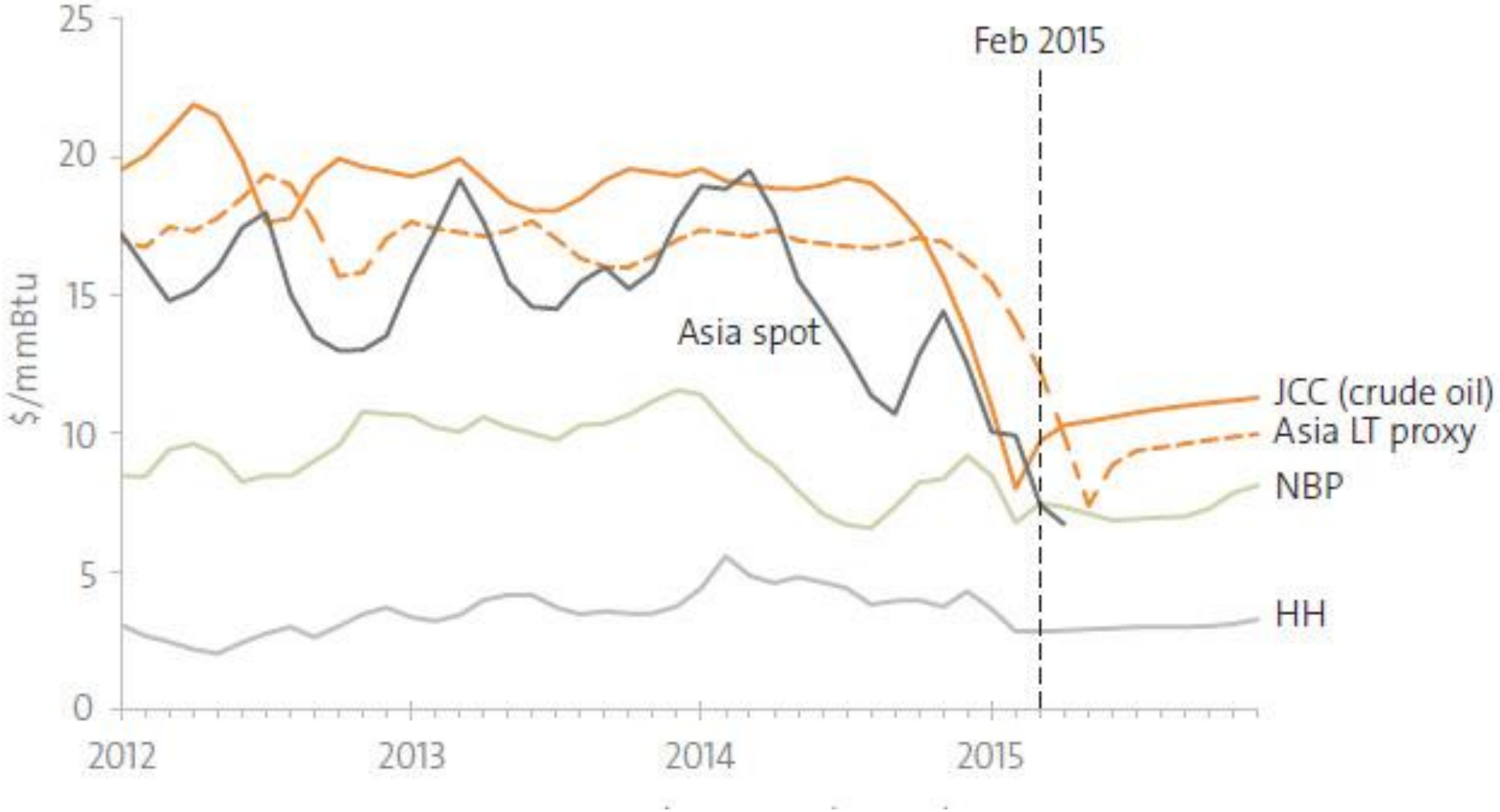
Pricing

Regulated: end user prices set by national authority (domestic markets of major producers)

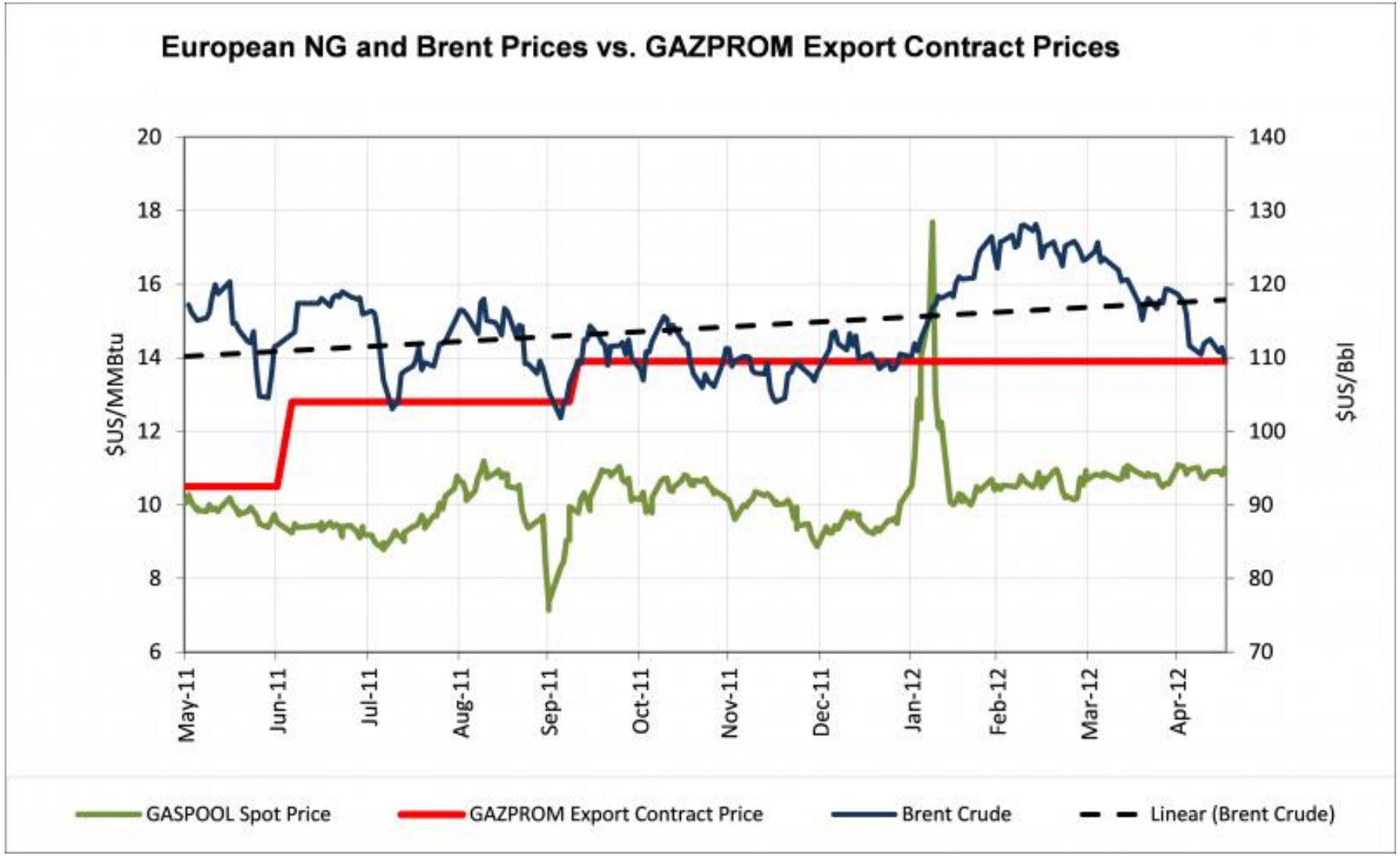
Fuel indexation: pegging the price to competing fuel reflects fuel substitutability (oil, oil product basket, fuel basket)

Market based pricing: price equilibrium in gas-to-gas competition and fuel-to-fuel competition

