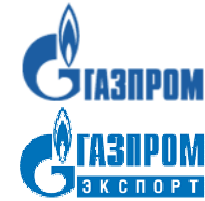


Putting a Price  
on  
ENERGY

International  
Pricing Mechanisms  
for Oil and Gas



# INTERNATIONAL PRICING MECHANISMS FOR OIL AND GAS (with focus on natural gas)

**Dr. Andrey Konoplyanik, Deputy Secretary General**  
**Ralf Dickel, Director, Directorate for Transit, Trade &  
Relations with Non-Signatories**

**Yulia Selivanova, Expert, Directorate for Transit,  
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**Energy Charter Secretariat**

**Seminar co-organised by the Energy Charter Secretariat,  
Ministry for Industry and Energy of the Russian Federation  
and**

**JSC «GAZPROM» / LLC «GAZPROMEXPORT»  
8 June 2007, Moscow, LLC «GAZPROMEXPORT»**



Energy Charter Secretariat

Putting a Price  
on  
ENERGY

International  
Pricing Mechanisms  
for Oil and Gas

# Report by the Energy Charter

## ЦЕНА ЭНЕРГИИ

Международные  
механизмы формирования  
цен на нефть и газ



СЕКРЕТАРИАТ ЭНЕРГЕТИЧЕСКОЙ ХАРТИИ

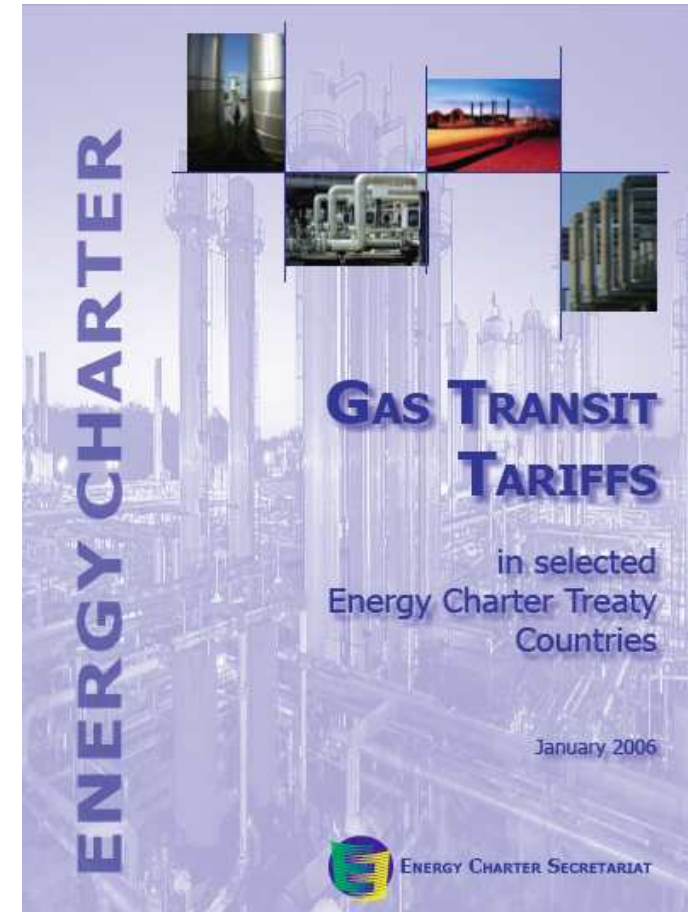
## PUTTING A PRICE ON ENERGY

International  
Pricing Mechanisms  
for Oil and Gas



ENERGY CHARTER SECRETARIAT

# Report by the Energy Charter



# The 1991 Energy Charter Declaration:

## *Title I Objectives:*

*"Within the framework of State sovereignty and sovereign rights over energy resources and in a spirit of political and economic co-operation, (the signatories) undertake to promote the development of an efficient energy market throughout Europe and a better functioning global market, in both cases based on the principle of non-discrimination and on market-oriented price formation, taking due account of environmental concerns."*



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### **Chapter 1 Introduction**

### **Chapter 2 Explaining Oil and Gas Pricing Mechanisms: Theoretical and Historical Aspects**

### **Chapter 3 Oil Pricing**

### **Chapter 4 Gas Pricing**

#### **4.1 Will Gas Follow Oil to Become a Global Commodity?**

#### **4.2 North America**

#### **4.3 The United Kingdom**

#### **4.4 Continental Europe**

#### **4.5 LNG**

### **Chapter 5 Overall Conclusions**



# Session 1: Pricing mechanisms for oil and gas

## Theoretical and historical aspects of oil and gas pricing

- Evolution of pricing for oil as a reference point for gas?
- Appearance and evolution of long-term gas contracts
- “Groningen (Dutch) concept” of long-term gas export contract
- Pricing formulas and mechanisms of regular price review
- Regional specificity of international pricing mechanisms for gas:
  - North America,
  - United Kingdom,
  - Continental Europe,
  - Asia – Pacific region





