

Natural gas markets

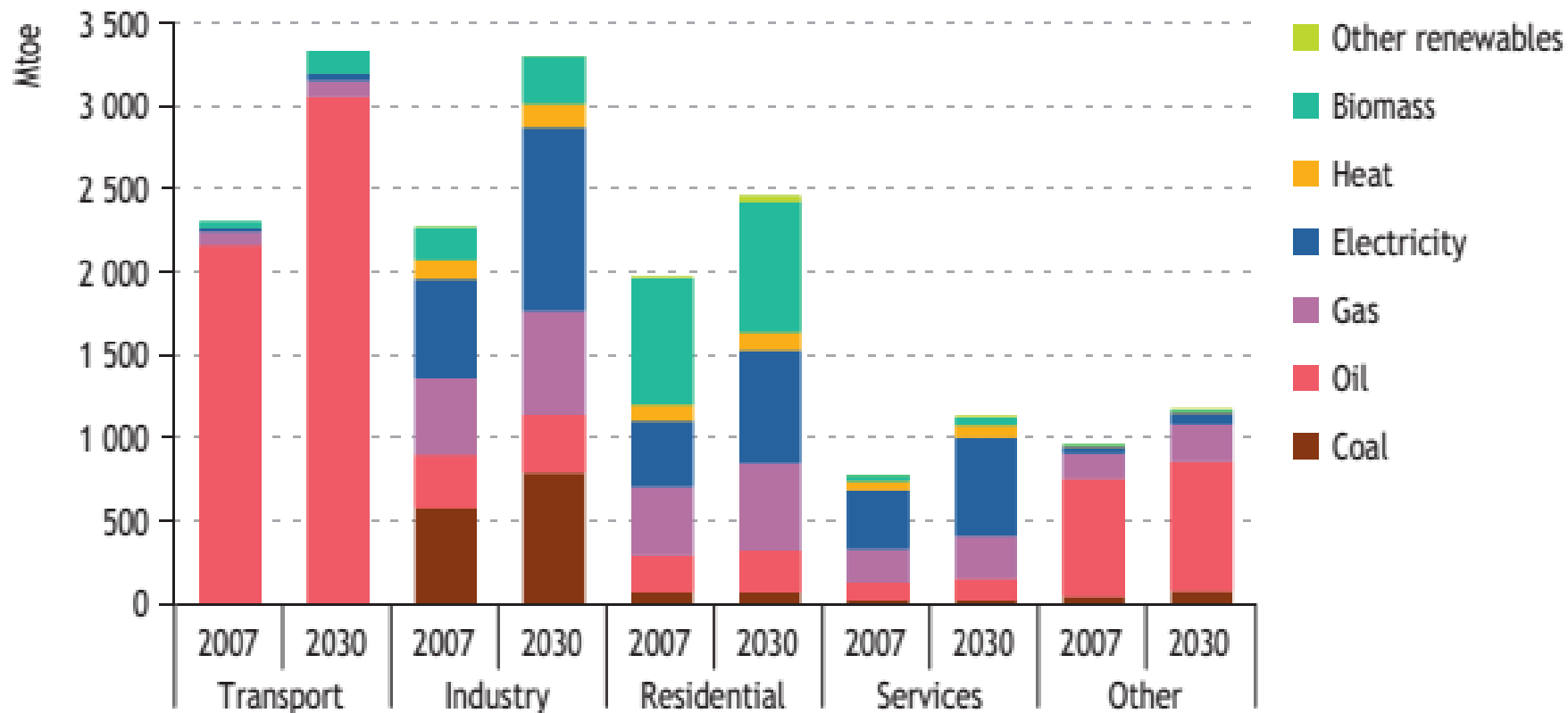
Jan Osicka

Natural gas and oil

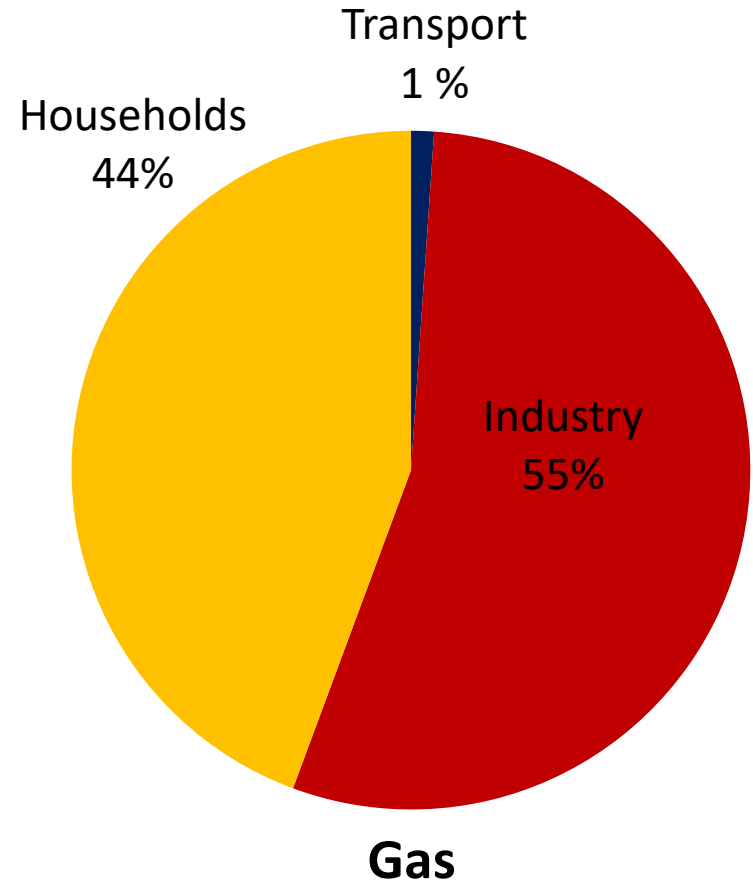
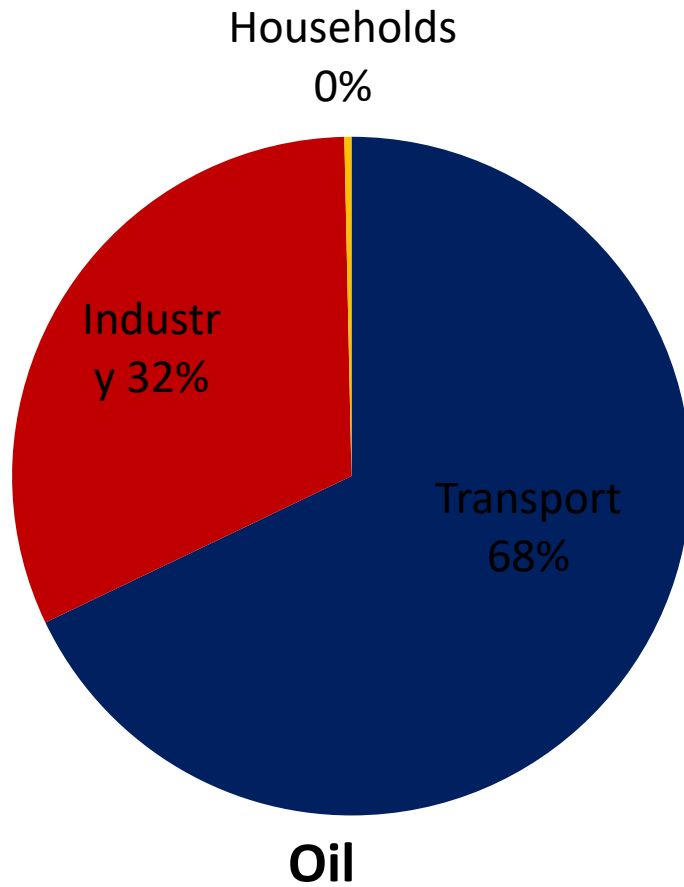
- Production: complements
- Consumptions: substitutes

- 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

Figure 40: Schematic of a Typical European Gas Industry in the Monopoly Era

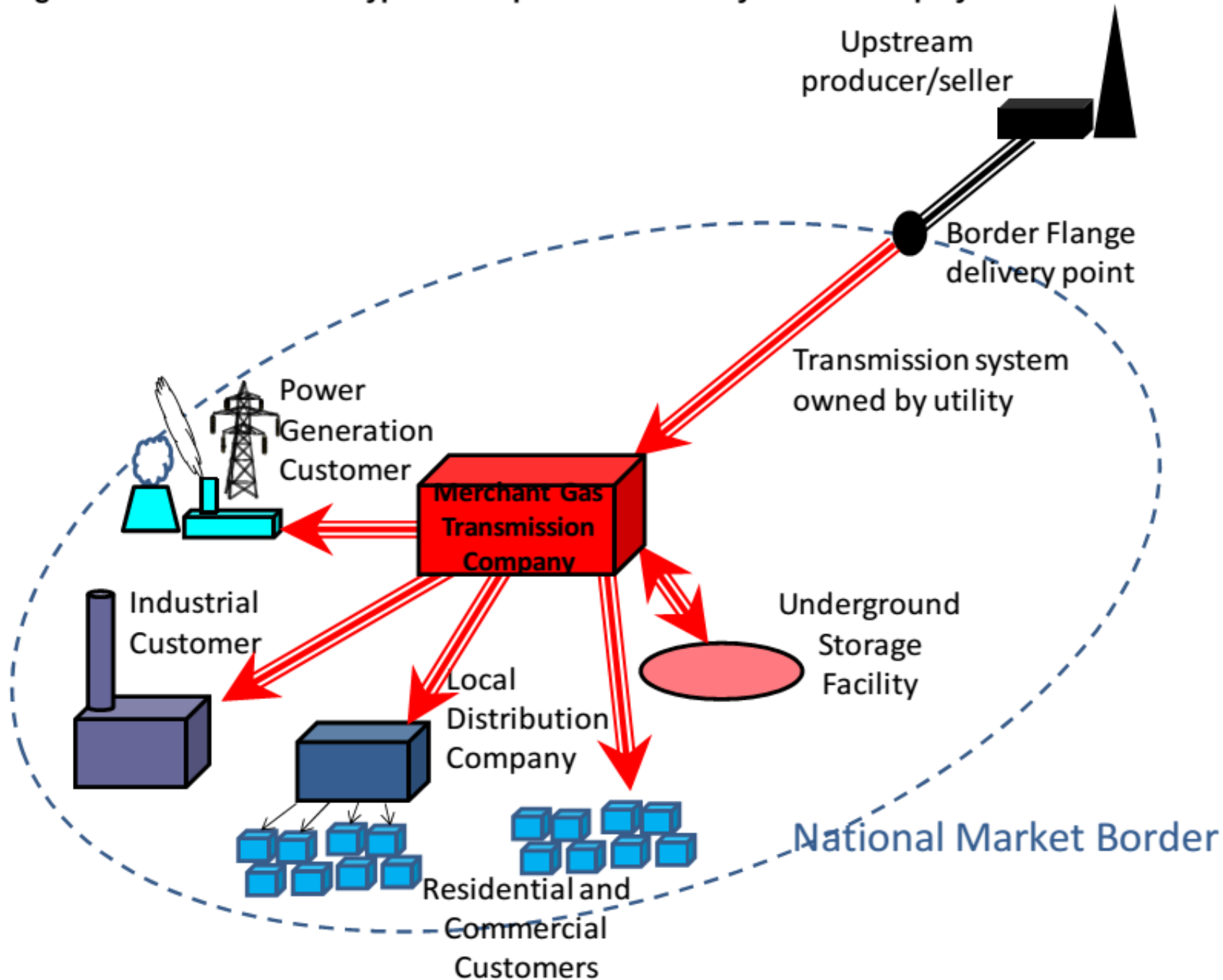
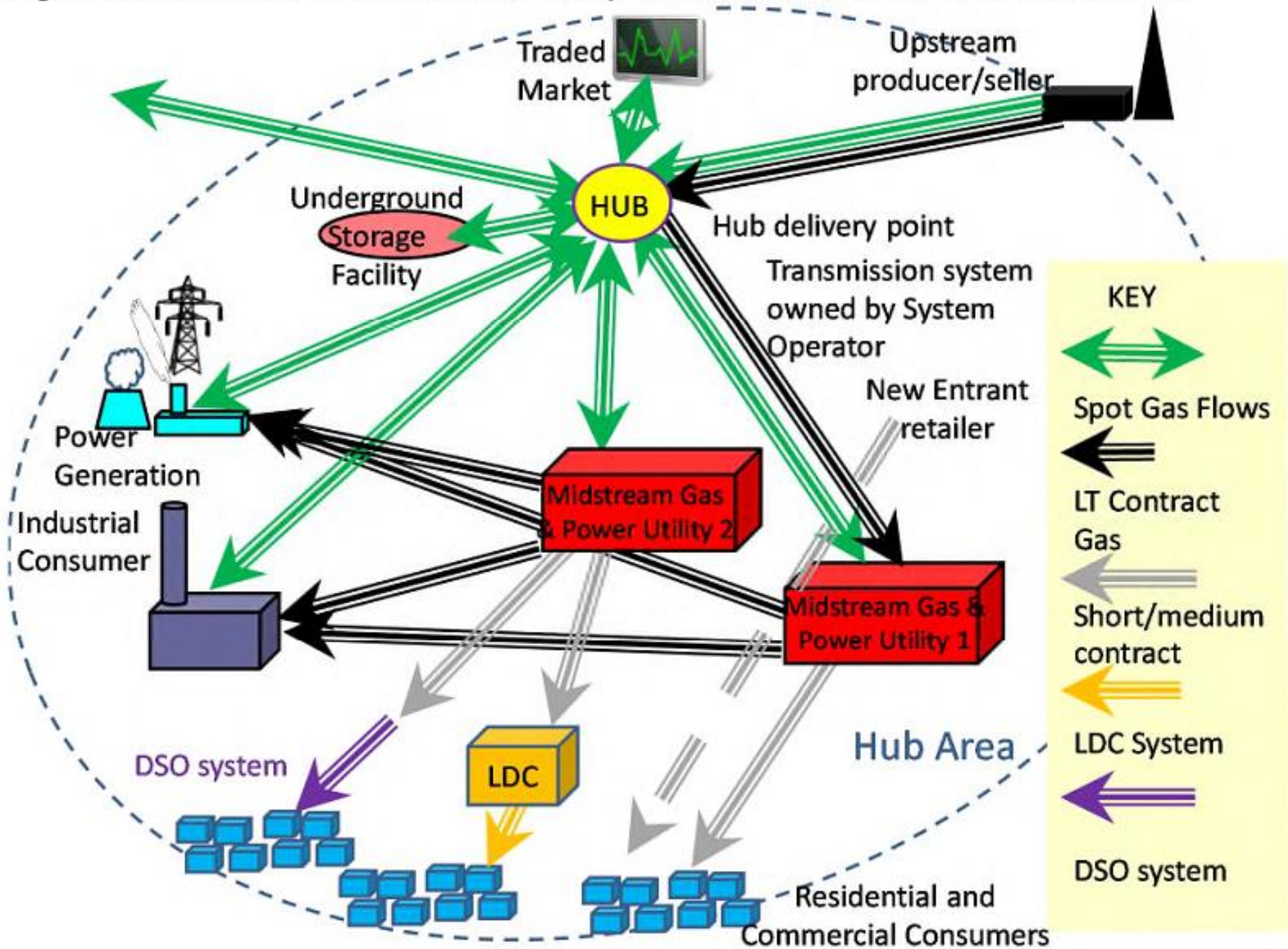