Fuel indexation

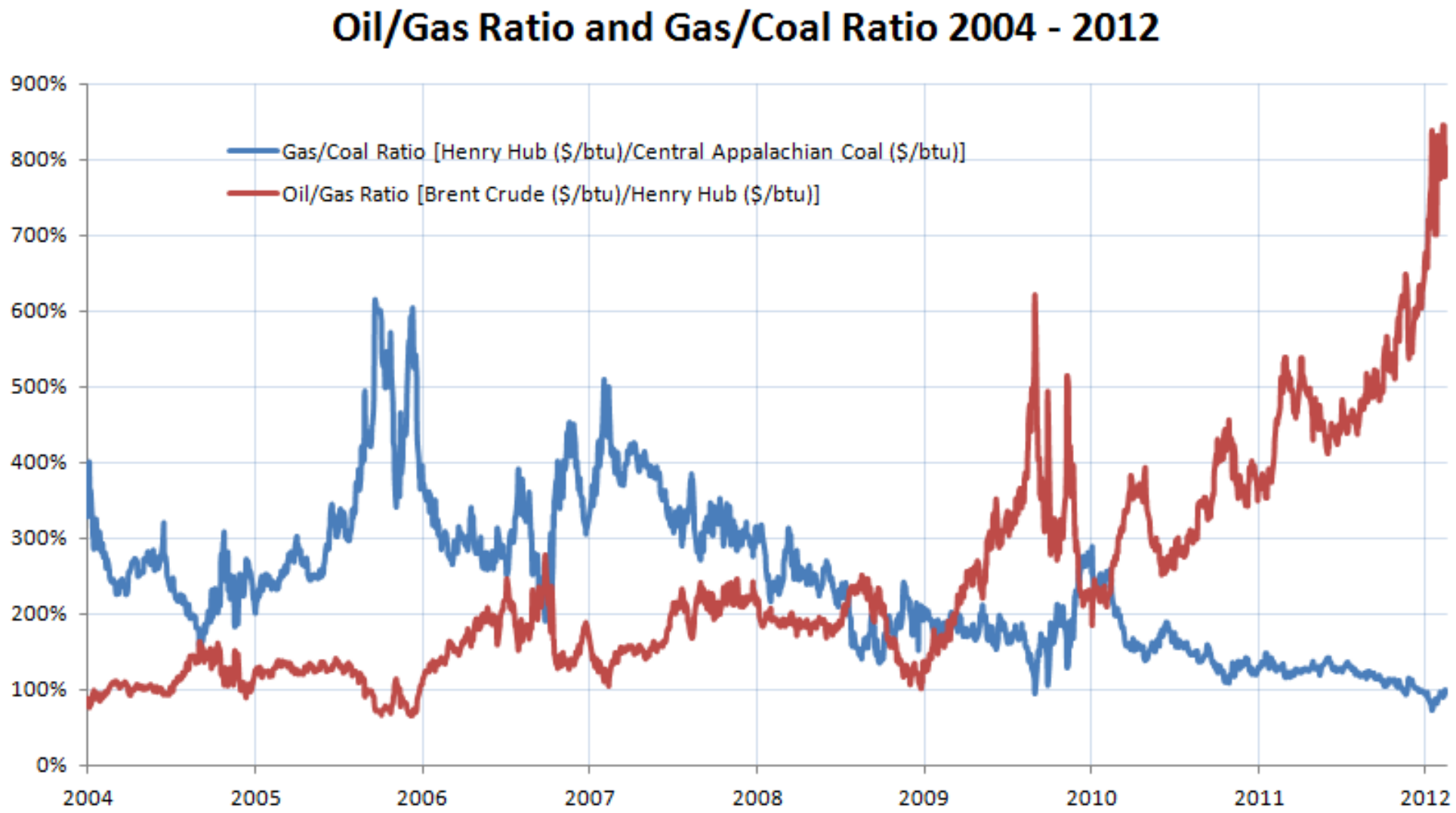


Fuel indexation

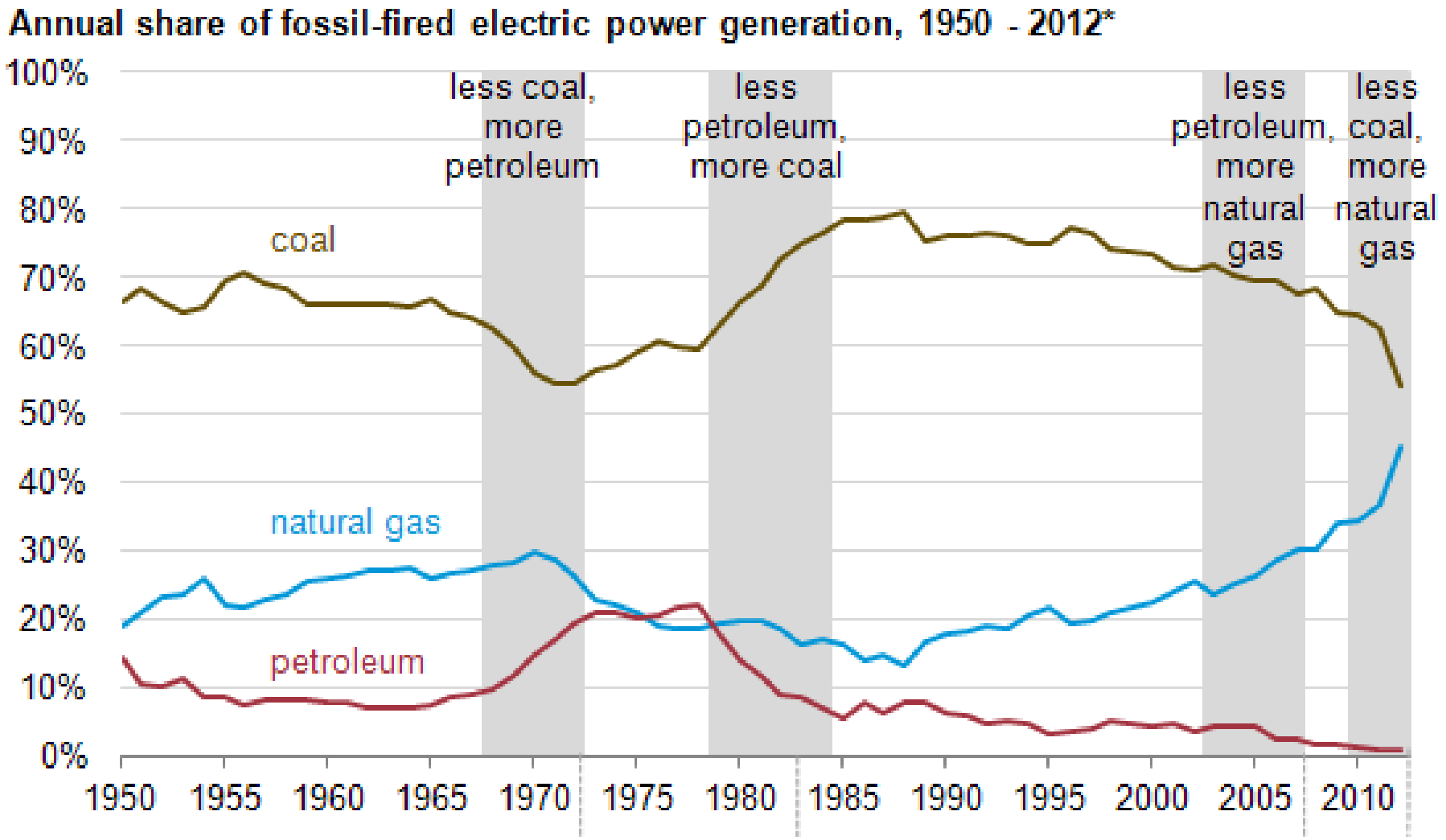


Gas-to-gas competition

Fuel-to-fuel competition (USA)



Fuel-to-fuel competition (USA)



Contracting

Duration
- Long-term contracts (LTCs)
- Spot

Trading mechanism
- Bilateral negotiations
- Over the counter (OTC)
- Exchange

Pricing
- Marginal costs
- Netback

Hubs/exchanges

Exchanges

- Trading places (physical, financial)
- Exchange = central counterparty
- Necessary conditions
  - Liquidity
  - Interest
  - Regulation

Hubs

- Infrastructure crossroads, natural development of physical trading
- Conditions
  - Infrastructure
  - Market fundaments – liquidity, demand
  - Storage capacity
  - Regulation: TPA

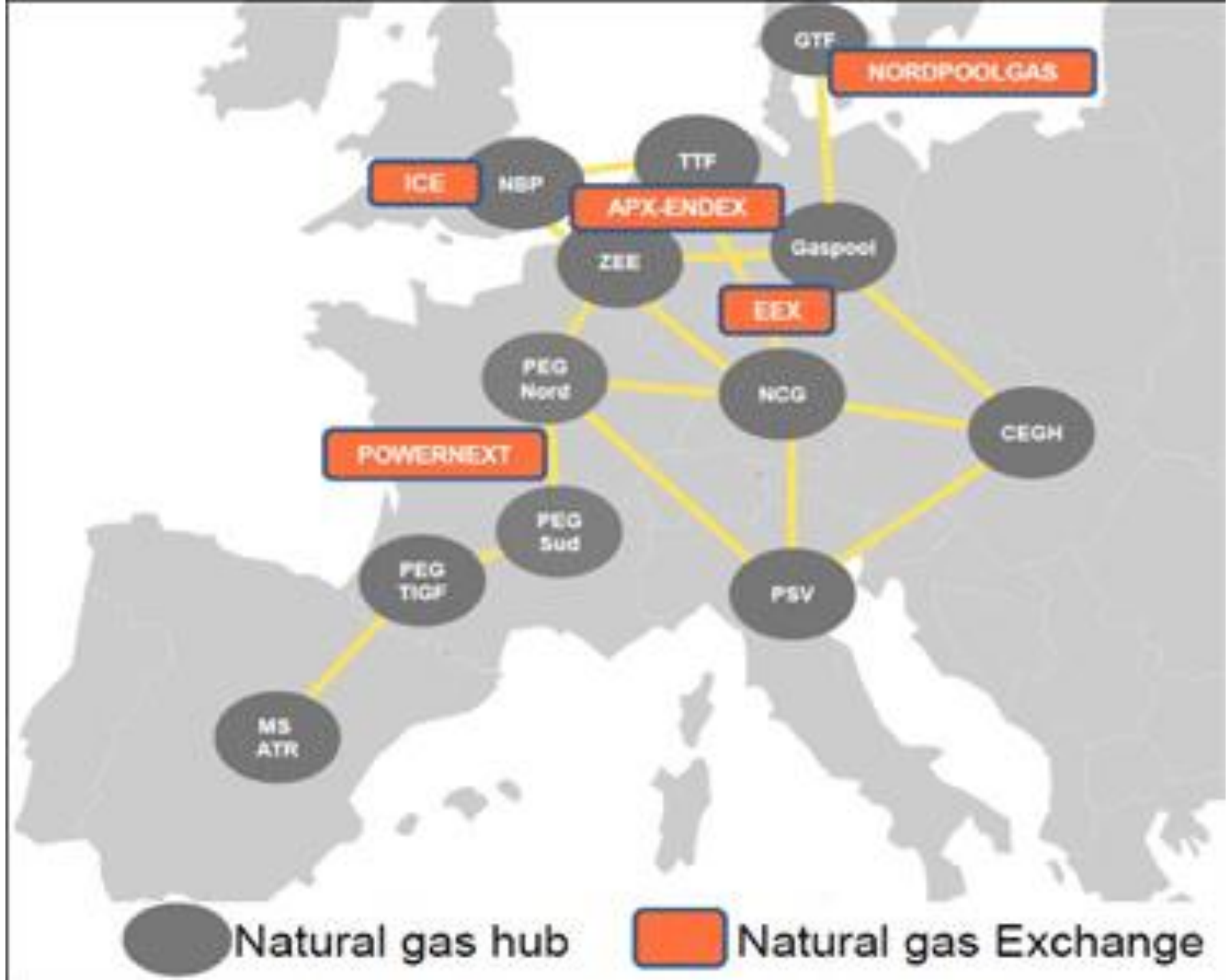
Hubs

Physical

- Transit hub: infrastructure crossroad + OTC trading
- Trading hub: infrastructure crossroad + Exchange
- Transition hub: in between

Virtual hubs

- Regulated emergence
- Geographical delimitation (regional or national market)


GTF
NORDPOOLGAS
ICE
NBP
TTF
APX-ENDEX
ZEE
Gaspool
EEX
PEG Nord
NCG
CEGH
POWERNEXT
PEG Sud
PEG TIGF
PSV
MS ATR
Natural gas hub
Natural gas Exchange

OTC

- Short term bilateral agreement
- Standardized products, balancing
- Direct or via a broker
- 16 – 40% of European market

Bilateral negotiations

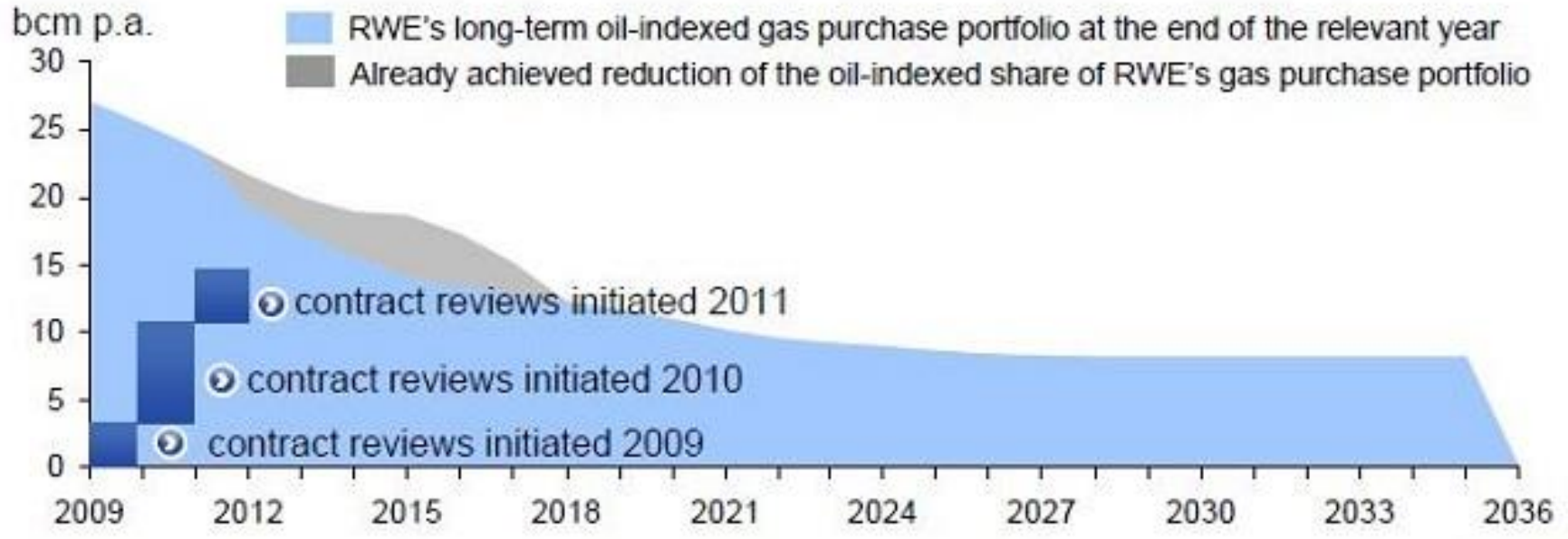
- Two parties, direct negotiations, details kept in secret (Russia-China gas deal of 2014)
- Long term, strategic contracts

- Content
  - Duration
  - Pricing formula
  - Additional clauses

Duration

15-35 years, recently up to 20 years

Example: RWE contract portfolio



Pricing formula: oil indexation

$$P(m) = P(o) + 0.60 \times 0.80 \times 0.0078 \times (LFO(m) - LFO(o)) + 0.40 \times 0.90 \times 0.0076 \times (HFO(m) - HFO(o))$$

... o = current month
... m = target month
... LFO = light fuel oil
... HFO = Heavy fuel oil
... 0.60, 0.40 = market shares of competing fuels
... 0.80, 0.90 = pass through factors
... 0.0078, 0.0076 = FO/gas energy parity