## Session 2: Development of long-term gas export contracts

- **Long-term contracts and liquid markets:**
  - North America,
  - United Kingdom,
- **Formation of import prices for gas in Continental Europe and main problems linked to cross-border gas flows between/within its Western and Eastern parts:**
  - EU – 15/25/27,
  - Former COMECON,
  - Former USSR/CIS
- **LNG market**

## Session 3: Questions and answers, discussion and conclusions

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- **Will Gas Follow Oil ?**
- **Future of long-term gas contracts**
- **Prospects of linking gas prices to prices for oil**
- **Other issues**





Putting a Price  
on  
**ENERGY**

International  
Pricing Mechanisms  
for Oil and Gas



# Session 1

## Pricing Mechanisms for Oil and Gas



# International Gas Pricing Mechanism

**Subject: international pricing mechanism**

**= Internationally traded gas**

- International trade, **NOT** national sector design
- Increasing gas imports:

**Case 1:** countries whose gas industry was built on imported gas (Continental EU, Japan and Korea)

based on LTCs, dominant part of cross border gas trade **> 90%**

**Case 2:** formerly self sufficient countries with an isolated market place (North America, UK) now in need for imports, often by LNG,

- new: import prices derived from domestic market places **< 10%**



# Session 1

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## Theoretical and Historical Aspects