Figure 43: Schematic of a Continental European Market with an Established Gas Hub



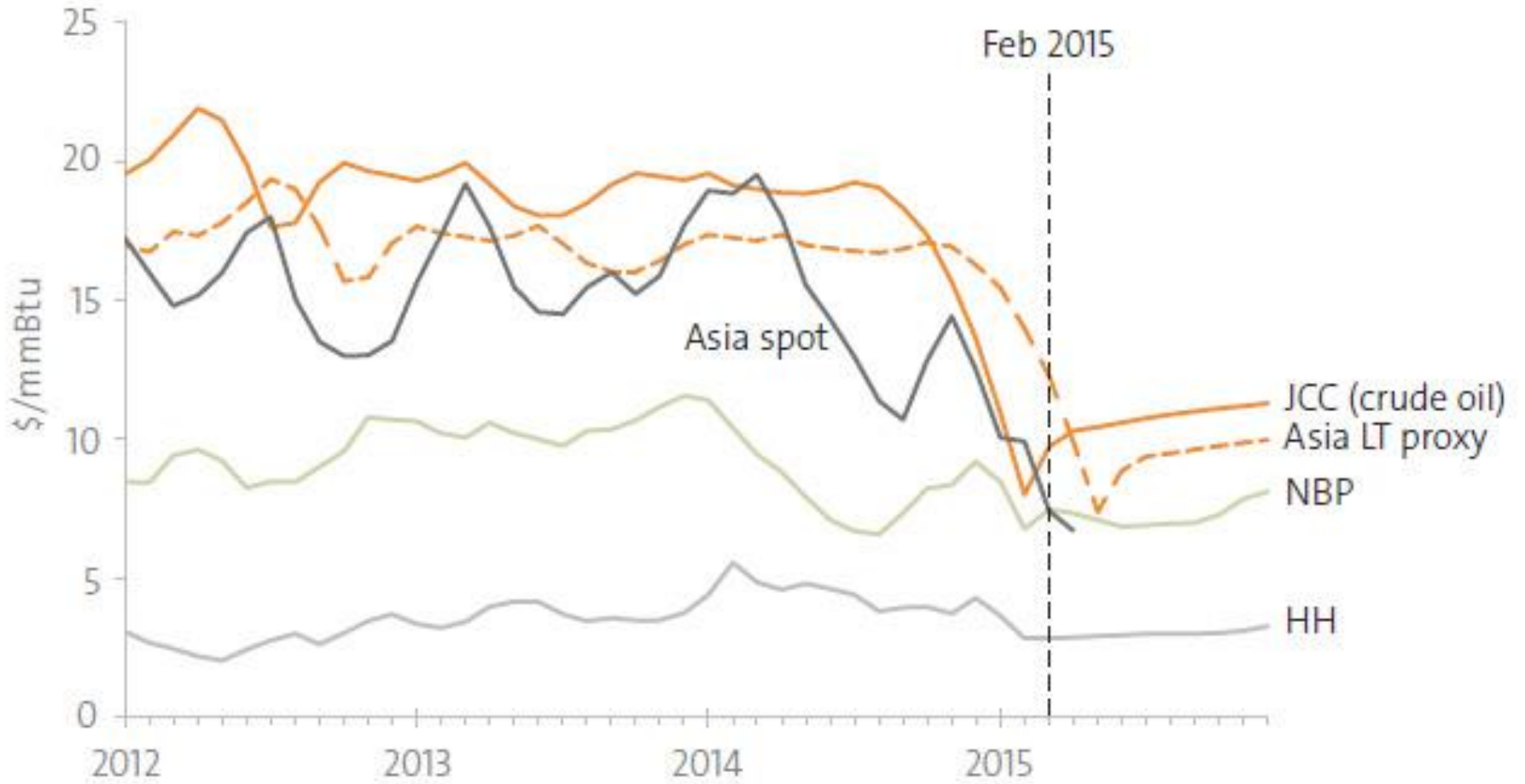
Pricing

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

European NG and Brent Prices vs. GAZPROM Export Contract Prices



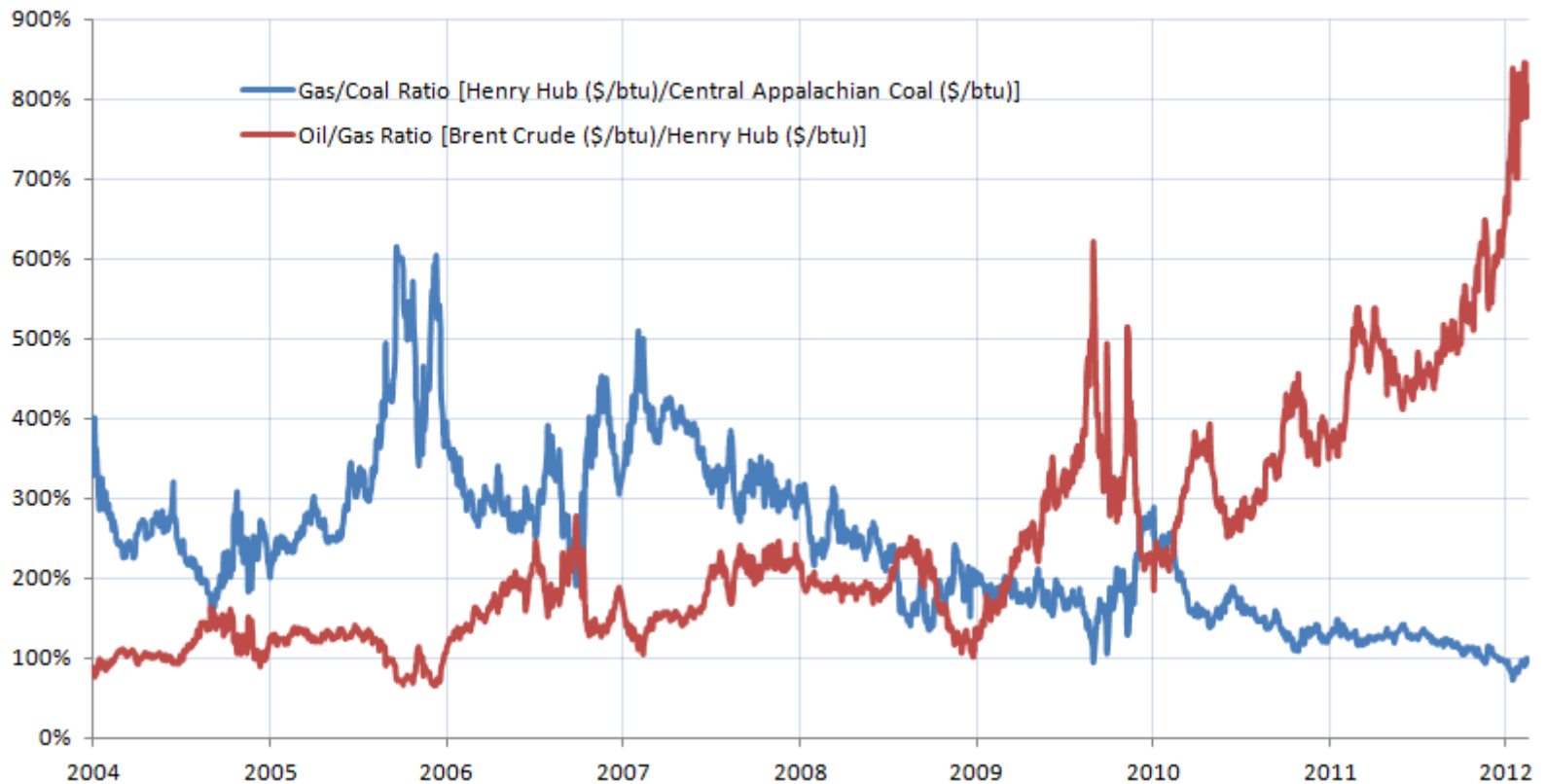
— GASPOOL Spot Price — GAZPROM Export Contract Price — Brent Crude - - - Linear (Brent Crude)