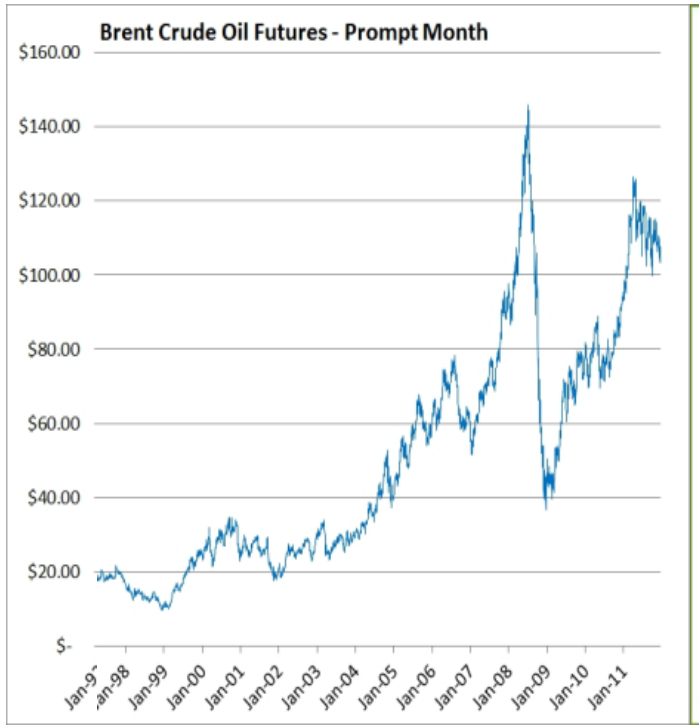
Energy content parity

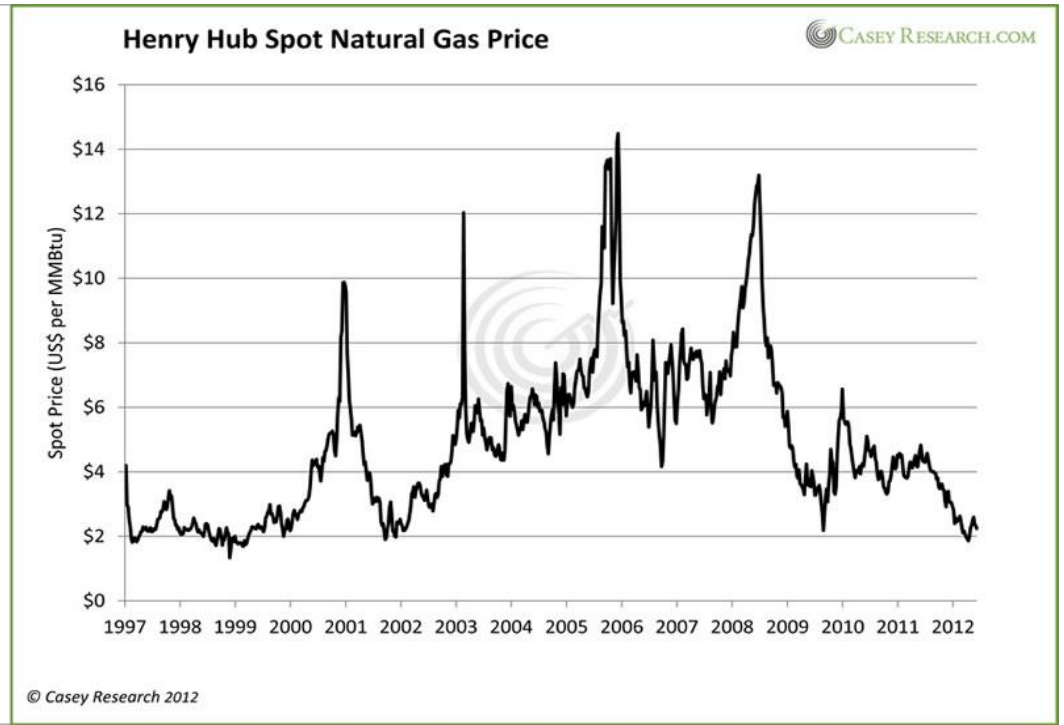
Oil parity is achieved at a = 0.172 (1 MMBtu = 0.172 barrels)

- Brent = **$120** => NG = 0.172*120 = **20.64** $/MMBtu (Brent parity)
- Brent = **$20** => NG = 0.172*20 = **3.44** $/MMBtu (Brent parity)

»Producers (Qatar, Russia) usually prefer oil indexation

»Consumers (North America, Europe) usually prefer hub/spot indexation

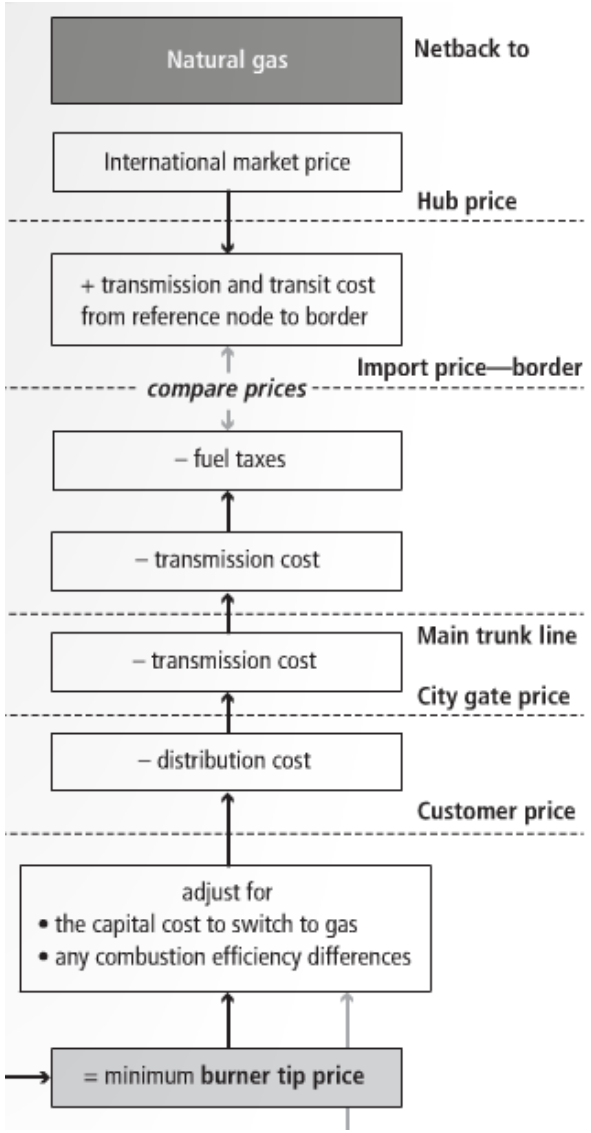




Pricing formula: Netback pricing

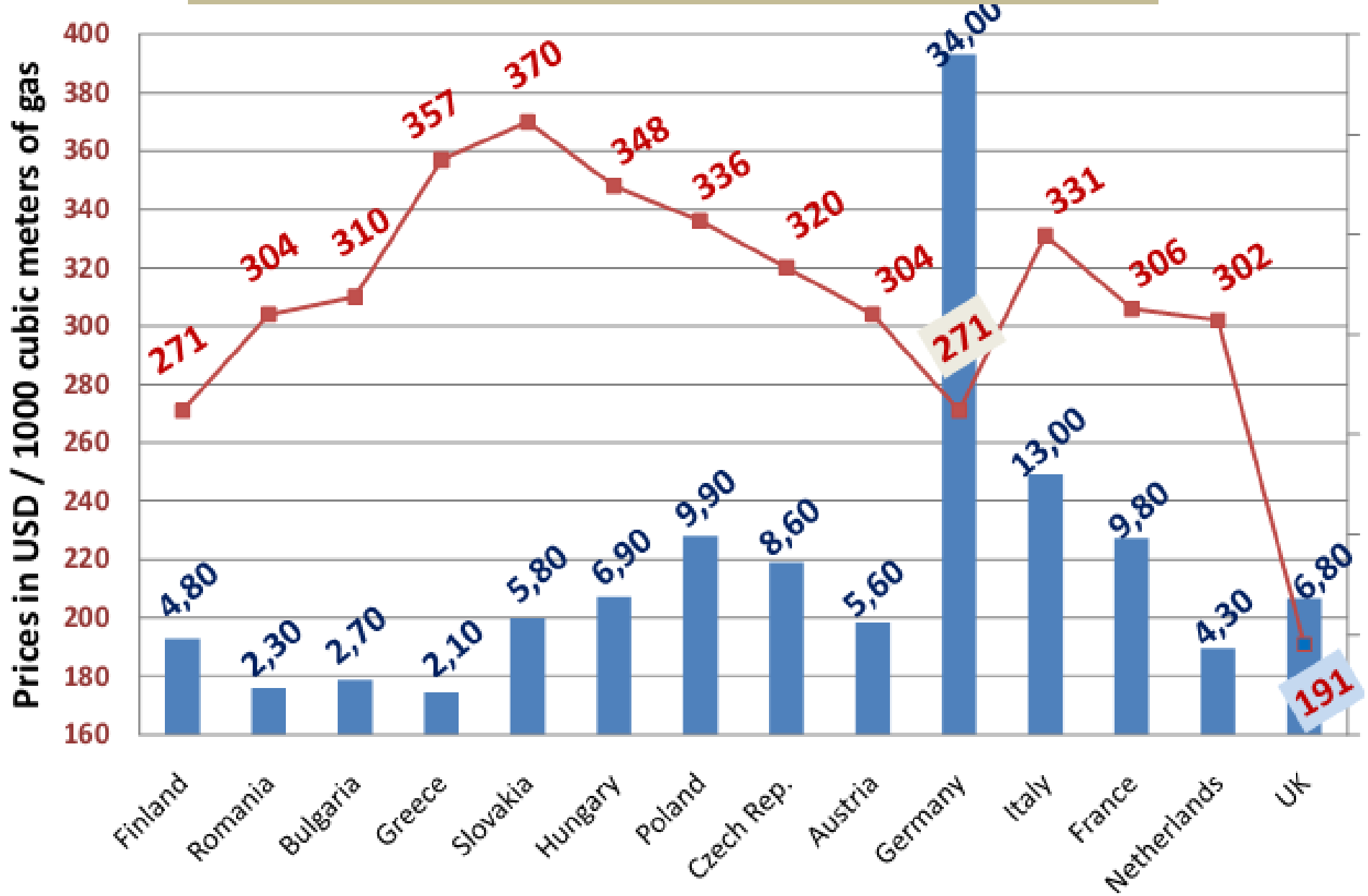
- *Netback price* = replacement value
- What is the maximum competitive price?