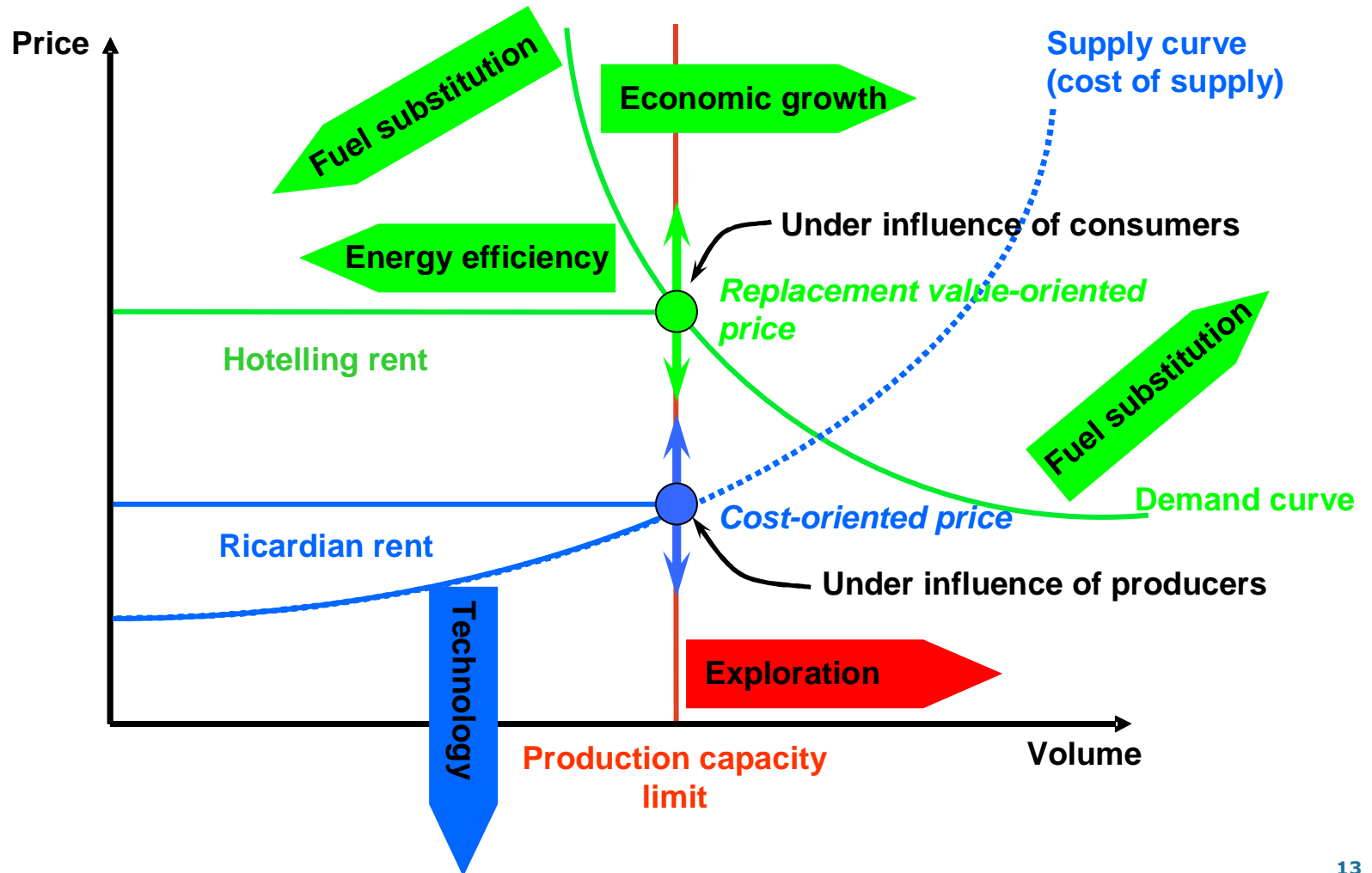
# Non-standard Theoretical Aspects

- Risk and High Specificity of Oil and Gas Investment: Transaction Cost Theory
- The Character of a Natural Resource: Ricardian Rent
- Finiteness of Resources: Hotelling's Theorem
- Producing Companies and Resource Owners: Principal-Agent Theory
- Inelastic Demand Combined with Supply Restrictions: Cournot-Nash-Formula
- Market Imperfections/Externalities: Pigou Taxes and Coase Theorem



# Pricing of Non-Renewable Energy Resources: RICARDIAN VS. HOTELLING RENT

$$\text{Ricardian rent} + \text{Hotelling rent} = \text{Resource rent}$$



# Gas Export Pricing & Prices

- Resource price and resource rent for non-renewable energy:
  - Ricardian rent: internal demand is *below* domestic production capacity limitations
  - Hotelling rent: internal demand is *above* domestic production capacity limitations
- Pricing principles:
  - Cost-plus => pricing at the internal domestic market of the producer *or* subsidized export pricing (Hotelling rent is shared with your own nation *or* with foreign nation)
  - Replacement value (costs of alternative energies) => in case when domestic production capacities are below internal demand for gas
  - Net-back replacement value = Replacement value netted back to an upstream point in the delivery chain (delivery point) => Dutch (Groningen) model of long-term export contract (since 1962)