Gas-to-gas competition



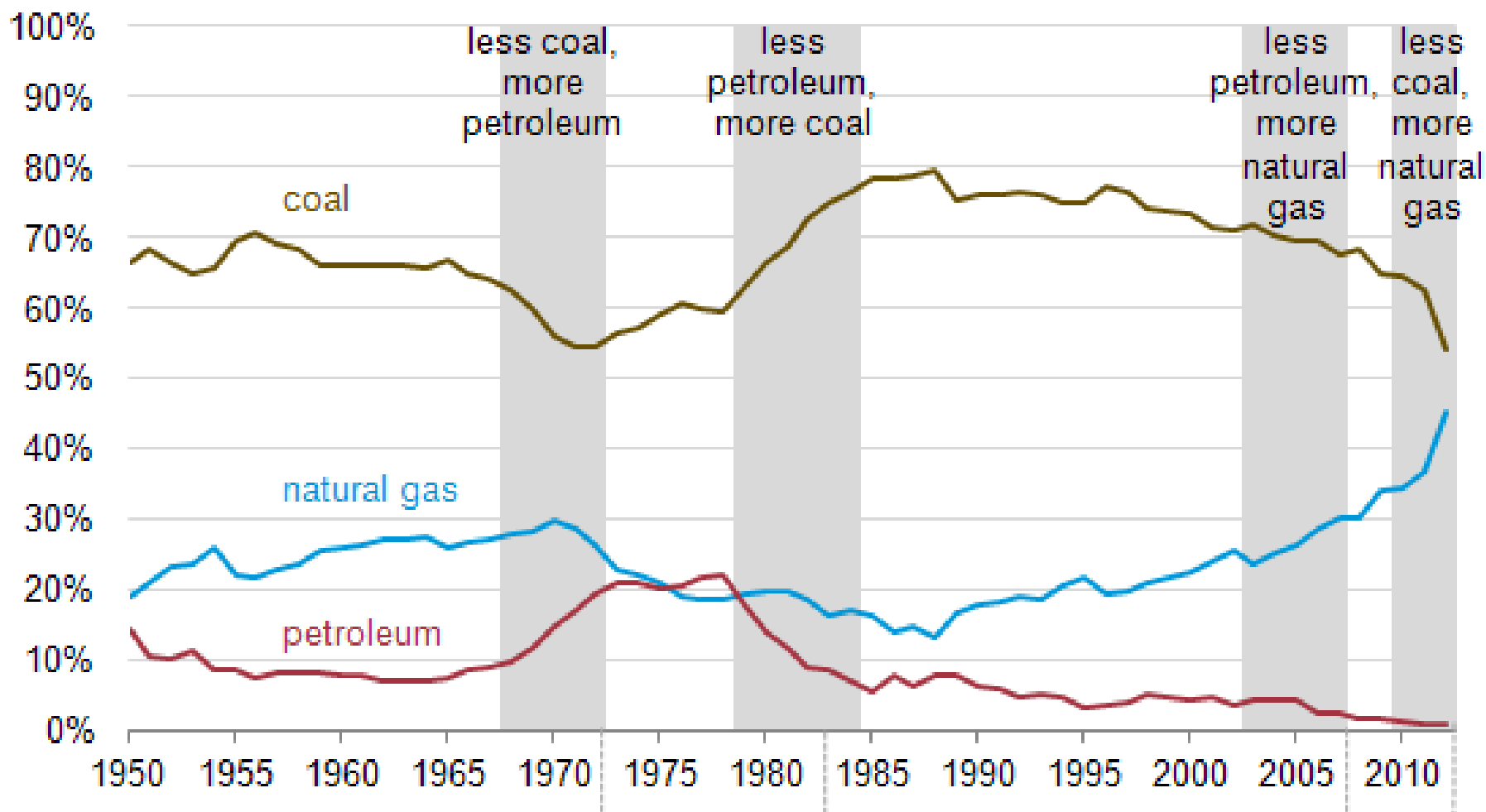
Fuel-to-fuel competition (USA)

Oil/Gas Ratio and Gas/Coal Ratio 2004 - 2012



Fuel-to-fuel competition (USA)

Annual share of fossil-fired electric power generation, 1950 - 2012*



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 fundamentals – liquidity, demand
 - Storage capacity
 - Regulation: TPA

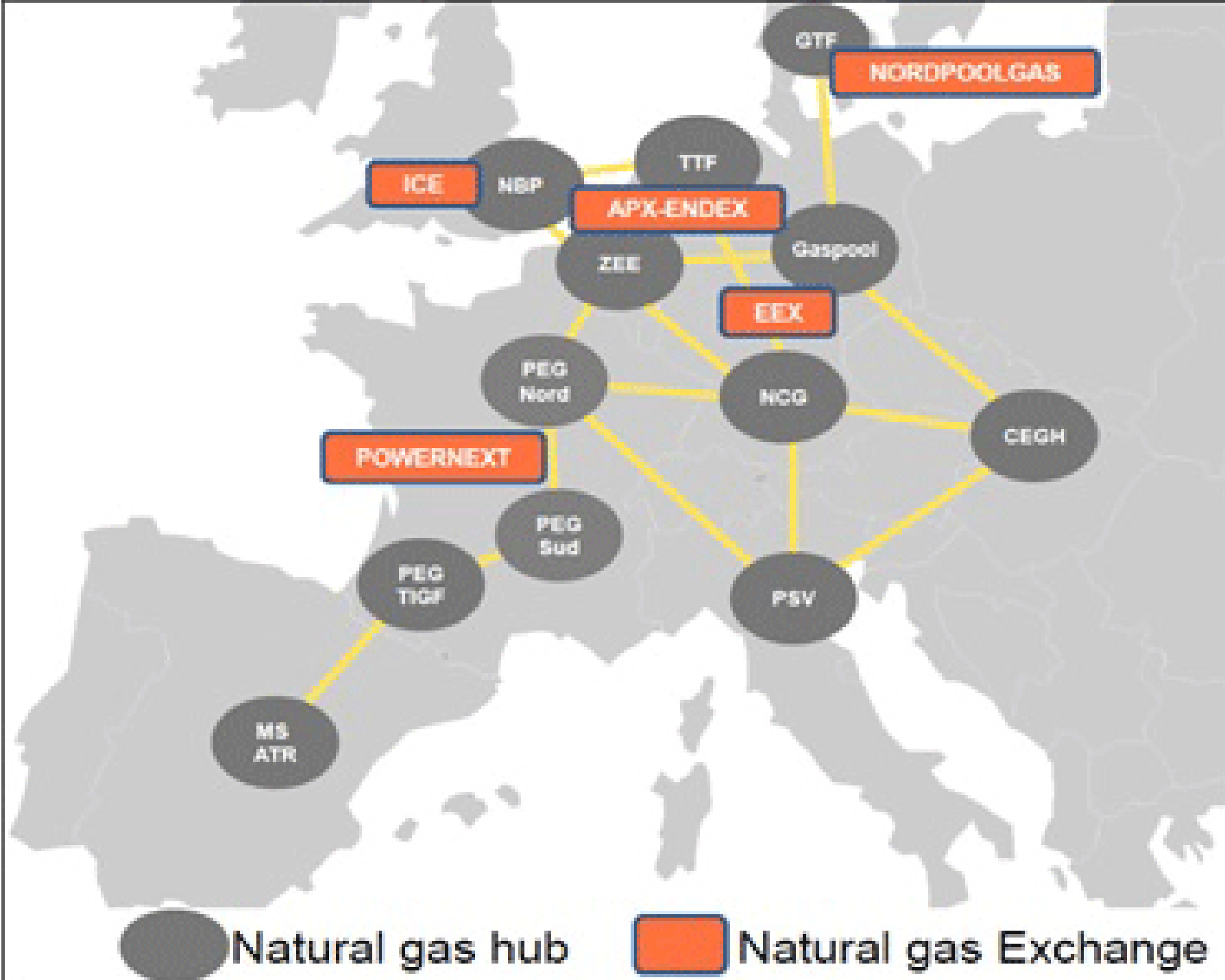
Hubs

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)



OTC

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

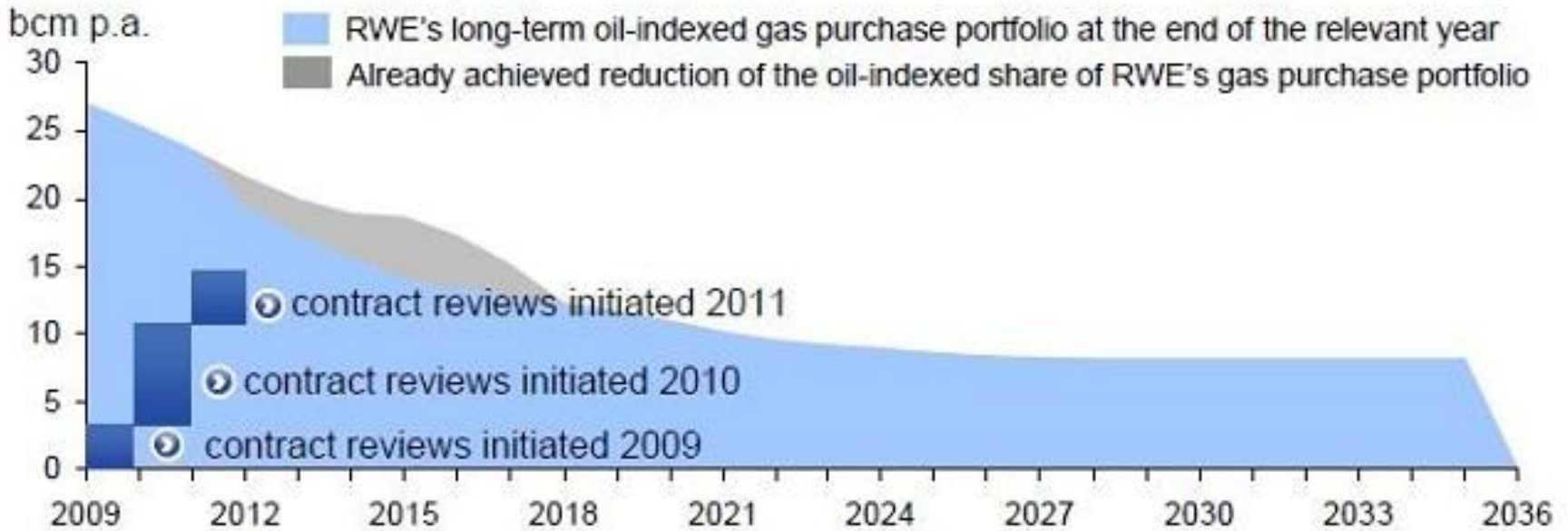
Bilateral negotiations

- 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

$$\begin{aligned} P(m) = & P(o) \\ & + 0.60 \times 0.80 \times 0.0078 \times (\text{LFO}(m) - \text{LFO}(o)) \\ & + 0.40 \times 0.90 \times 0.0076 \times (\text{HFO}(m) - \text{HFO}(o)) \end{aligned}$$

... 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

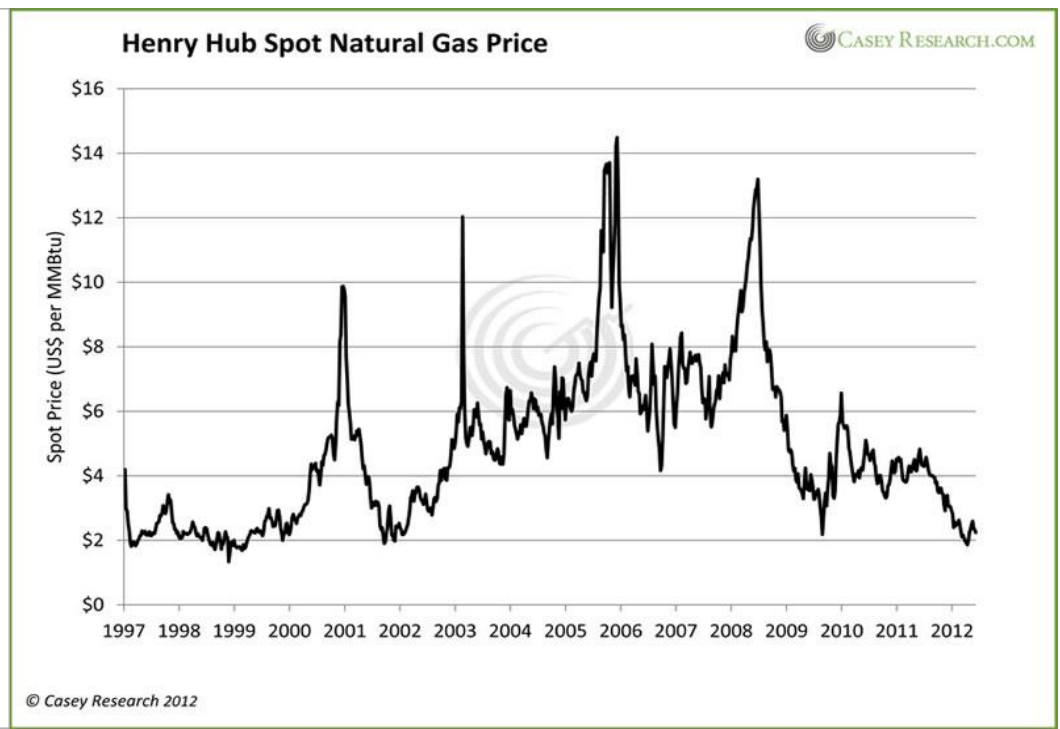
Energy content parity

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

- Brent = **\$120** => NG = $0.172 \times 120 = \mathbf{20.64}$ \$/MMBtu (Brent parity)
- Brent = **\$20** => NG = $0.172 \times 20 = \mathbf{3.44}$ \$/MMBtu (Brent parity)