- Netback to natural gas
- Netback to other fuels

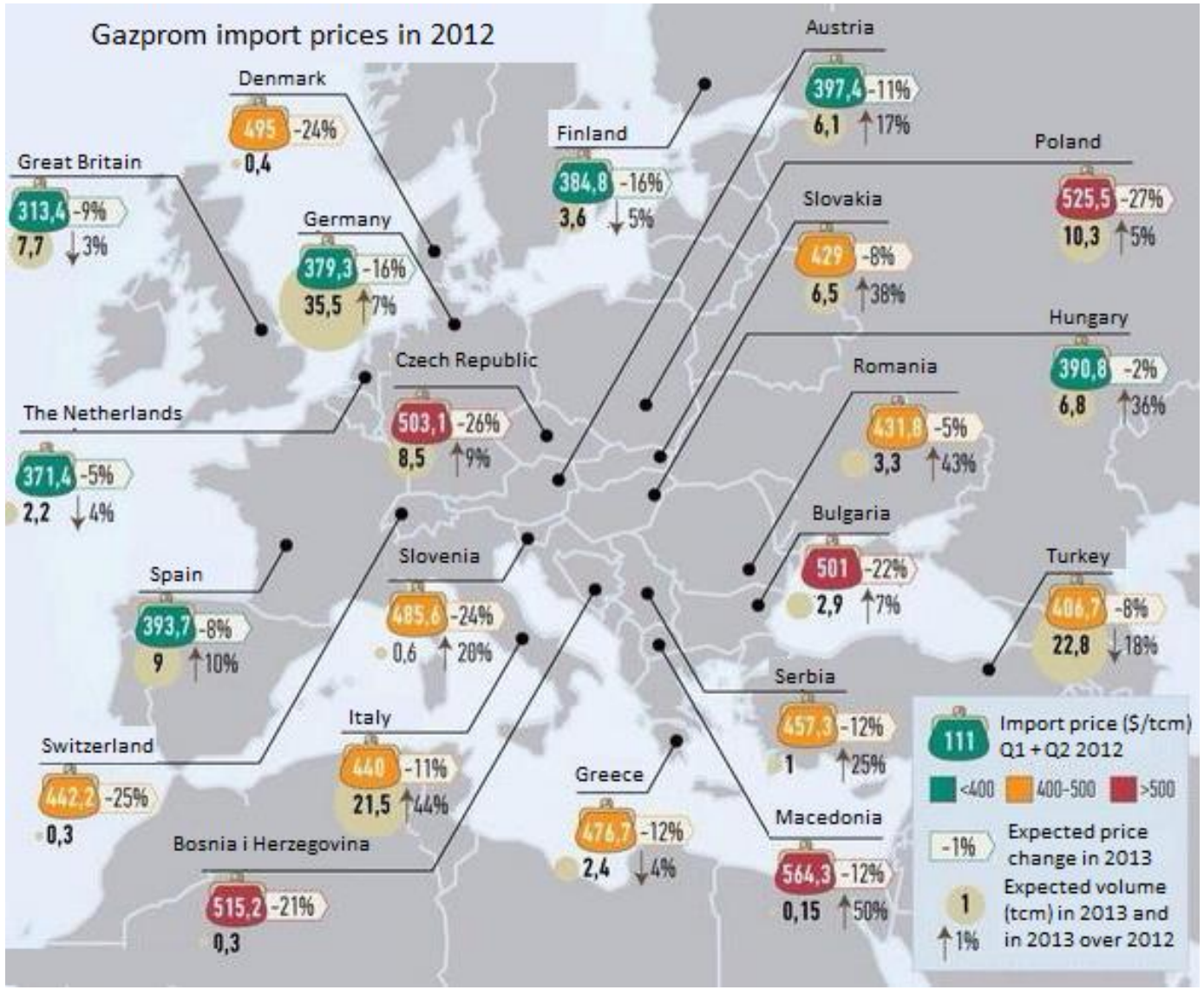


Gazprom gas prices for EU – 2010

Source: www.vedomosti.ru – 25th February 2011



Russian import price in 2012



Additional clauses

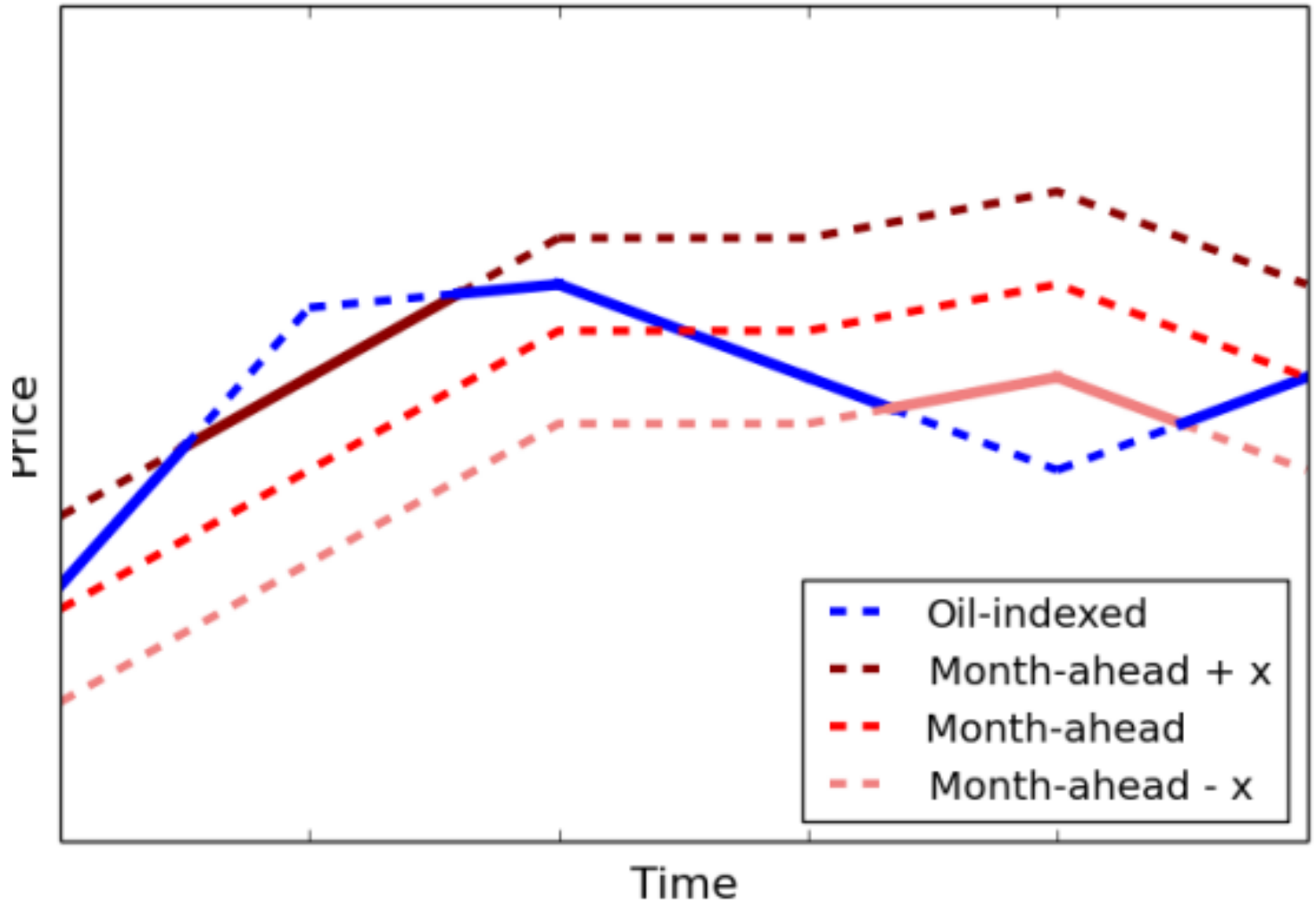
- Flexibility (take-or-pay): (70-) 85 - 90%
- Destination clause (reexport)
- Delivery point

Compromising oil and hub indexation: mixed formula (Gazprom – E.ON, RWE 2010)

Price formula:

85% oil indexed + 15% hub indexed

Compromising oil and hub indexation: „Indirect spot pricing“ (Gazprom – ENI, PGNiG, 2013)



LNG

Oil, Gas, Coal 2010

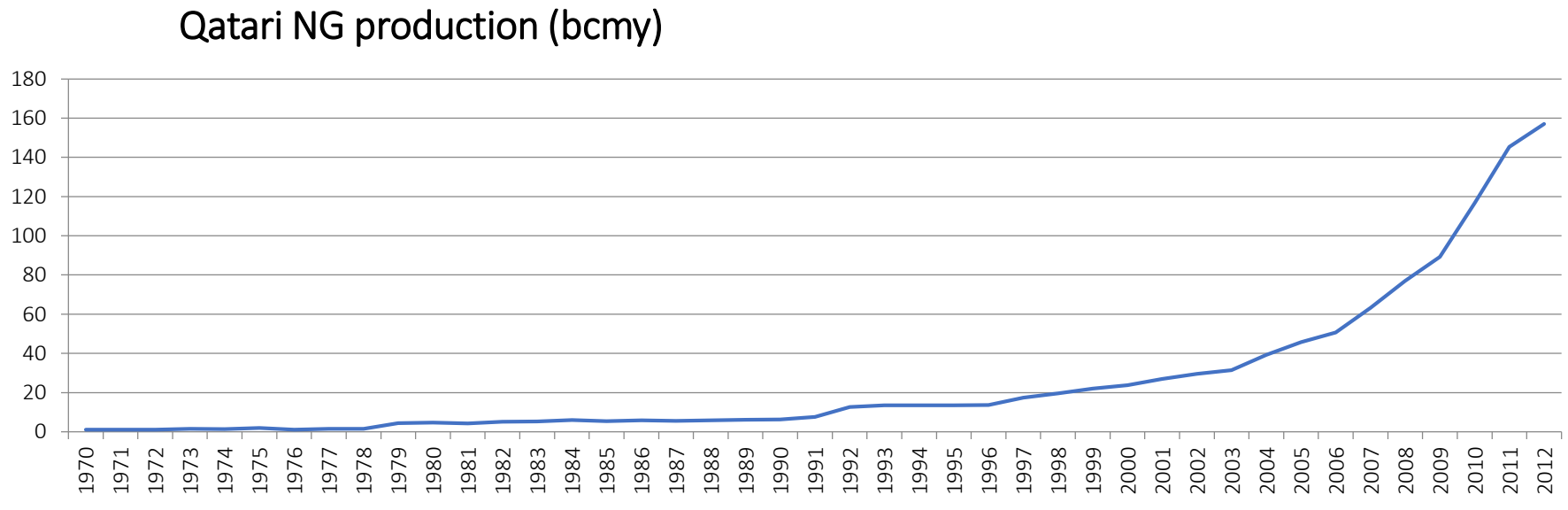
(milion MMBtu)	Oil	Gas	Coal
Reserves	8 021 000	6 657 200	16 441 176
Production	169 456	113 670	150 794
Traded	107 512	34 710	24 520
Seaborne trade	59 096	10 573	13 631

Oil, Gas, Coal 2010

	Oil	Gas	Coal
Trade/Production (%)	63.4	30.5	16.3
Seaborne trade/Trade (%)	55.0	30.5	55.6
Seaborne trade/Production (%)	34.9	9.3	9.0

Development of LNG trade

- Before 2000: strictly bilateral LTCs supplying premium markets (Spain, France, Japan, South Korea)
- After 2000: the rise of Qatar
  - 1997: 0.16 bcm of LNG exported
  - 2012: 105.4 bcm of LNG exported



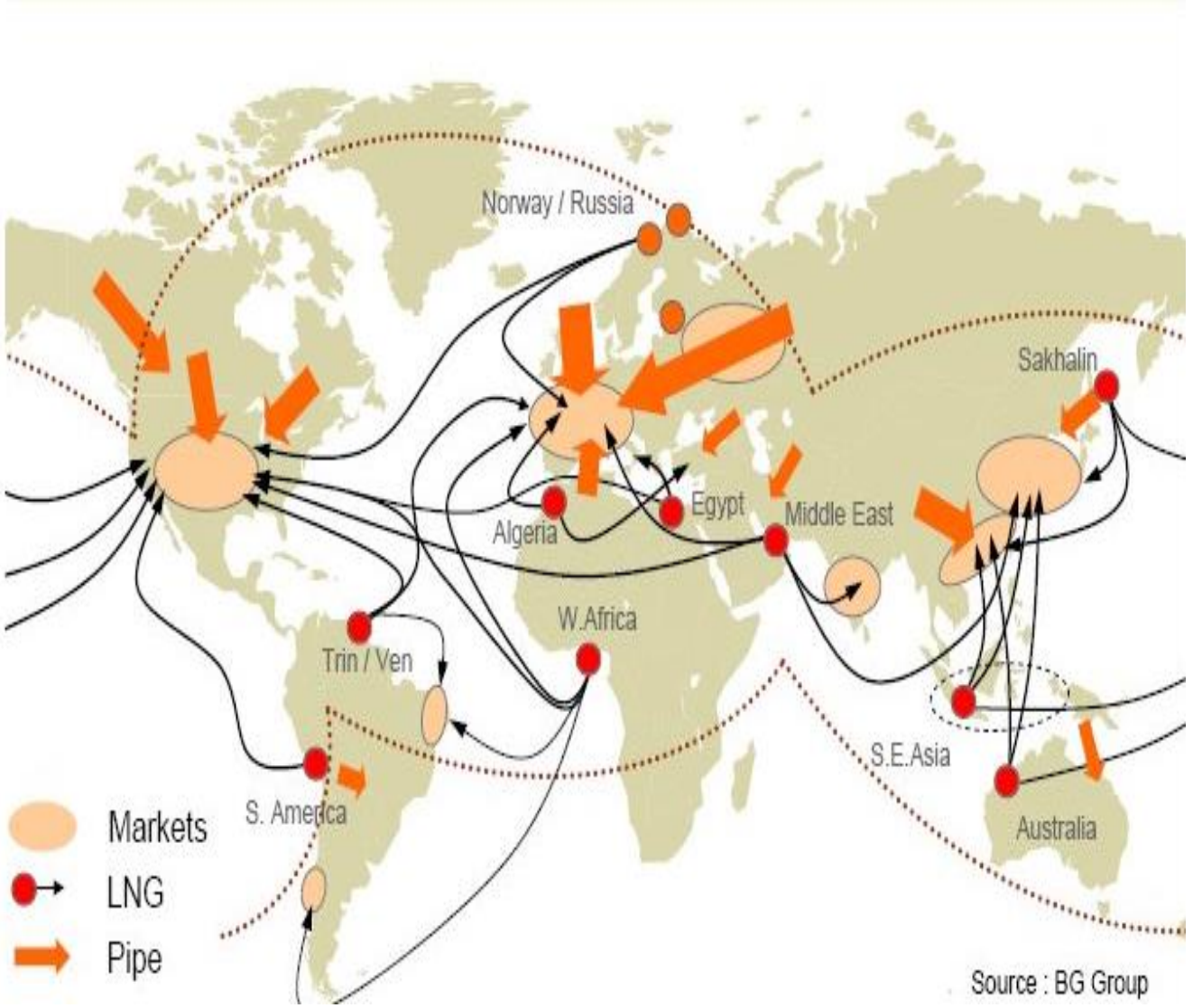
Global Situation before 2010

- Two main production areas:
  - Atlantic basin
  - Pacific basin

- Three main consumption areas:
  - North American market
  - SE Asia
  - Europe

- Growing share of LNG on the overall traded volume.