# Session 1

## Evolution of pricing for oil as a reference point for gas?



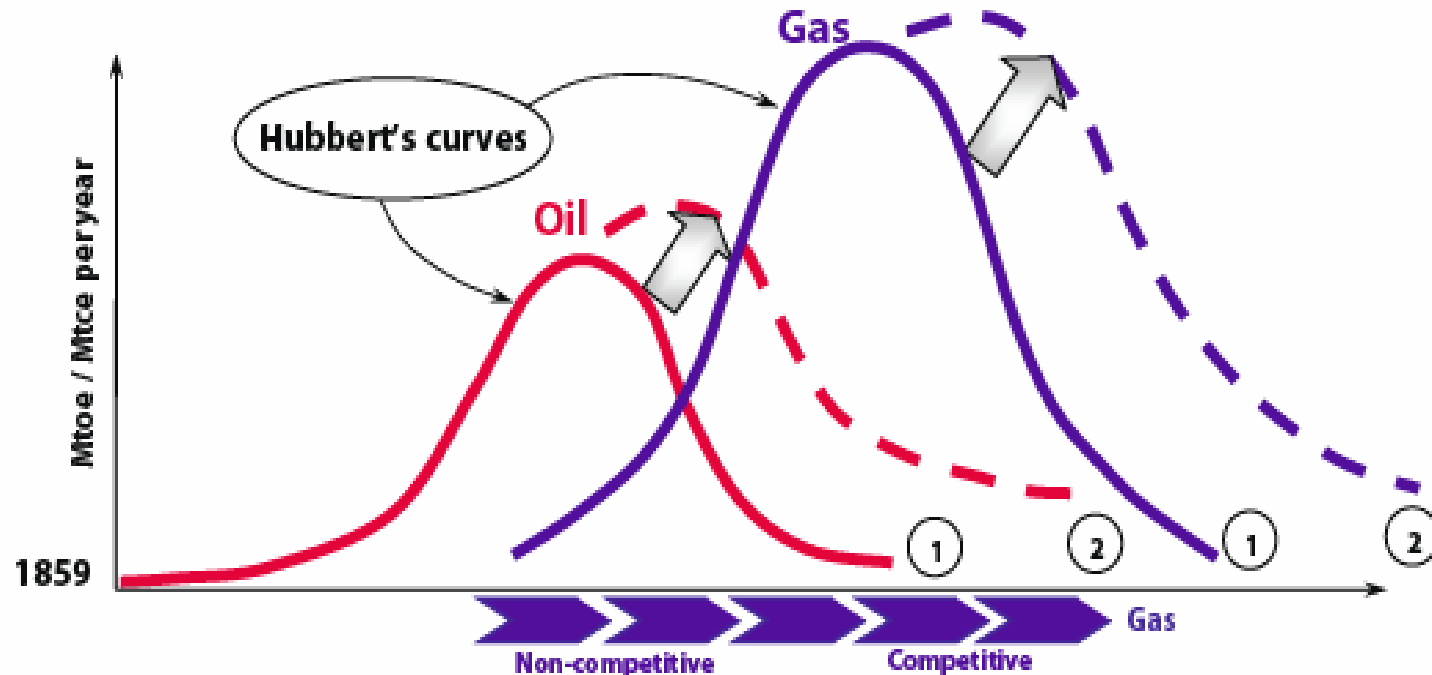
# Oil Pricing

- Since mid 80s oil developed to become a global commodity: Spot and futures markets replaced the OPEC system of official selling prices
- They went through: glut and tight supply; accidents, wars and terrorisms; critics of manipulation and speculation. But: a liquid market is firmly in place.
- **Oil prices demonstrate that liquid markets do not mean low prices**





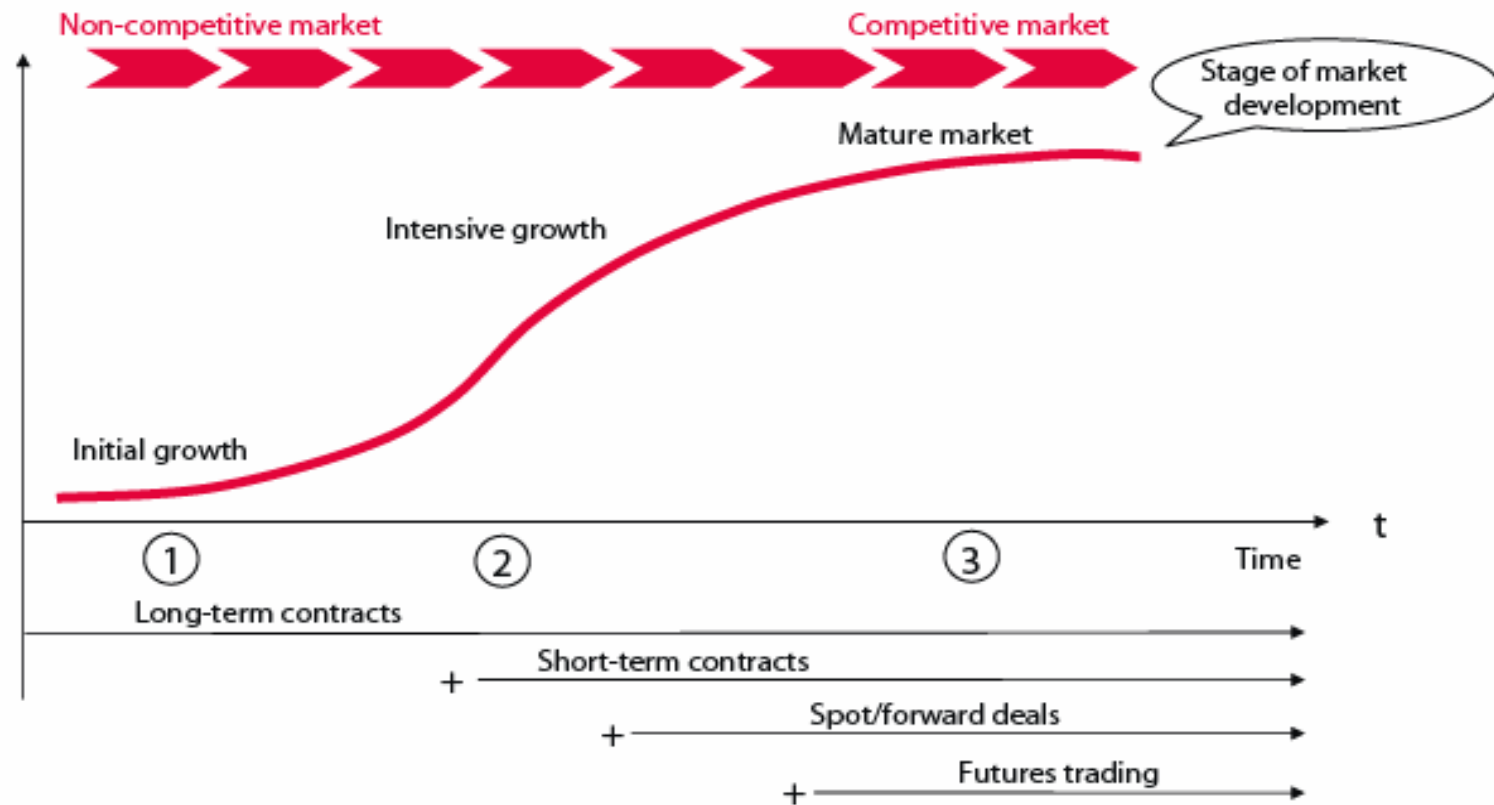
# Hydrocarbons markets: from non-competitive to competitive structures