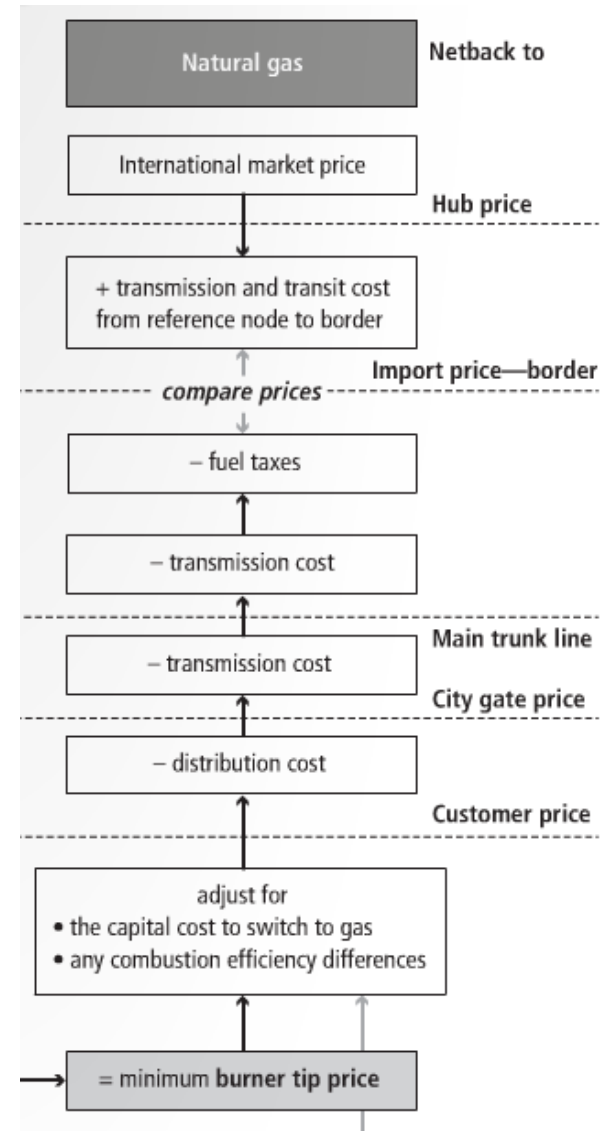
» Producers (Qatar, Russia) usually prefer oil indexation

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



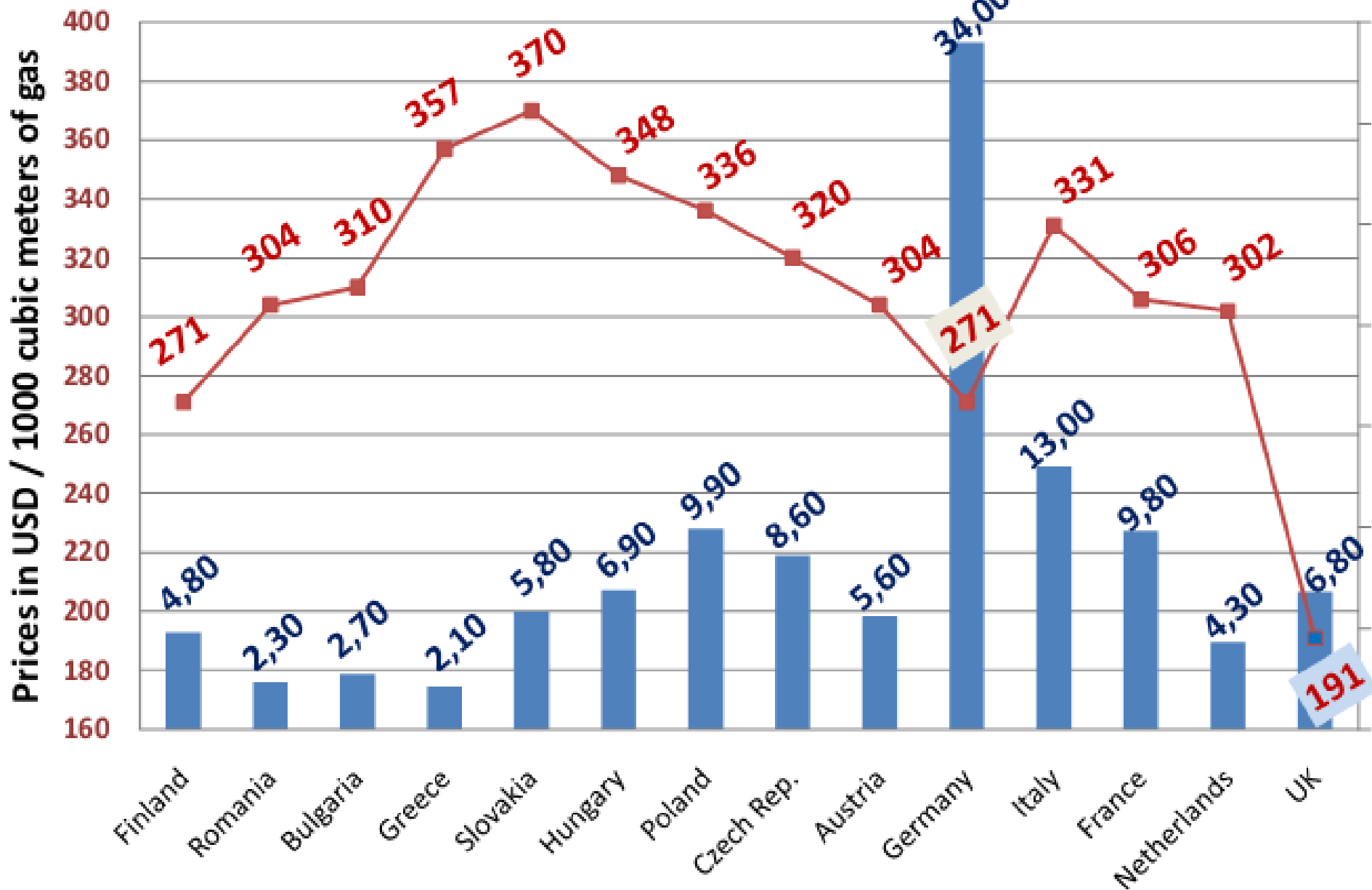
Pricing formula: Netback pricing

- *Netback price* = replacement value
- What is the maximum competitive price?
- Netback to natural gas
- Netback to other fuels

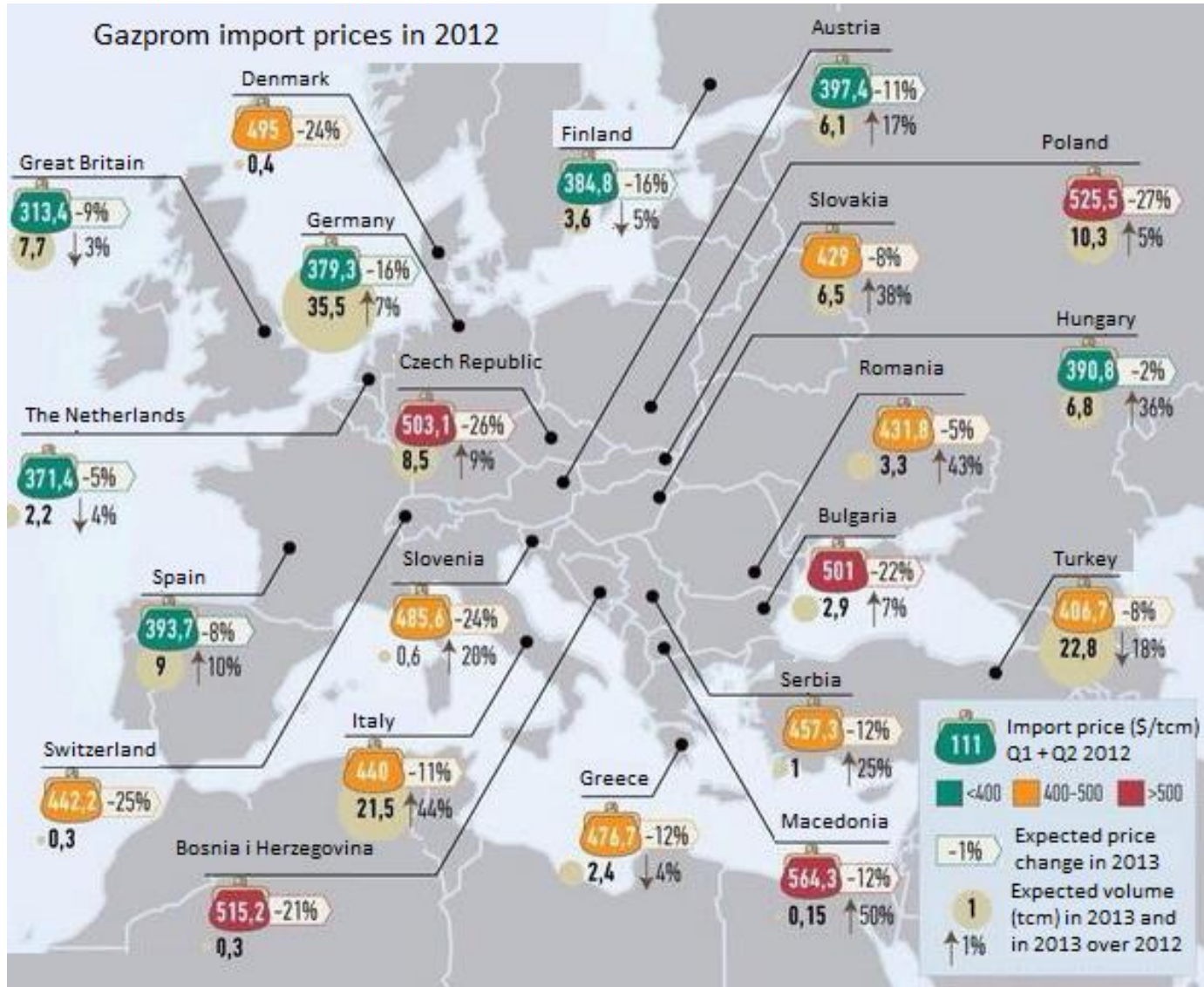


Gazprom gas prices for EU – 2010

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



Russian import price in 2012



Additional clauses

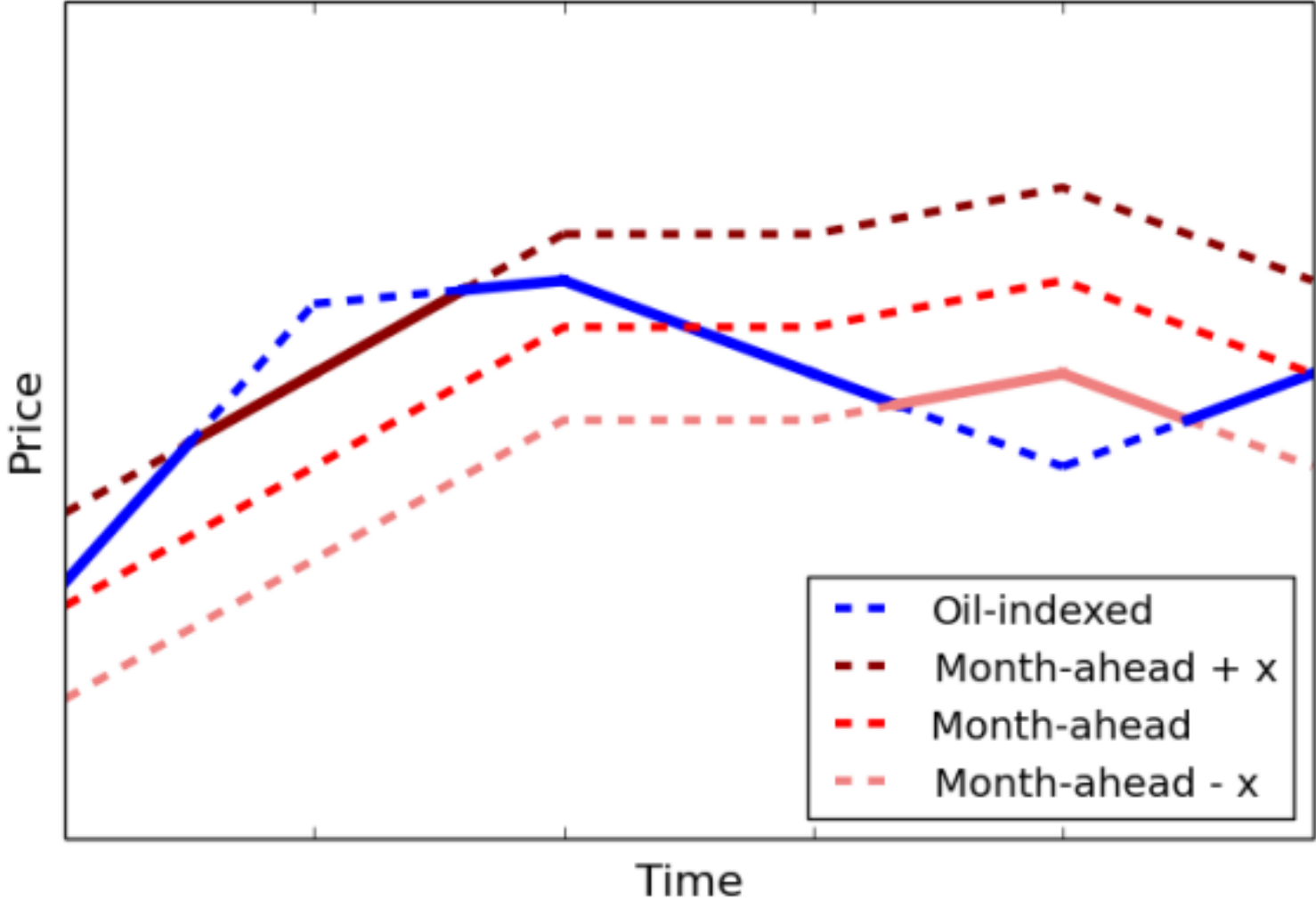
- Flexibility (take-or-pay): (70-) 85 - 90%
- Destination clause (reexport)
- Delivery point