- The rise of Qatar (and possibly Australia).

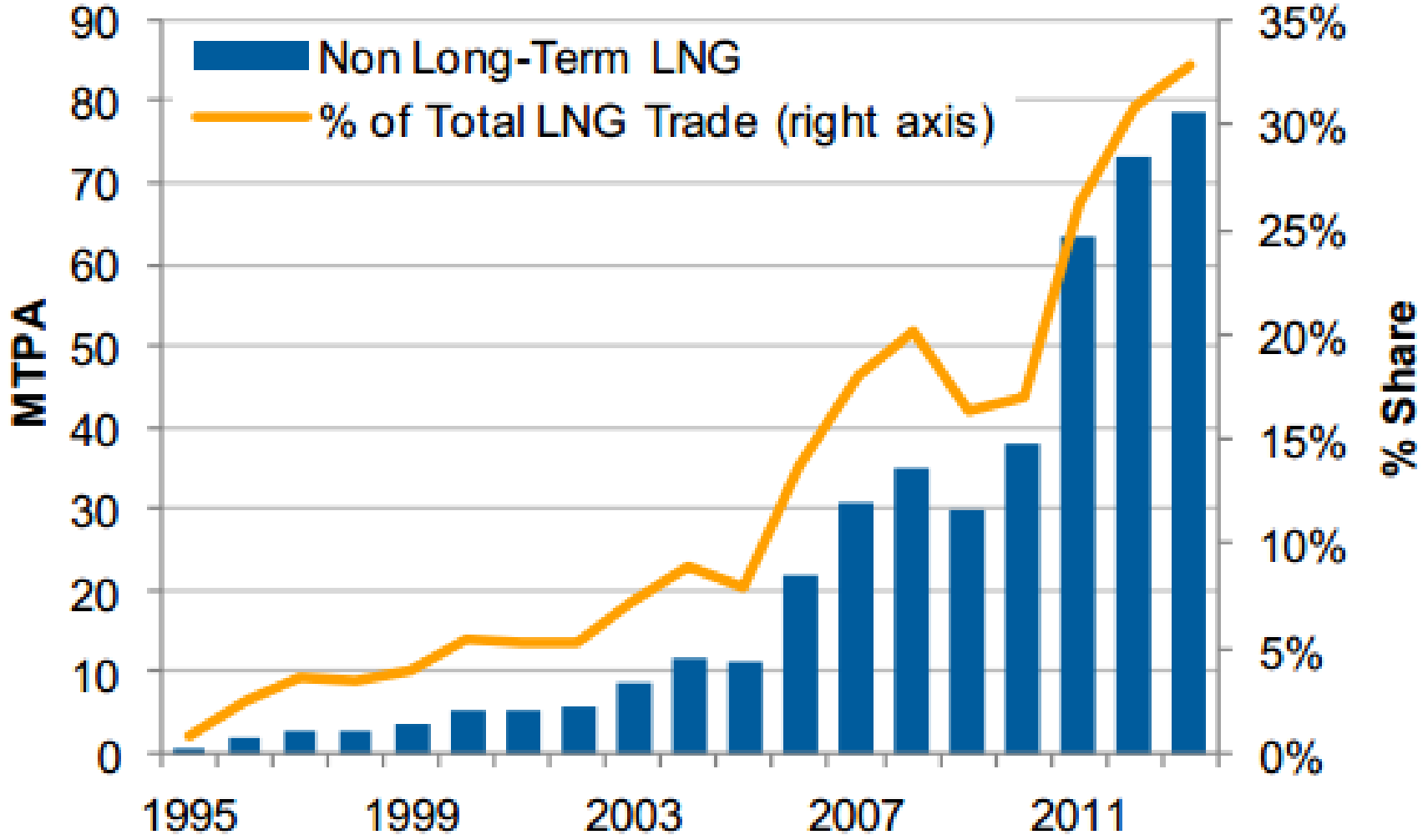


Since 2010

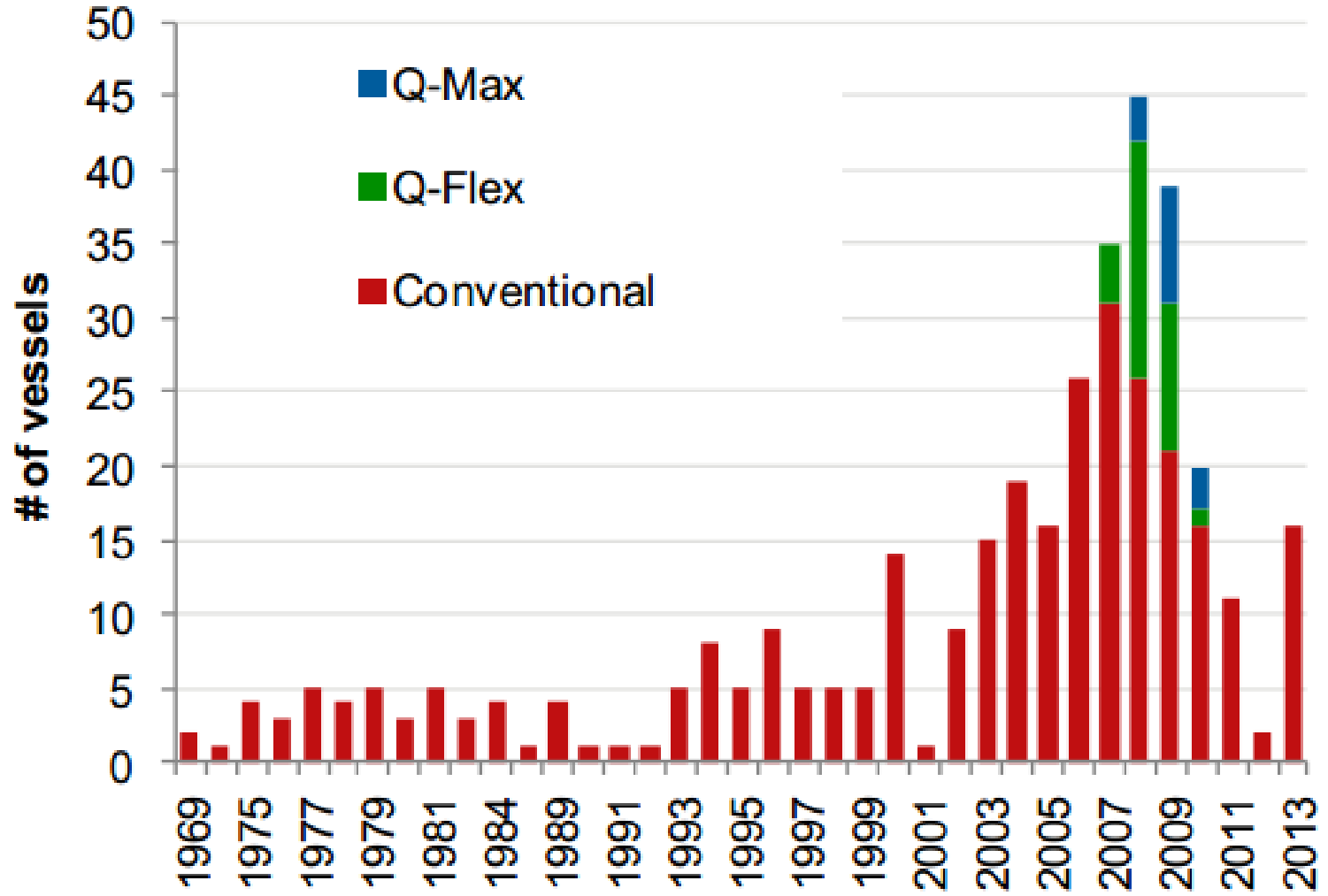
- North America out of the picture

- Rapid rise of flexible trading
  - More LNG contracts with destination flexibility
  - New exporters and importers
  - Balancing needs in traditional markets
  - The continued disparity between prices in different basins which has made arbitrage an important and lucrative monetization strategy.
  - The large growth in the LNG fleet
  - The decline in competitiveness of LNG relative to coal and shale gas
  - The large increase in demand in Asia and in emerging markets

Flexible LNG trading

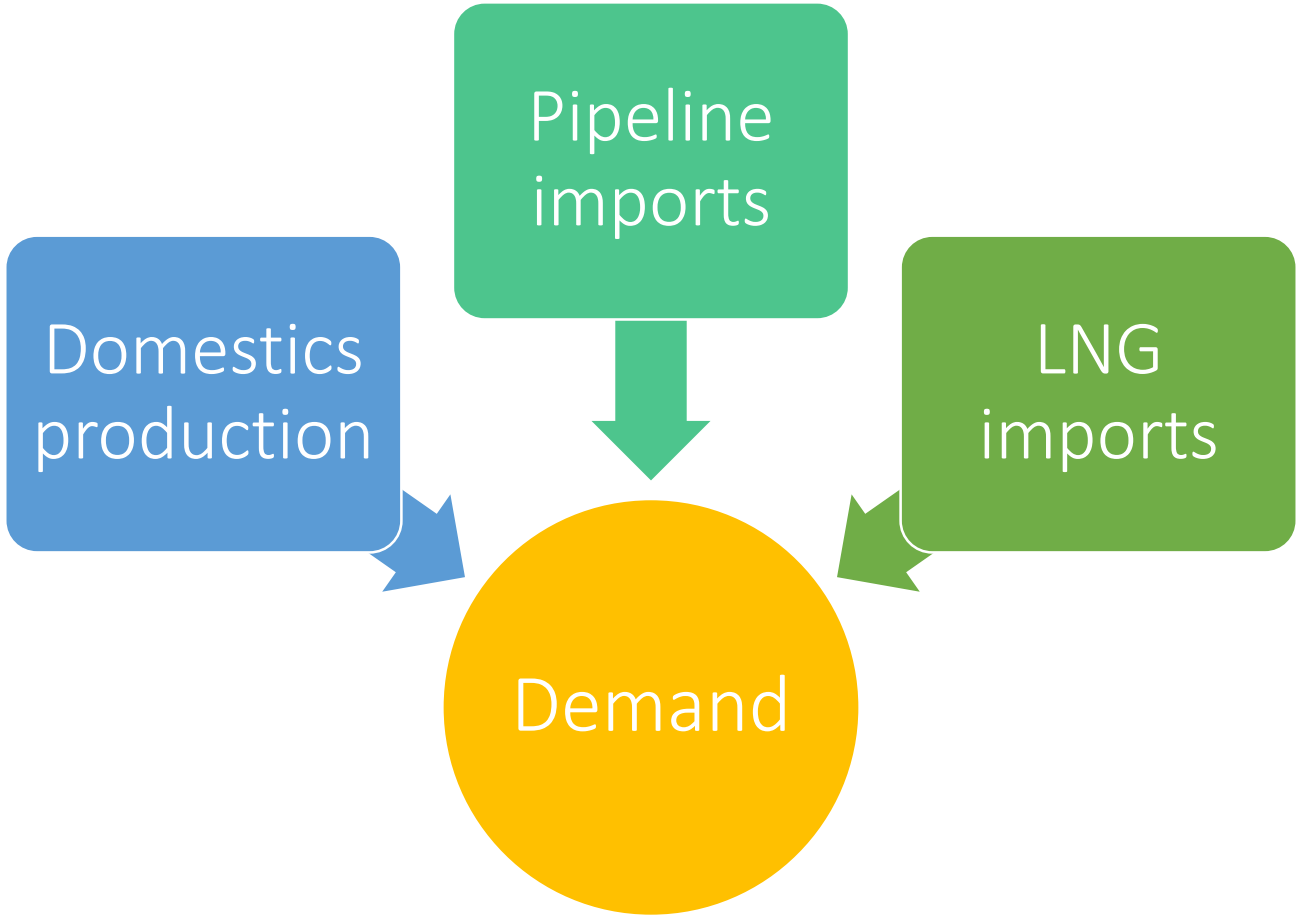


Global LNG Fleet by Year of Delivery

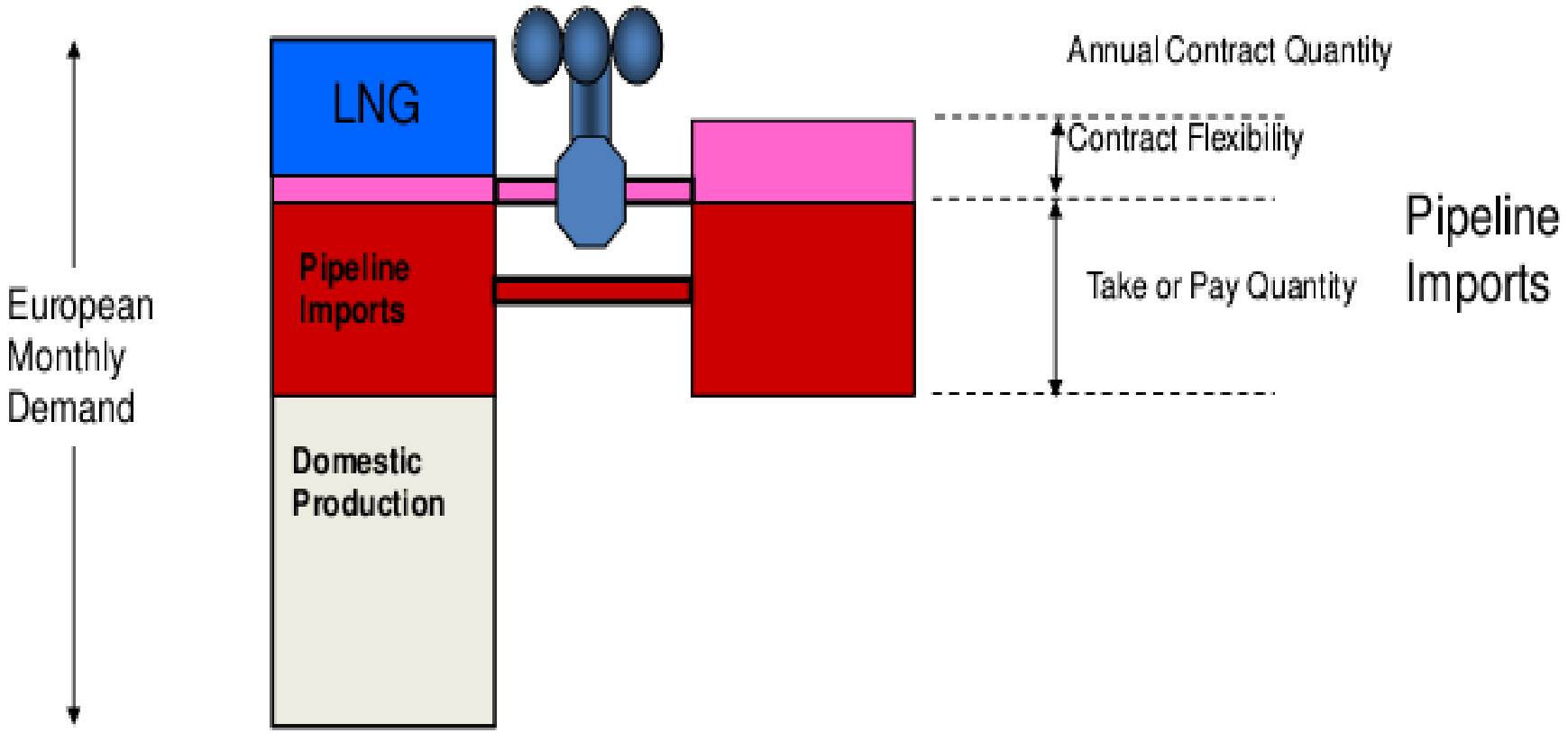


European supply dynamics

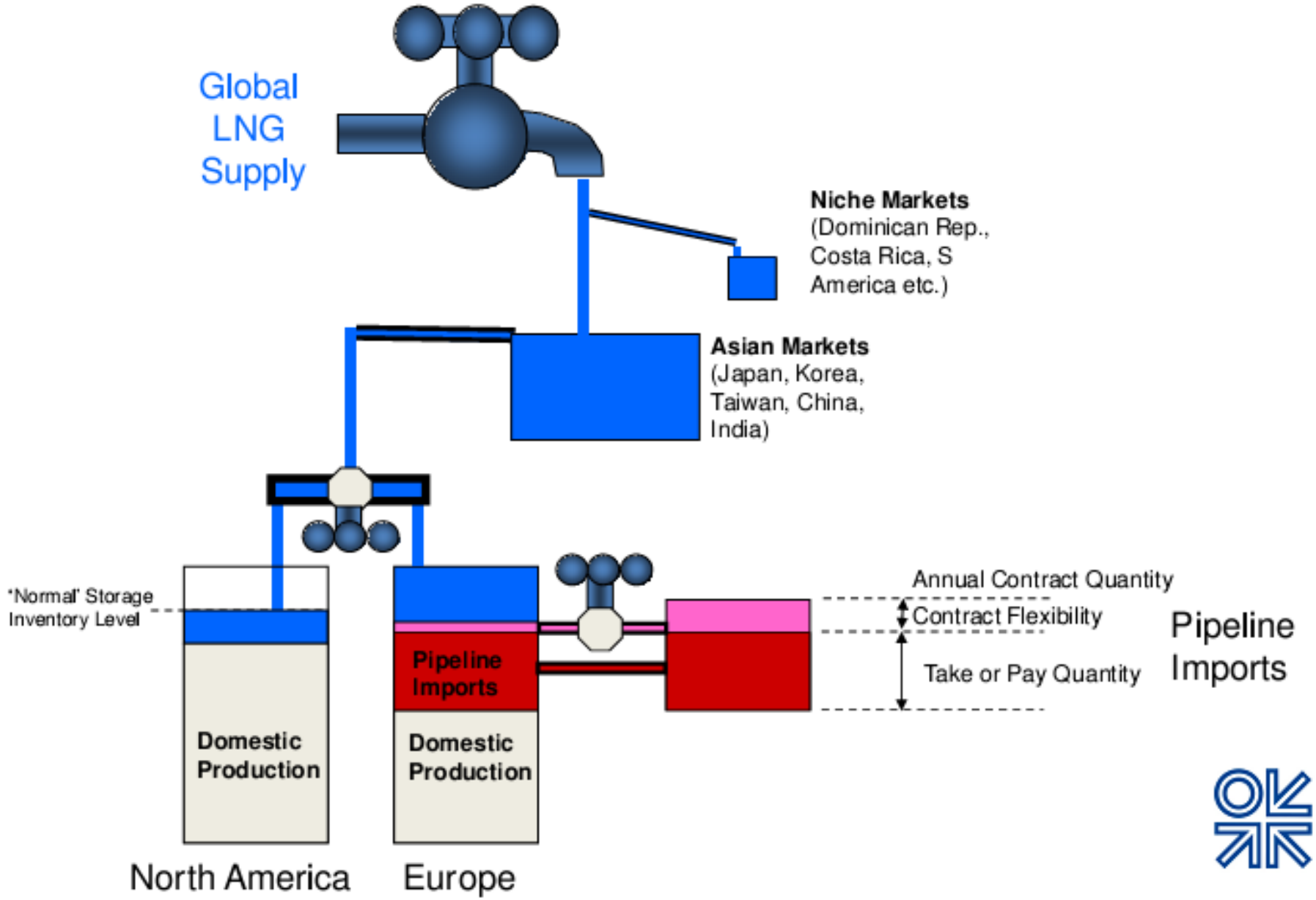
European supply dynamics



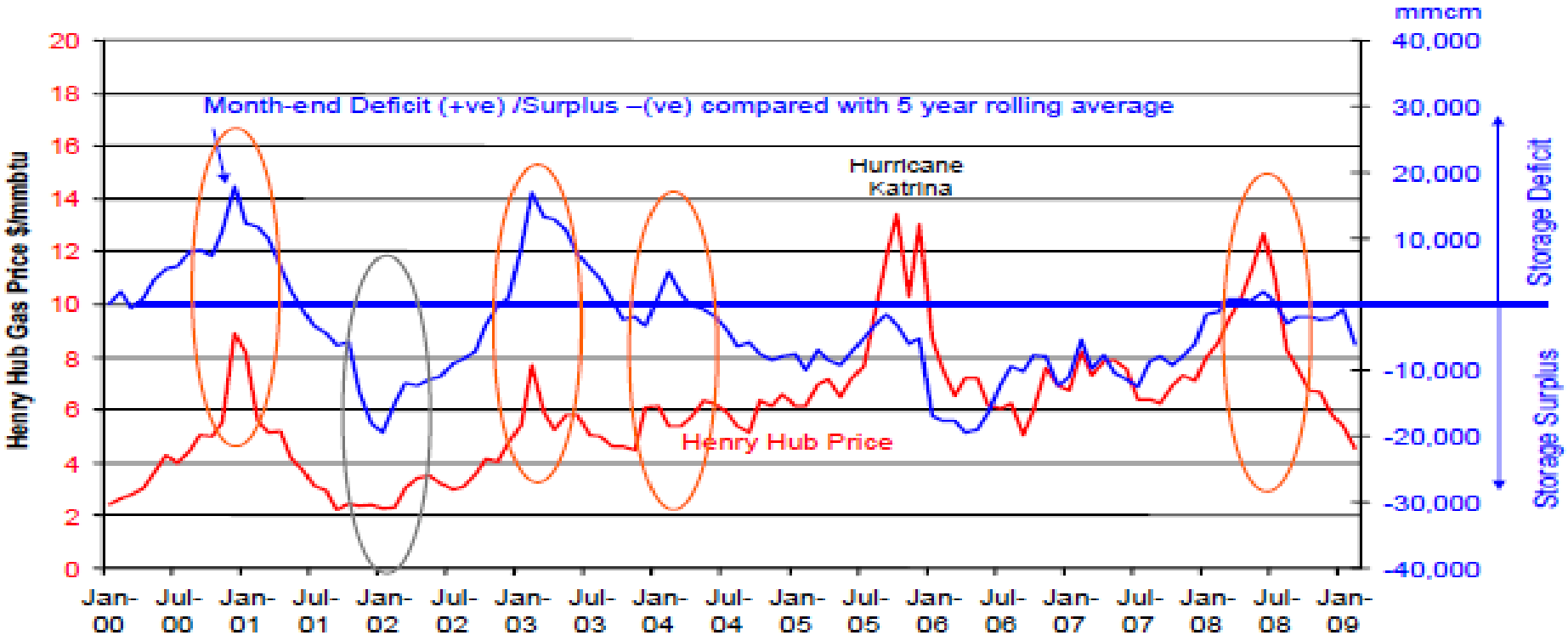
European Supply Dynamics



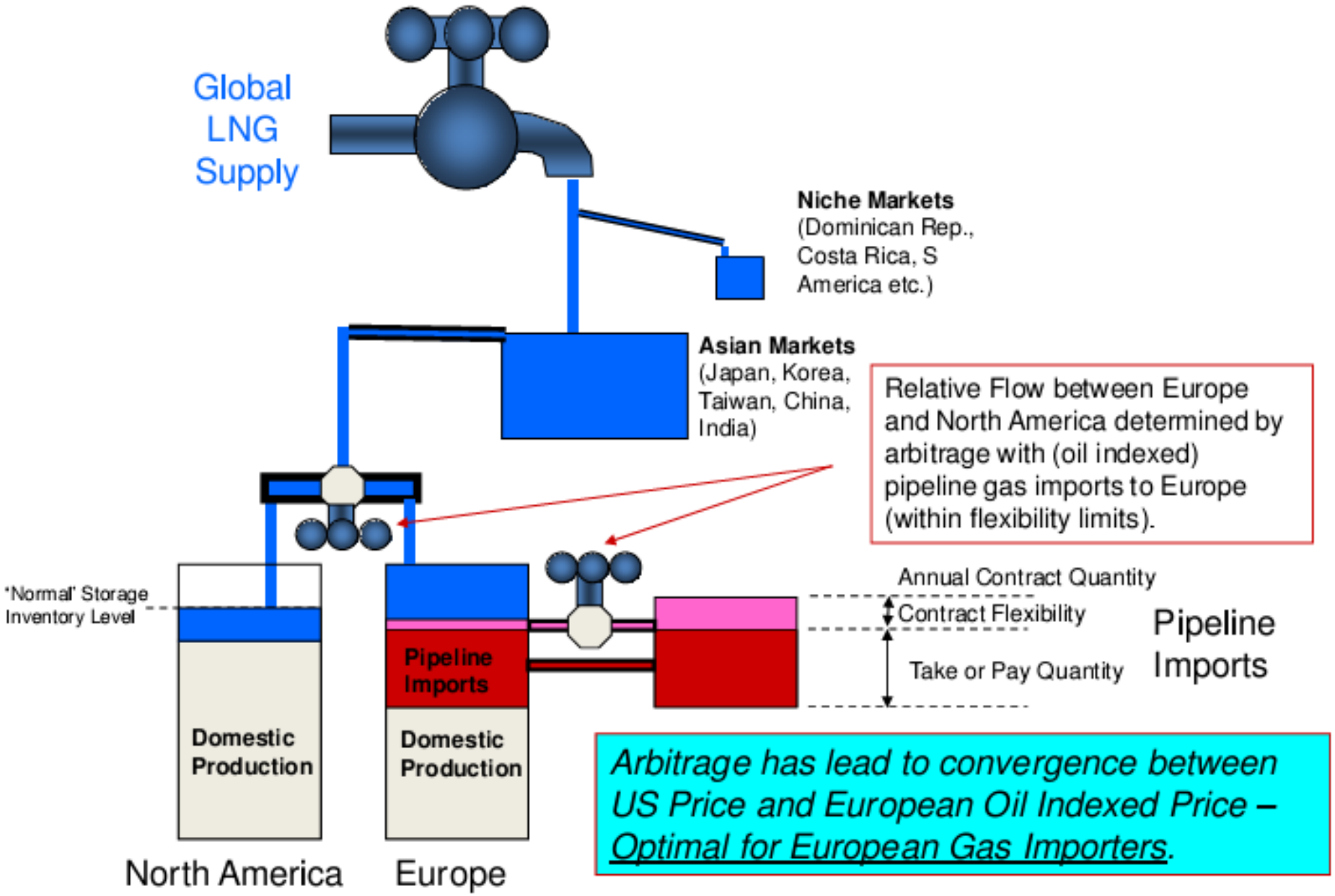
Global LNG System -1



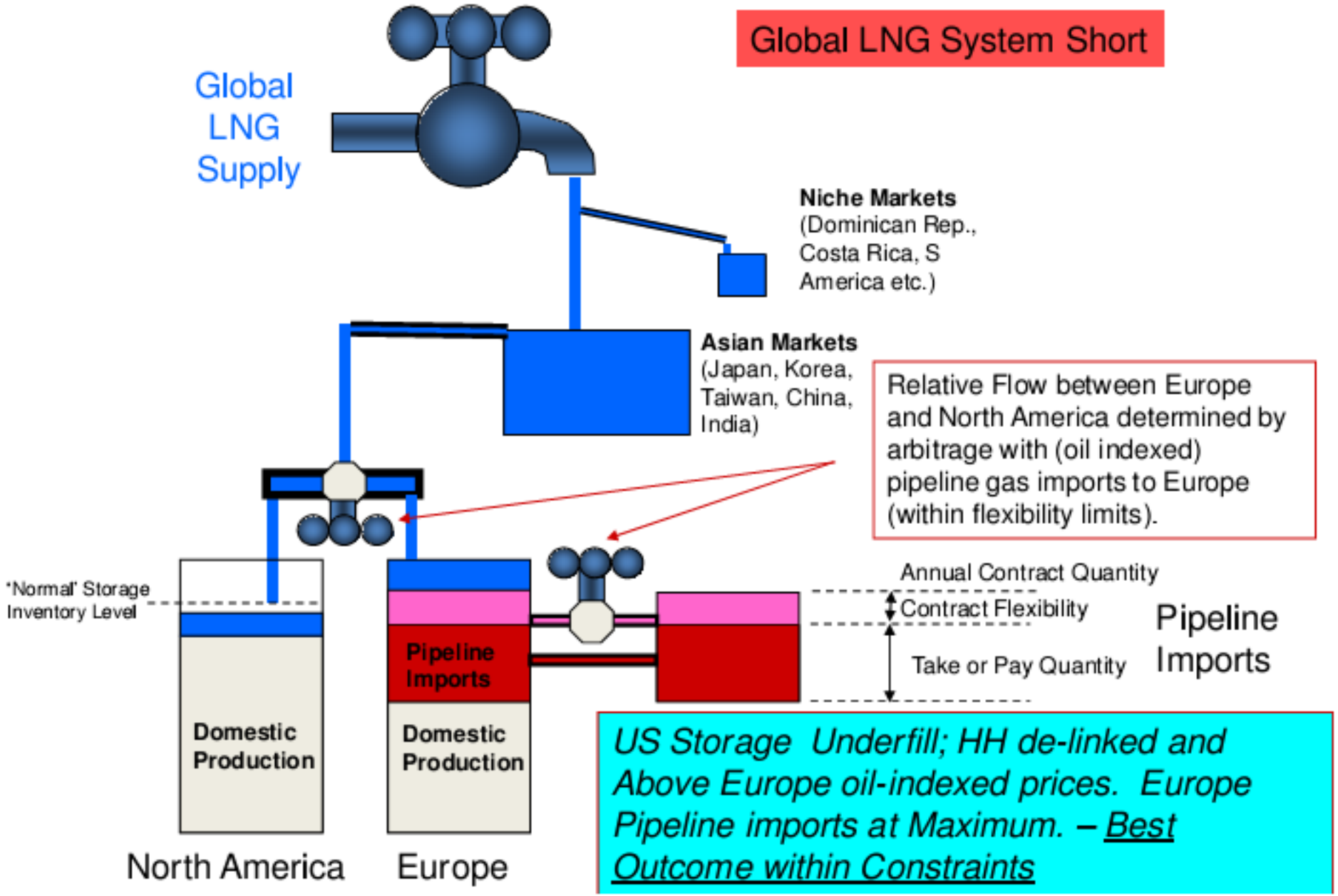
US storage level as a volatility factor



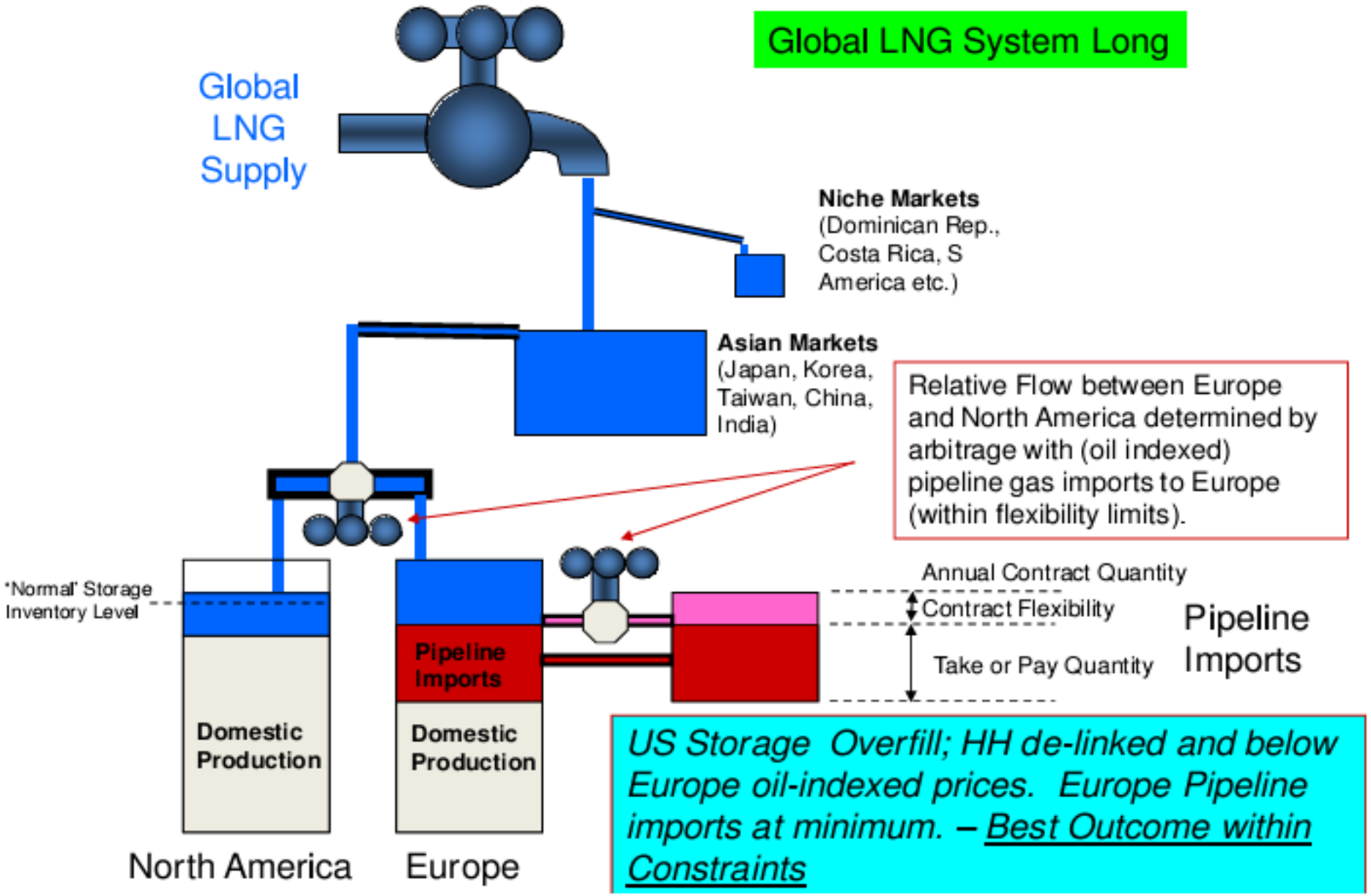
Global LNG System - 1

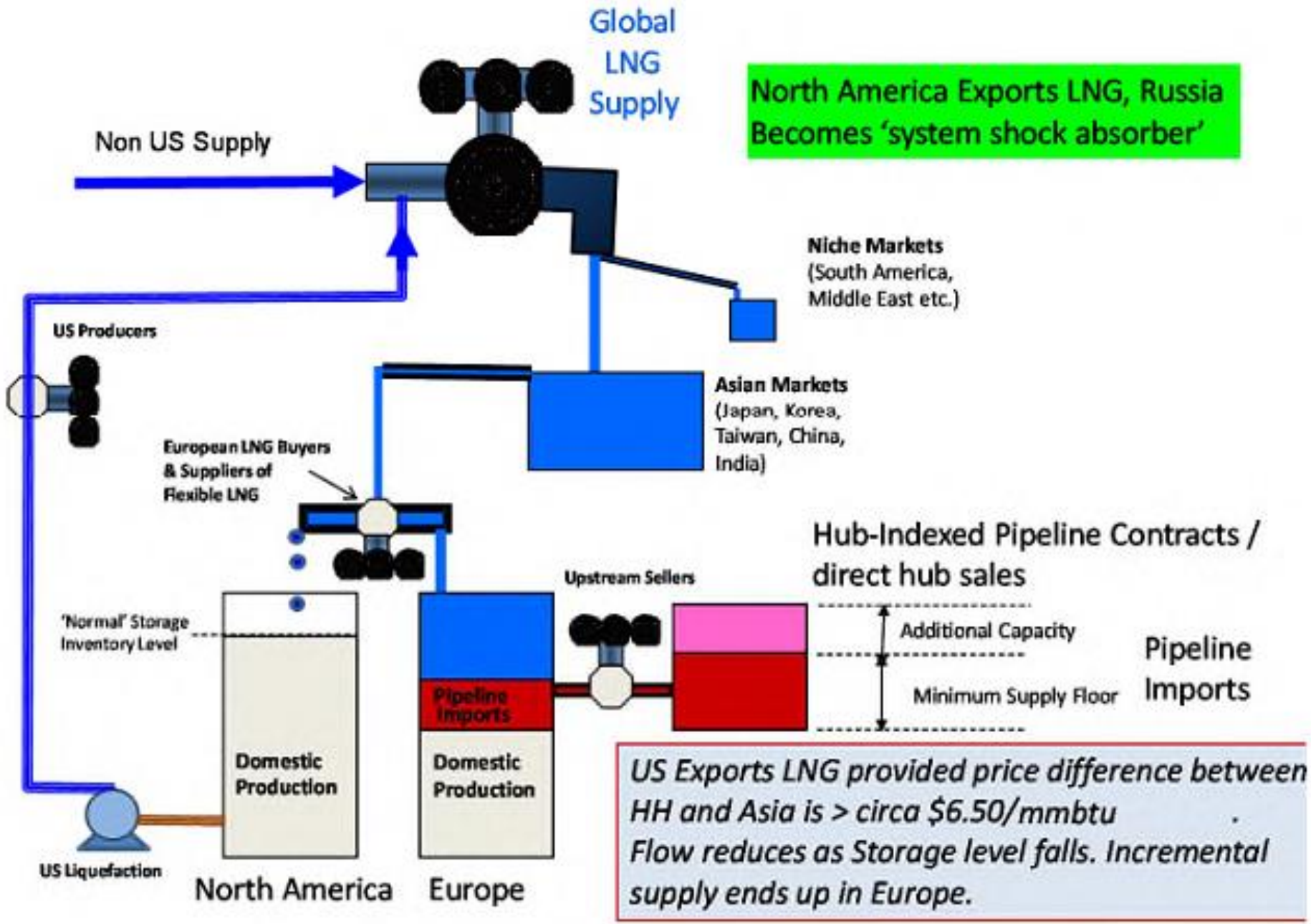


Global LNG System - 5

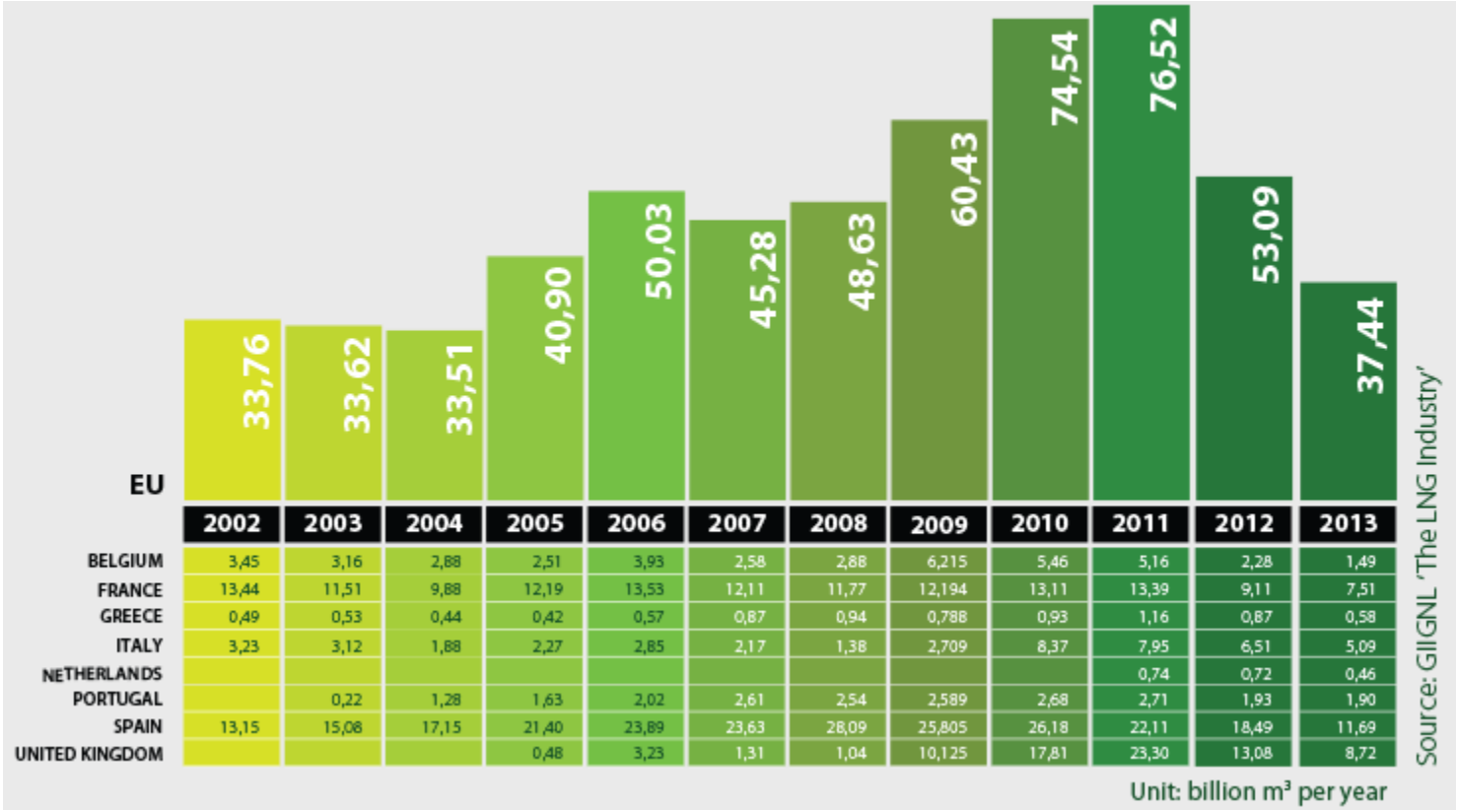


Global LNG System - 4




Global LNG Supply
Non US Supply
North America Exports LNG, Russia Becomes 'system shock absorber'
Niche Markets (South America, Middle East etc.)
US Producers
Asian Markets (Japan, Korea, Taiwan, China, India)
European LNG Buyers & Suppliers of Flexible LNG
Hub-Indexed Pipeline Contracts / direct hub sales
Upstream Sellers
'Normal' Storage Inventory Level
Additional Capacity
Minimum Supply Floor
Pipeline Imports
Pipeline Imports
Domestic Production
Domestic Production
US Liquefaction
North America
Europe
US Exports LNG provided price difference between HH and Asia is > circa $6.50/mmbtu
Flow reduces as Storage level falls. Incremental supply ends up in Europe.

EU LNG imports

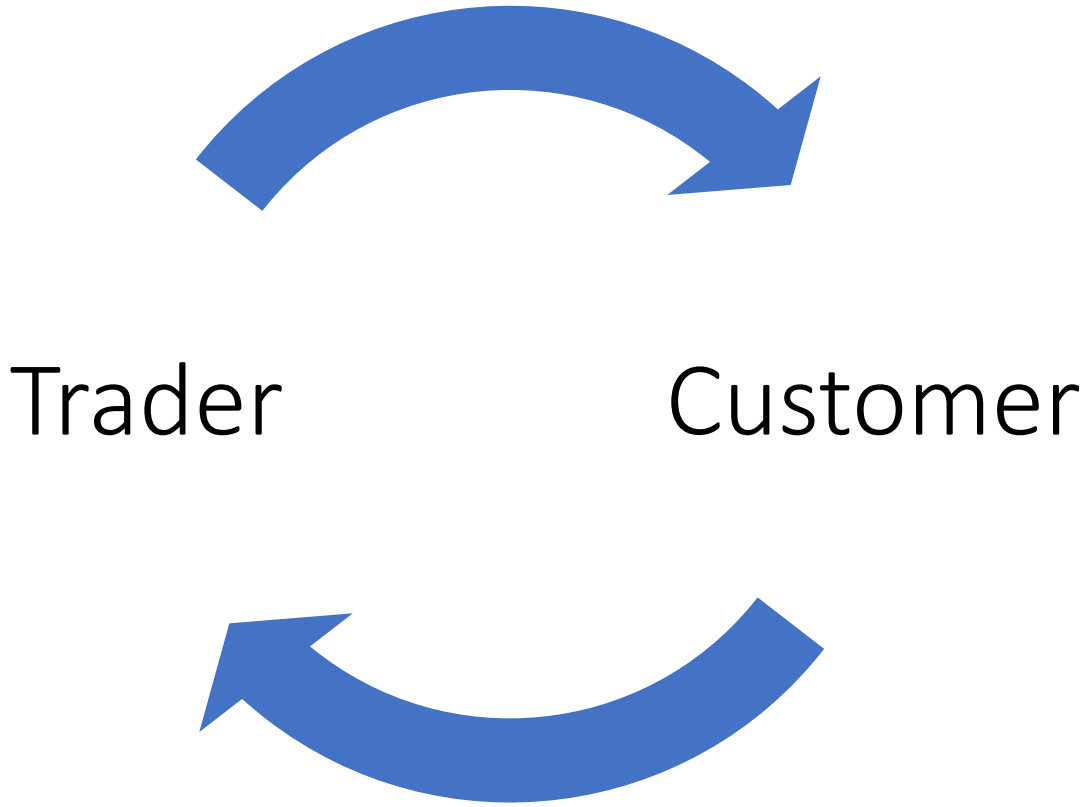


	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
EU												