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

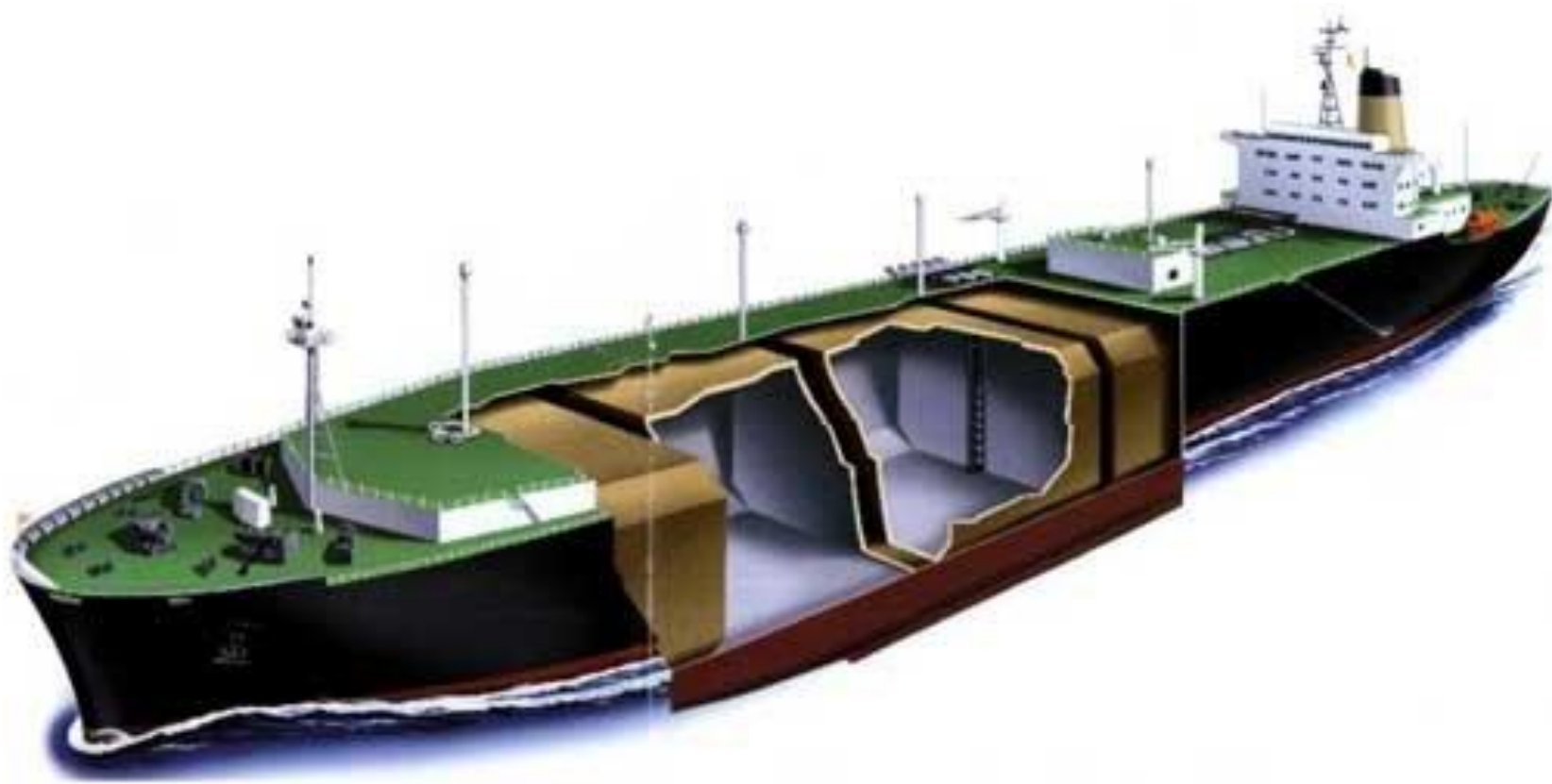
- Price formula

= 85% oil indexed + 15% hub indexed

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



LNG



Oil, Gas, Coal 2010

(million 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

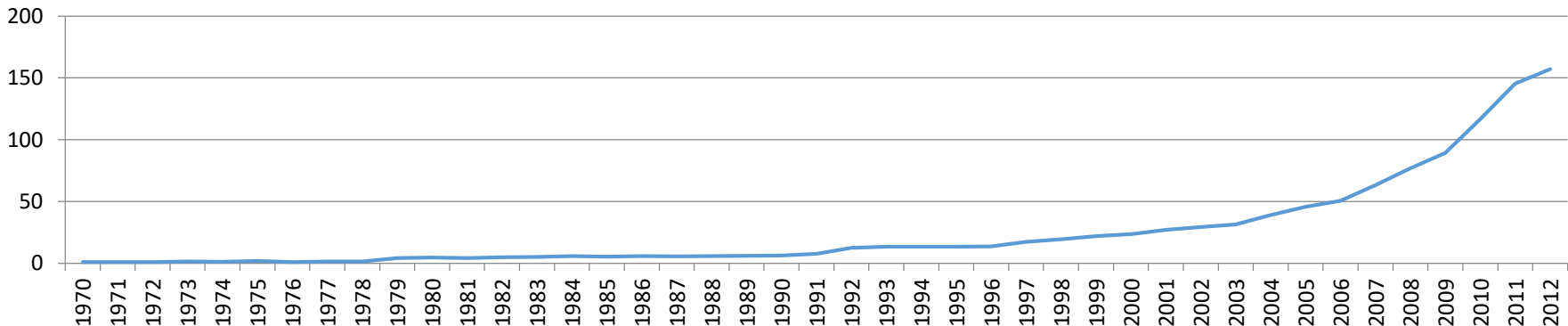
Oil, Gas, Coal 2010

	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

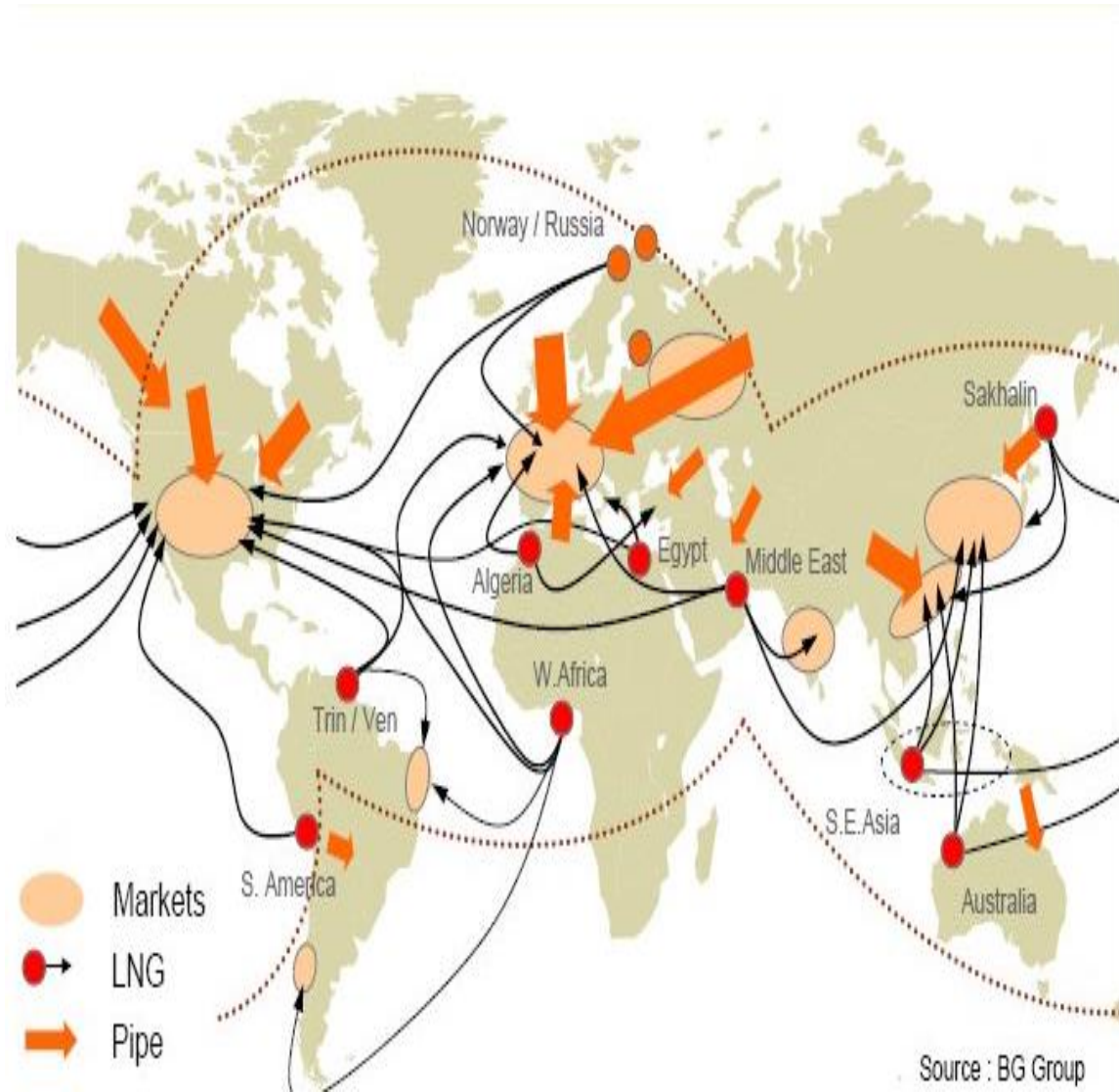
- Before 2000: strictly bilateral LTCs supplying premium markets (Spain, France, Japan, South Korea)
- After 2000: the rise of Qatar
 - 1997: 0.16 bcm of LNG exported
 - 2012: 105.4 bcm of LNG exported

Qatari NG production (bcmy)



Global Situation before 2010

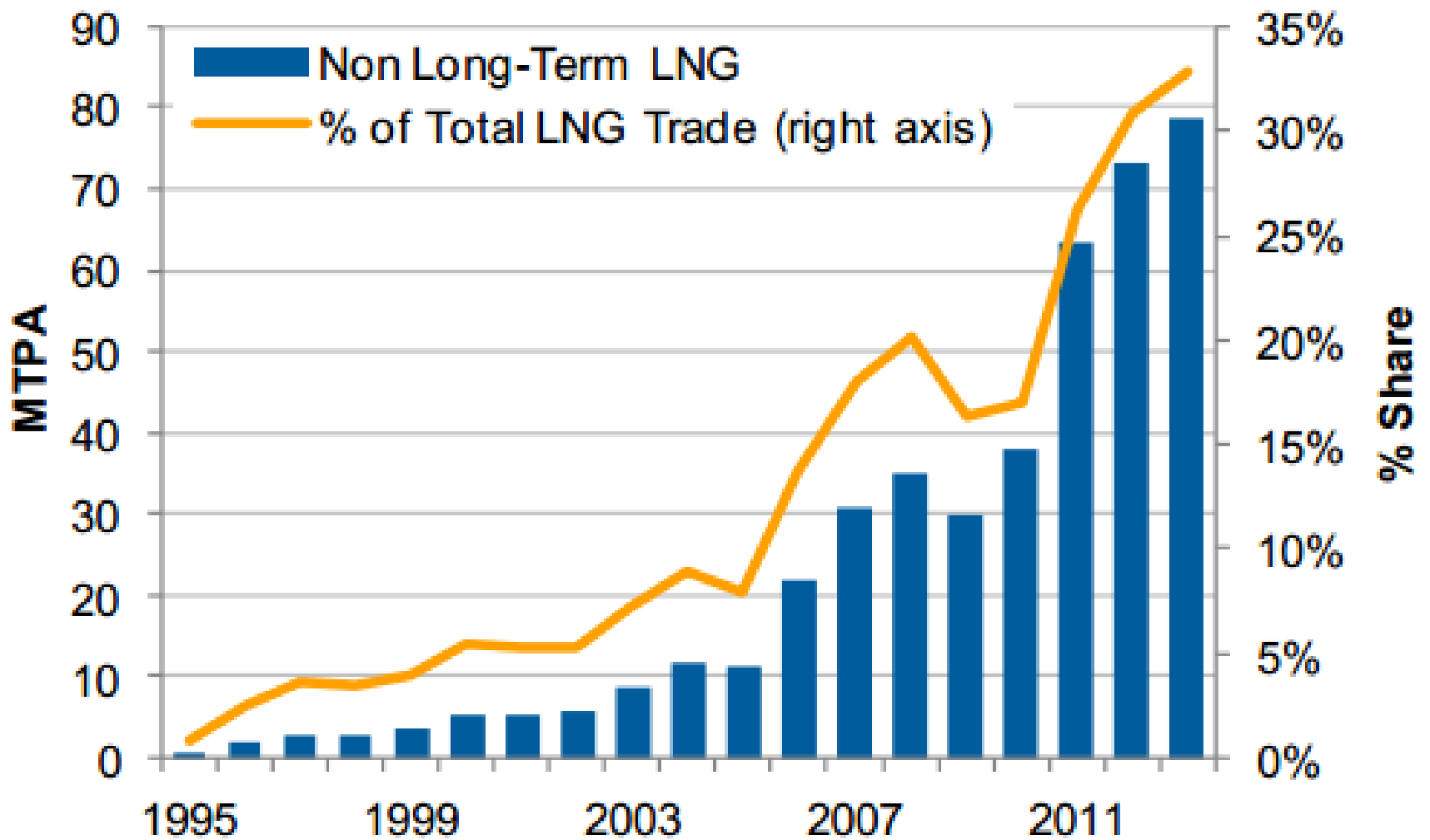
- Two main production areas:
 - Atlantic basin
 - Pacific basin
- Three main consumption areas:
 - North American market
 - SE Asia
 - Europe
- Growing share of LNG on the overall traded volume.
- The rise of Qatar (and possibly Australia).