BELGIUM	3,45	3,16	2,88	2,51	3,93	2,58	2,88	6,215	5,46	5,16	2,28	1,49
FRANCE	13,44	11,51	9,88	12,19	13,53	12,11	11,77	12,194	13,11	13,39	9,11	7,51
GREECE	0,49	0,53	0,44	0,42	0,57	0,87	0,94	0,788	0,93	1,16	0,87	0,58
ITALY	3,23	3,12	1,88	2,27	2,85	2,17	1,38	2,709	8,37	7,95	6,51	5,09
NETHERLANDS										0,74	0,72	0,46
PORTUGAL		0,22	1,28	1,63	2,02	2,61	2,54	2,589	2,68	2,71	1,93	1,90
SPAIN	13,15	15,08	17,15	21,40	23,89	23,63	28,09	25,805	26,18	22,11	18,49	11,69
UNITED KINGDOM				0,48	3,23	1,31	1,04	10,125	17,81	23,30	13,08	8,72

Source: GIIGNL 'The LNG Industry'

Unit: billion m^3 per year

Retail market



Retail price (CZ)

Price components

- Non-regulated: 50-81%
  - Supplier/trader price (wholesale price)
  - Storage price
- Regulated: 19-50%
  - Transmission (high-pressure network)
  - Distribution (low-pressure network)
  - Market operator services (balancing, clearing)
  - Gas tax (legal entities)
  - VAT

Customers

Up to 1.89 MWh/y – just cooking
1.89-7.56 – cooking and hot water
More than 7.56 – heating

20-25 MWh/y – typical household

Below 630 MWh/y – „small customer“ by law (protected customer)

Trader-customer relations

Competition and retentive programs

- 24/7 assistance services
- Energy consultancy (efficiency, furnaces, insulation, lighting)
- Price
- „Personal assistant“
- Discounts on (un)related services (mobile tariffs, fitness, ...)

Trader-customer relations

- Customers prefer price to other benefits