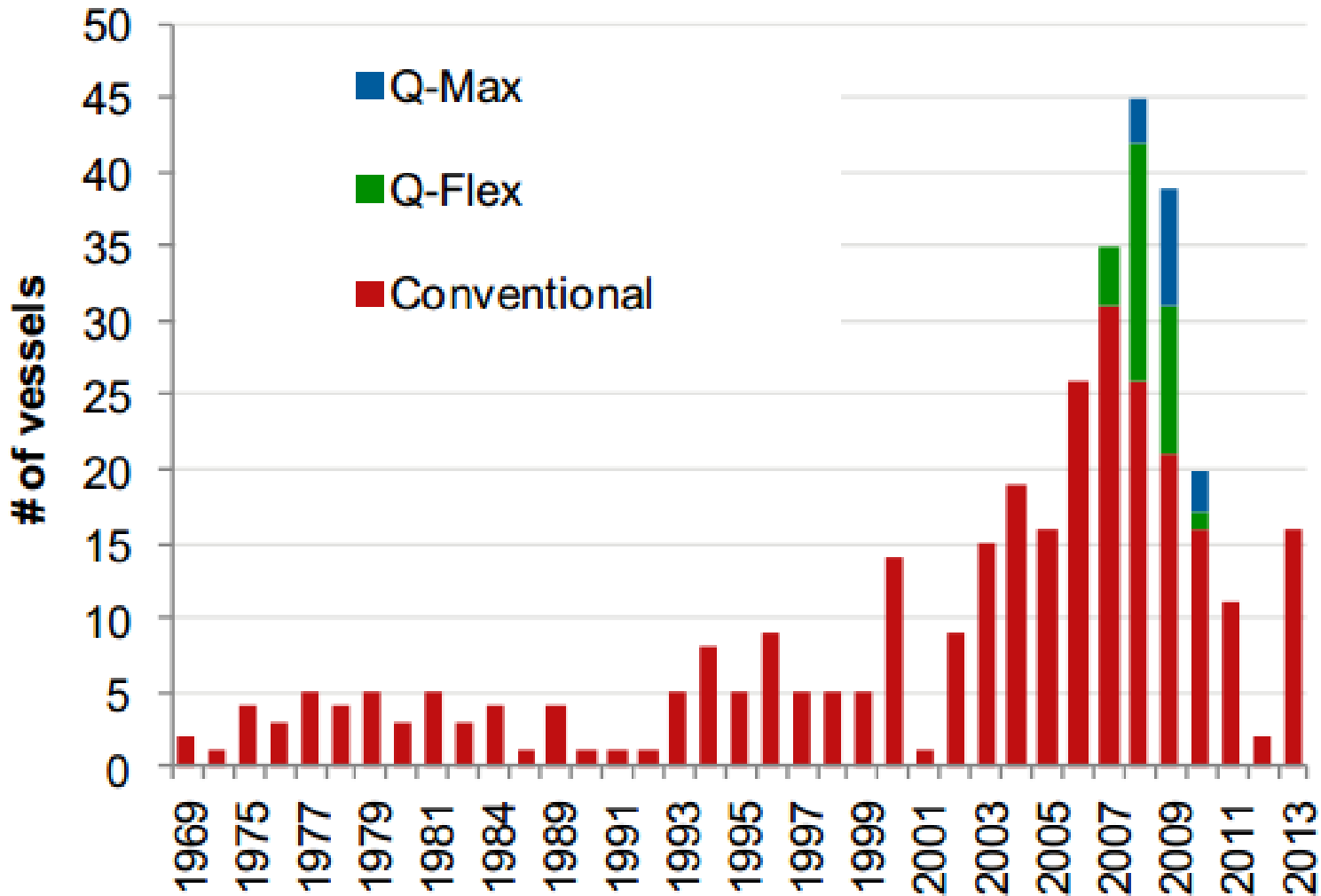
Since 2010

- 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

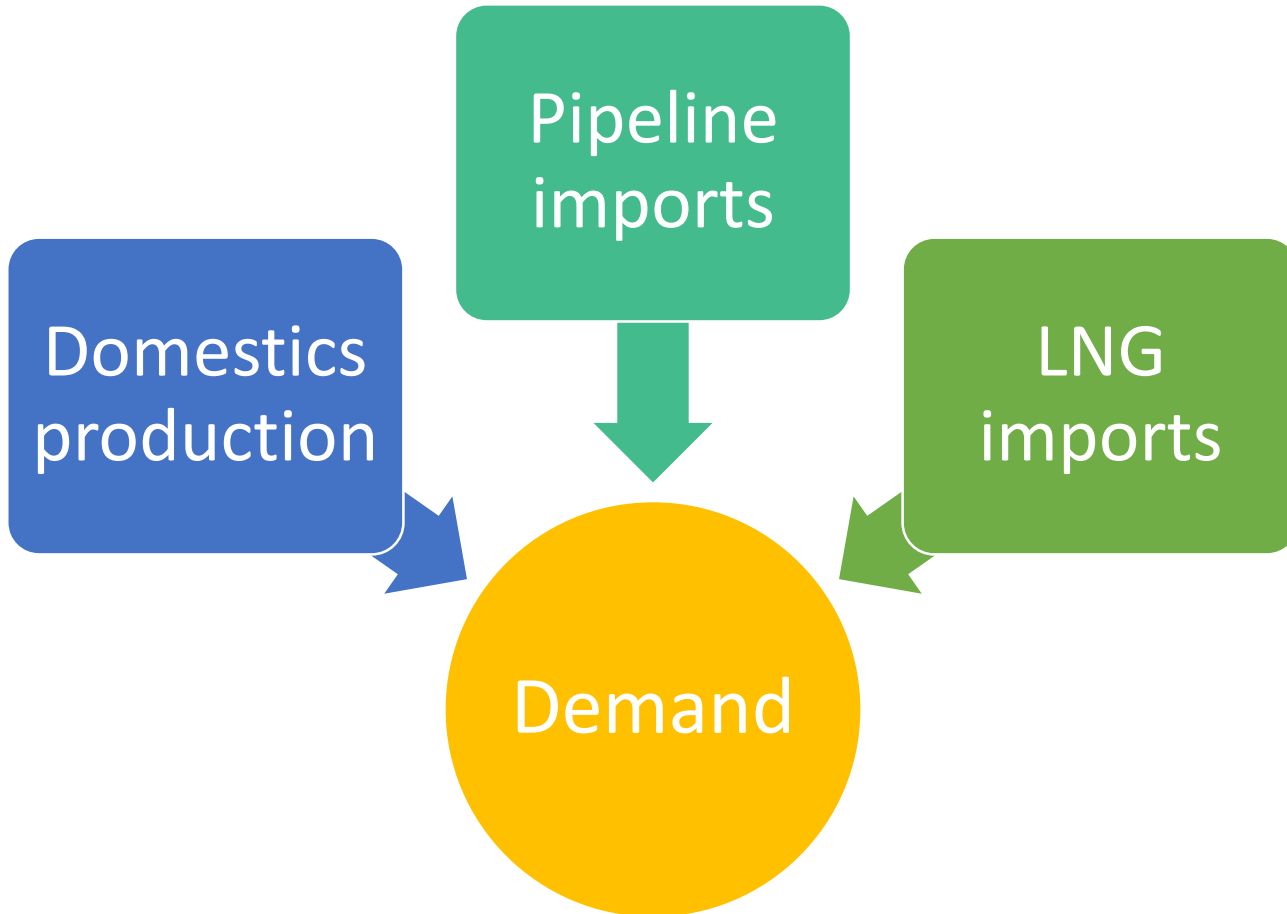


Global LNG Fleet by Year of Delivery

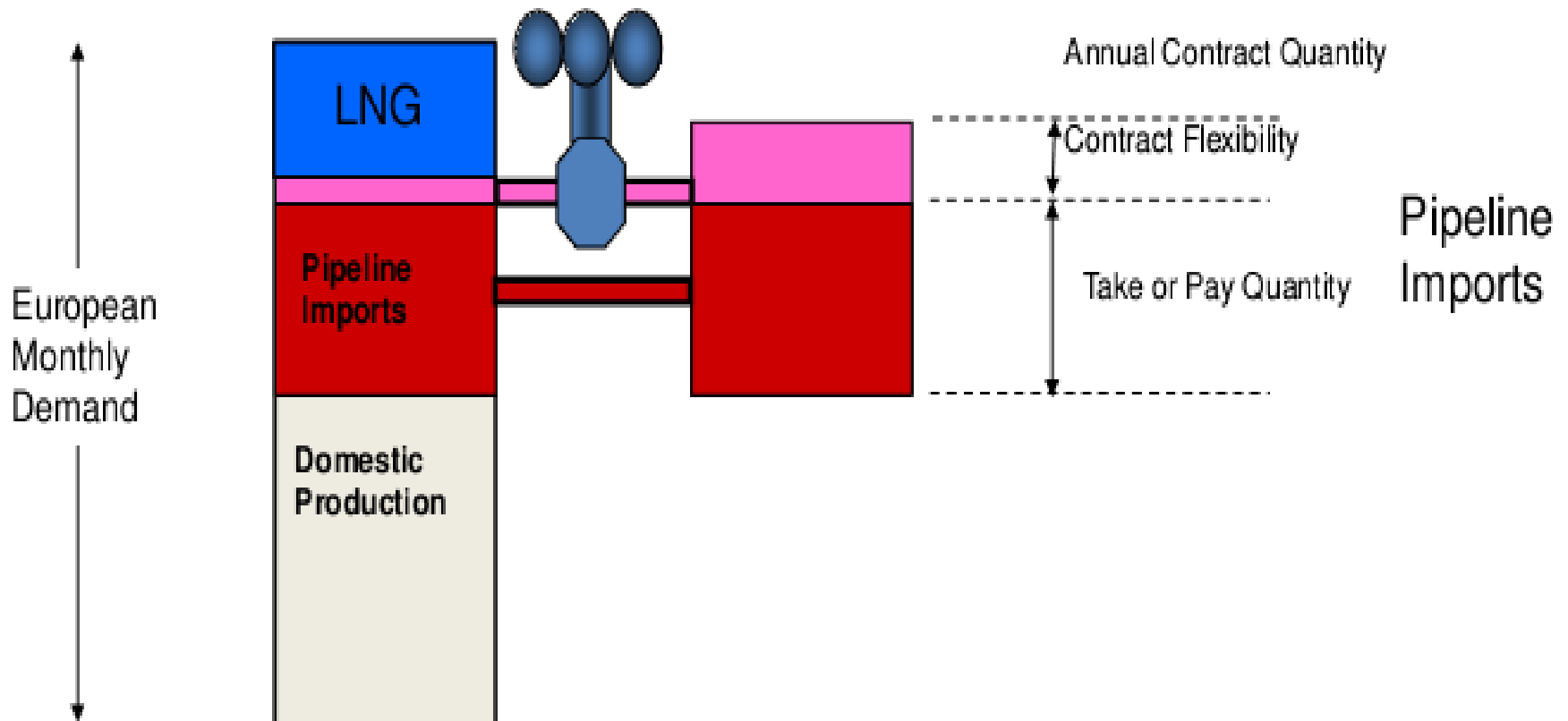


European supply dynamics

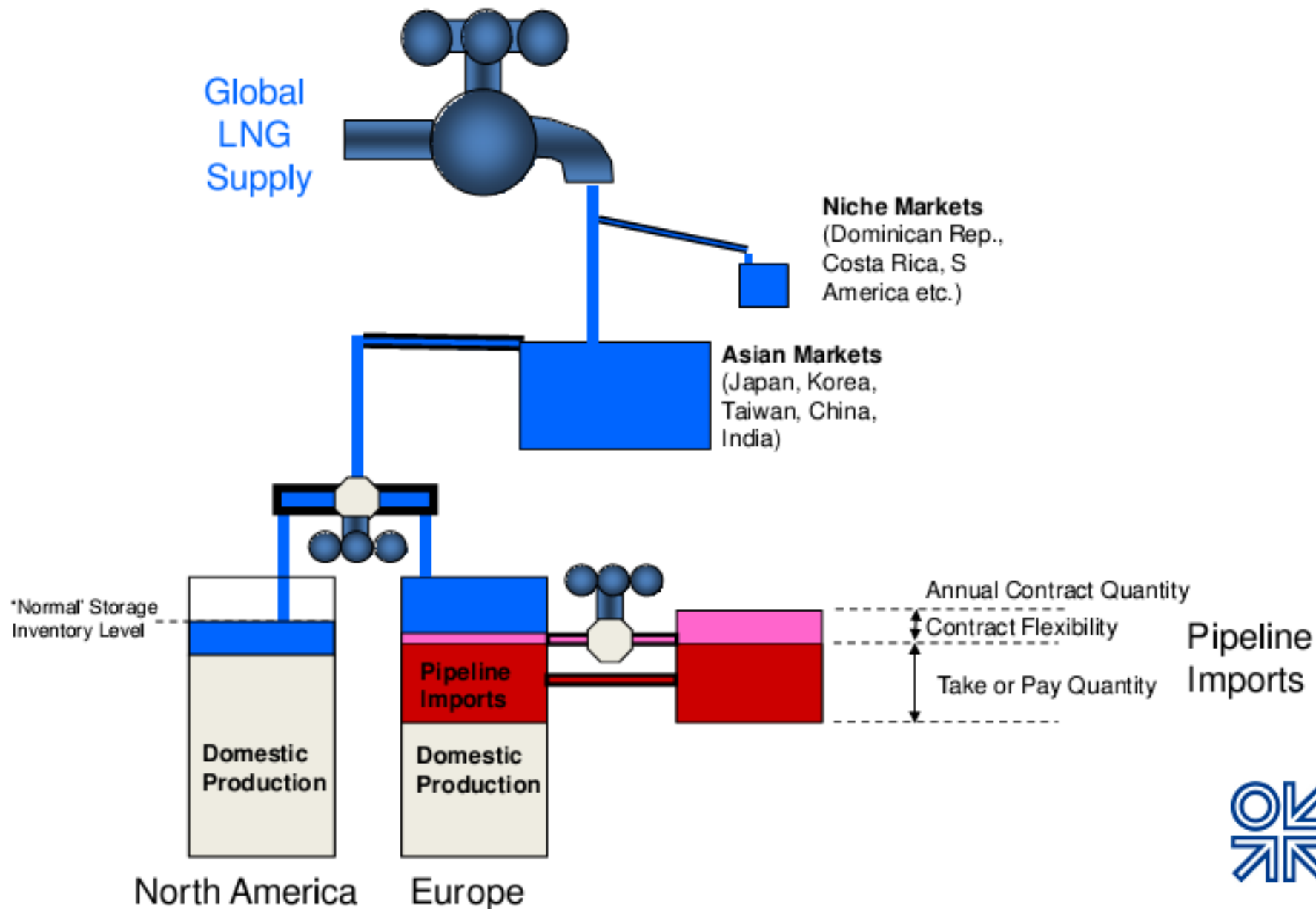
European supply dynamics



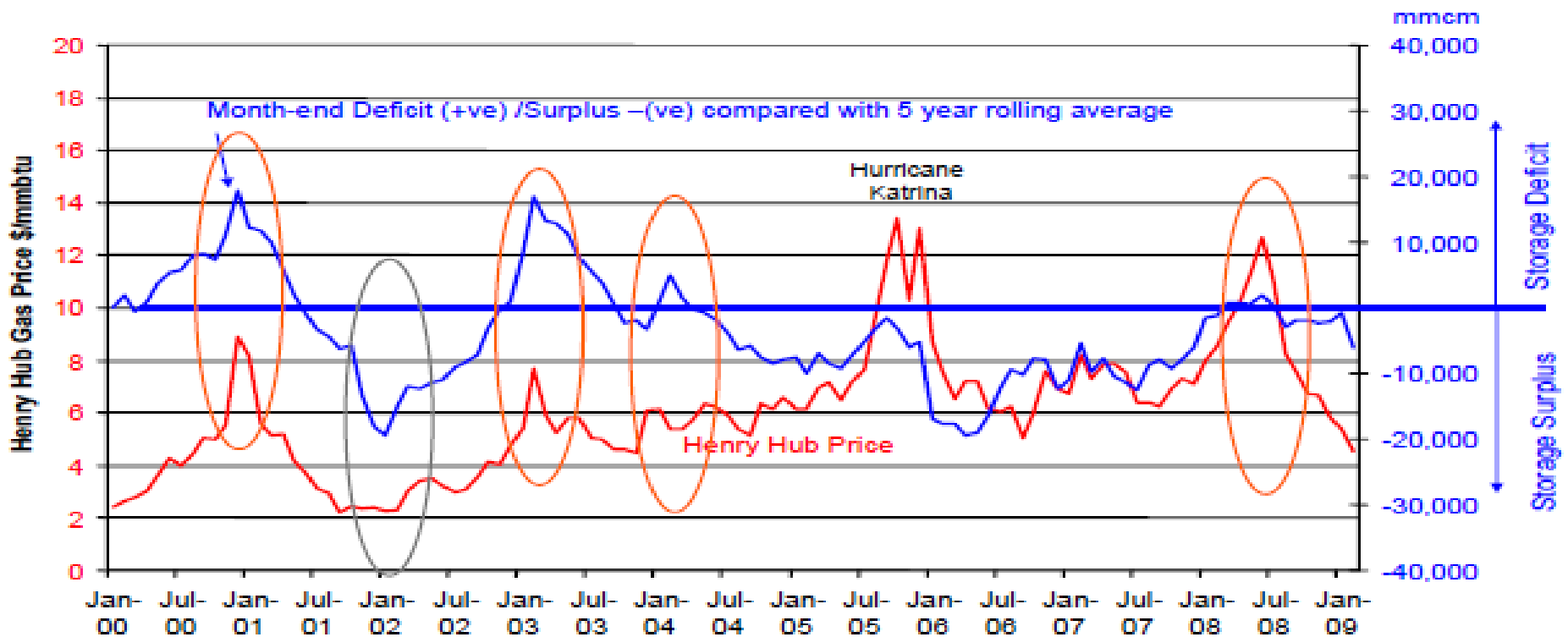
European Supply Dynamics



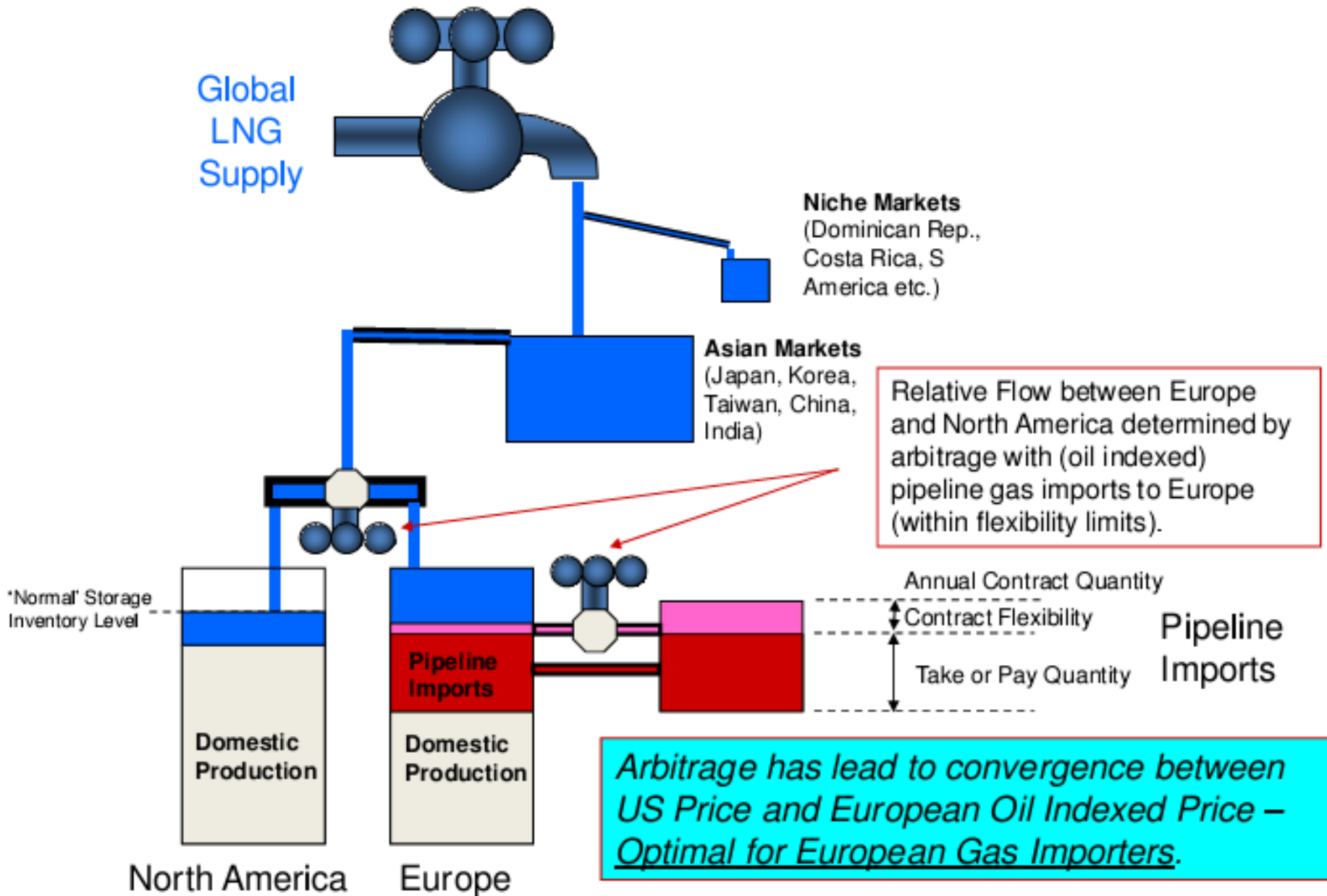
Global LNG System - 1



US storage level as a volatility factor