- Traders want them to prefer other benefits

- Large customers change supplier every year
- Households:
  - 1/3 already switched
  - 2/3 not incentivized

Trader-customer relations

At what price it makes sense to gain or maintain a customer?

- Margin
  - Gross: margin per MWh (smaller customers bring more profits due to limited negotiation position)
  - Net: margin per MWh including salaries, advertising, etc. (large customers bring more profits due to tiny margin x great volumes)

    => Portfolio: small customers unstable in offtake (weather) and stable in contracts; large customers stable in offtake and unstable in contracts
- Negotiation position: price, individual terms of service => dozens of products (tariffs) now on the market
- The treshold between small and big customer is getting lower (100-200 MWh/y)

At the price when gross margin > acquisition costs.

Trader-customer relations

Door to door contracting (D2D)

Direct, or

Outsourced:

+ Time efficient
+ Cost efficient
+ Coverage
+ Powerful channel

- No exclusive cooperation
- Whole portfolio moving
- Ignoring portfolio
- Faking offtake volumes for more commision

In the shoes of a trader...

- Searching for purchase oportunities
- Fighting for customers
- Fighting with customers
- Regulation to follow:
  - National law
  - Original European directives (implementation risk)
  - European Court of Justice‘s rulings
  - Rulings of the Member states‘ highest courts