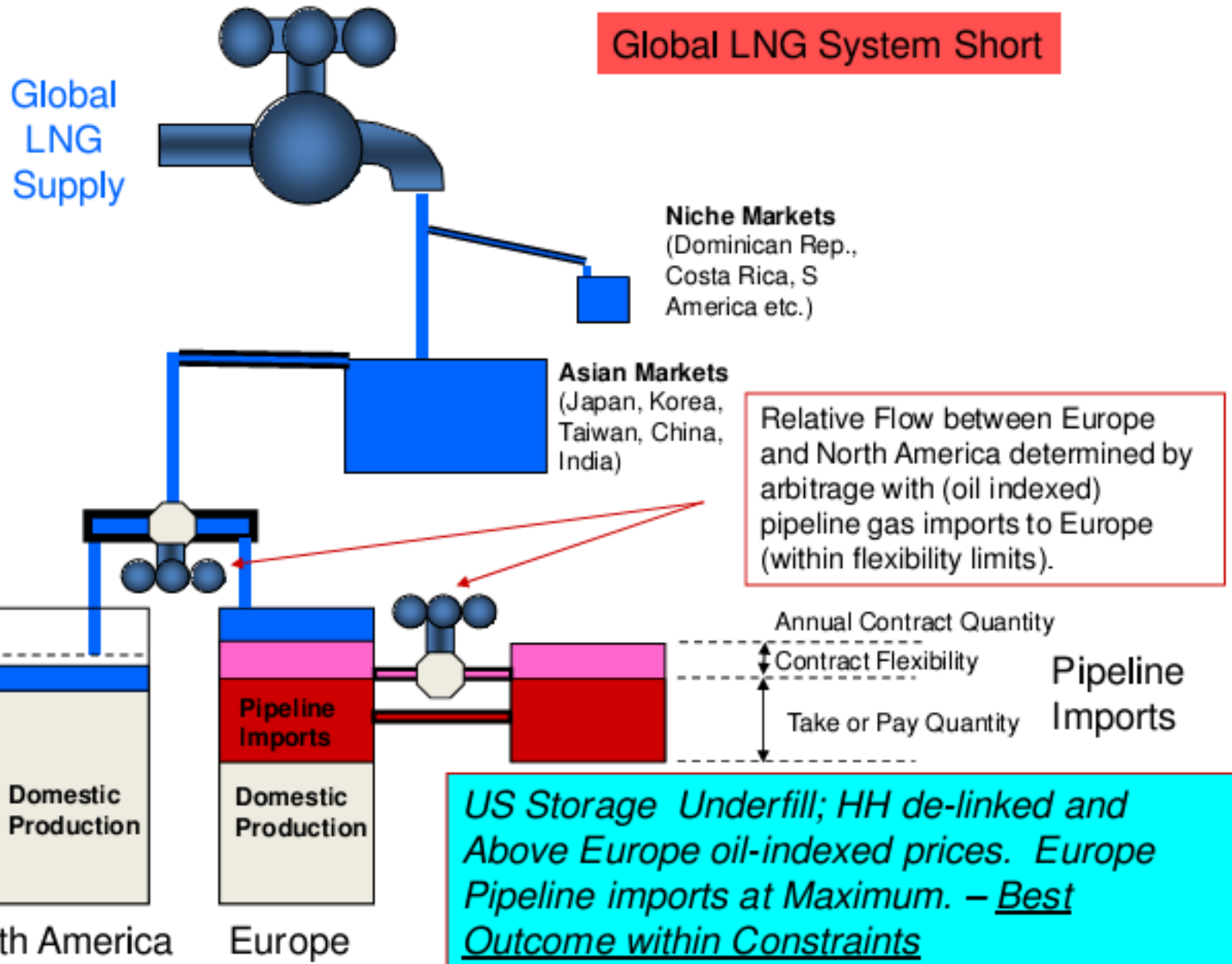


Global LNG System - 1



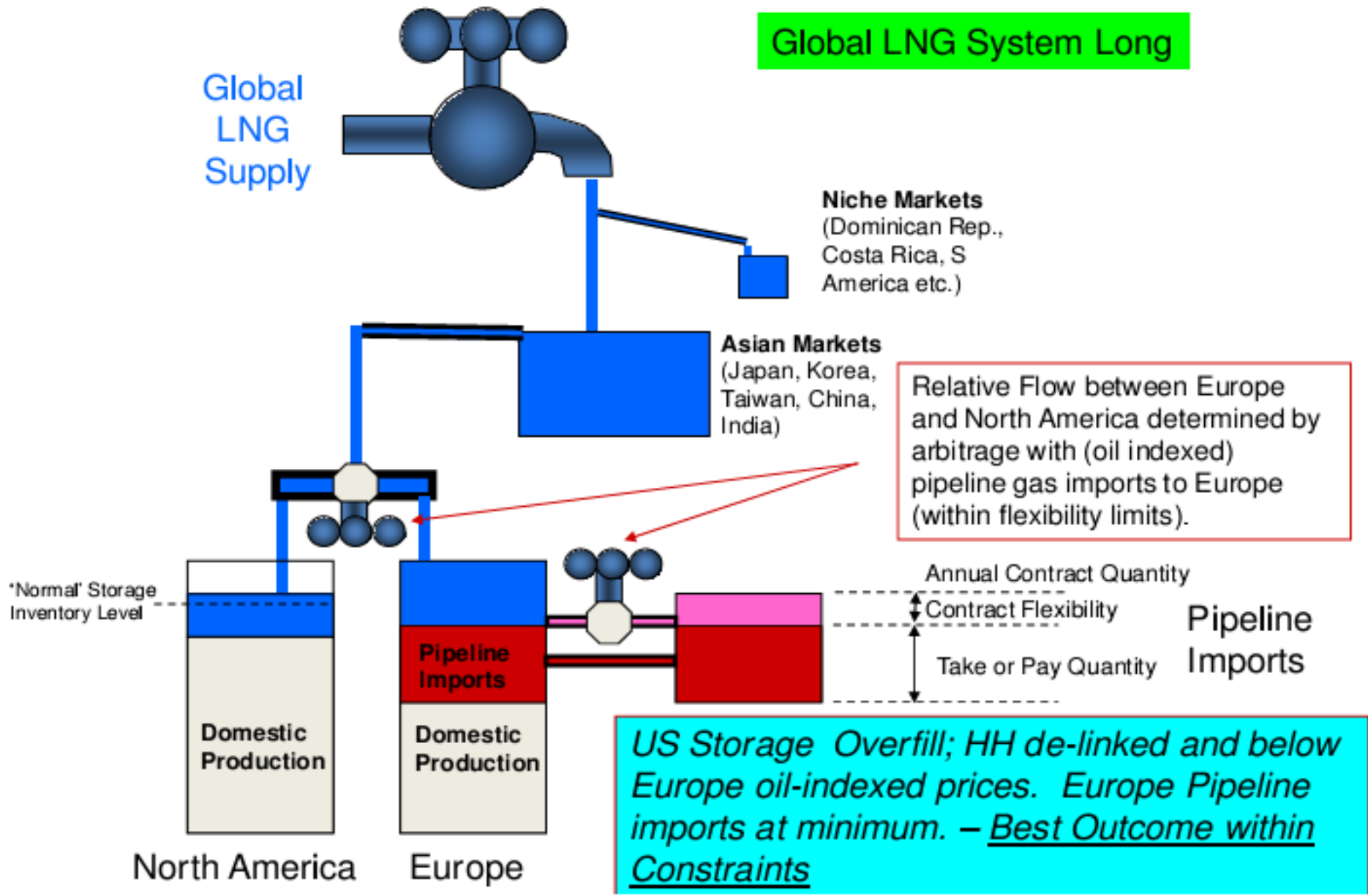
Global LNG System - 5

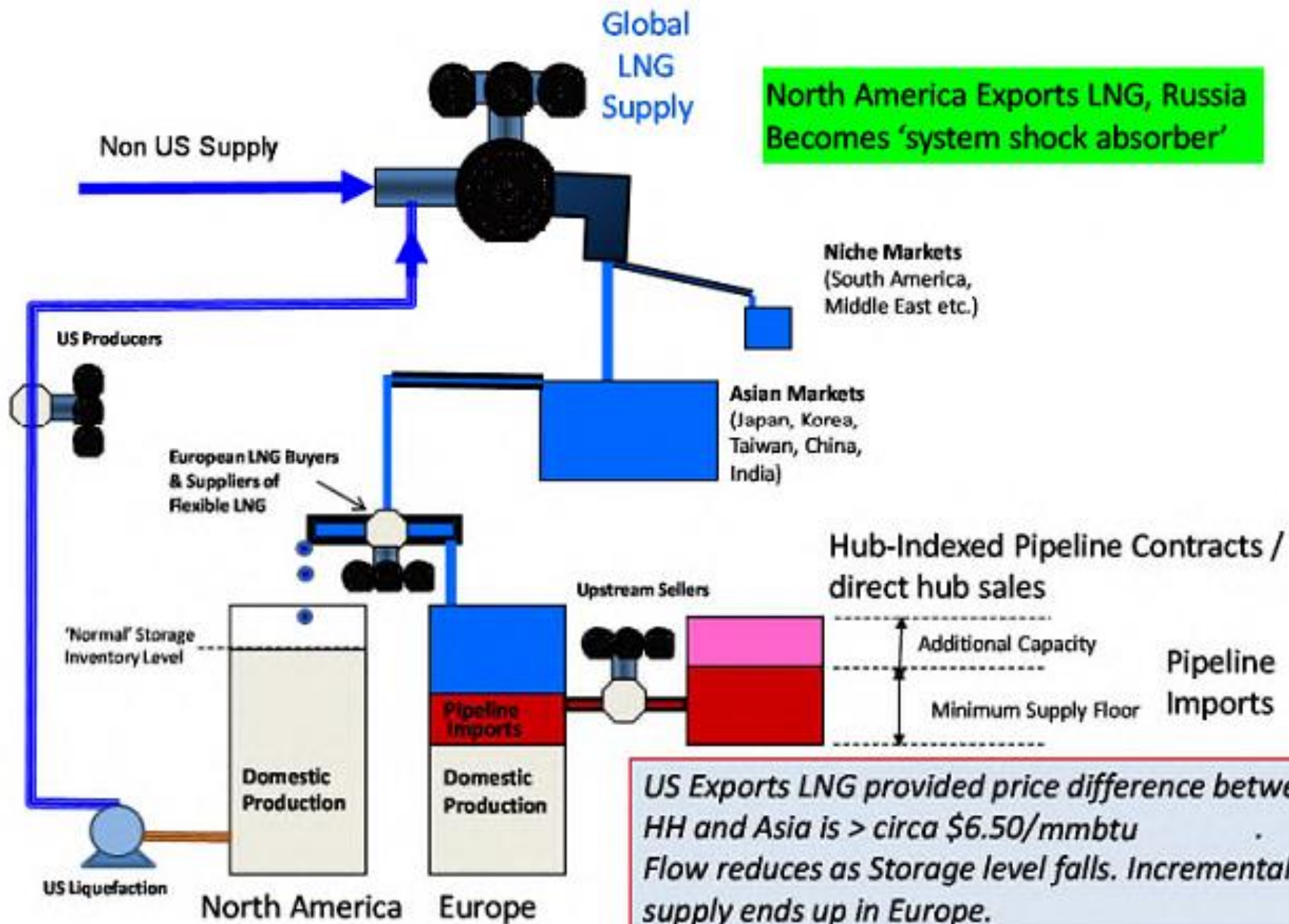
Global LNG System Short



Global LNG System - 4

Global LNG System Long





EU LNG imports



Retail market

Trader

Customer



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 commission

In the shoes of a trader...

- Searching for purchase opportunities
- 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