- ➡ Shift of "Hubbert's curve" in the foreseeable future due to economic and technical factors
- ① Conventional oil and gas resources as of today
- ② Unconventional oil and gas resources as of today which will become conventional ones in the future



# Gas markets development



- ① Pricing mechanism's development stages:
- ① - cost-plus
  - ② - escalation formulas (based on alternative fuels prices)
  - ③ - based on futures prices (commodities markets)



# Session 1

## Appearance and evolution of long term gas export contracts





# Origin of concept

- Groningen – one of the first Super Giant gas fields, first large gas exports worldwide
- Before Groningen – cost-plus approach for gas associated with oil fields (in NL and beyond)
- Producer received a fraction of final consumer price
- Goal of Dutch government: to achieve the highest revenue from Groningen for the Dutch Government
- Nota de Pous (11 June 1962)

# The Groningen Concept

Developed by Nota de Pous (Note to Parliament in **1962**)  
For exports:

## Pricing:

- Replacement value principle (no cost-related approach)
- Net-back value, netted back from replacement value
- Regular price review, if no joint solution=> arbitration
- Price risk and reward for seller, marketing risk for buyer
- Protection against arbitrage by buyer

## Volumes and risks:

- Long term supply vs. off take obligation based on minimum pay: dedication of certain volumes of reserves vs. commitment to market defined volumes
- Secure supply at marketable prices against reliable sales volumes at maximum highest marketable price



# Basis of Concept – Exports

- Long term large volume supply contracts
  - Fixed supply obligation
  - Minimum pay volumes / de facto fixed off take volume
- Allows building of infrastructure for and in export market
- Pricing based on net back value based on replacement value of competing fuels
- Regular price review, disputes settled by arbitration
- Allows to sell gas in competition with other fuels
- Different netbacks to Dutch border:
  - Different replacement value in different countries
  - Compensation for transport if not delivered free border



# Groningen: Concept of Long Term Contracts

First large gas export ever

## Pricing:

- Replacement value (also domestically), regular price review
- For exports: net back to delivery point based on replacement value, arbitration in case of disputes

Ensures marketability of the gas

## Volumes:

- Obligation for reliable supplies
  - Min pay volumes (take-or-pay)
- Ensures defined volumes, incentive not to oversupply the market



# Specifics of Dutch exports

## ● Short haul gas:

- ▶ High flexibility in line with market needs
- ▶ Low annual minimum pay (about 3000 hrs)
- ▶ Max capacity not available all year long
- ▶ Export investment covered by capacity charge

## ● Volumes:

commitment of certain volumes of reserves and delivery capacity vs. commitment to market minimum volumes (minimum pay)





# Session 1

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## Pricing Formulas and Regular Price Reviews



# A Typical Net Back Gas Price Formula

$$P_m = P_o + 0.60 \times 0.80 \times 0.0078 \times (LFO_m - LFO_o) + 0.40 \times 0.90 \times 0.0076 \times (HFO_m - HFO_o)$$

The gas price  $P_m$  during the Month  $m$  is a function of

- the starting gas price  $P_o$
- and the price development of competing fuels Light Fuel Oil (LFO) and Heavy Fuel Oil (HFO)



# An Example of a Price Re-opener

- If the circumstances beyond the control of the Parties change significantly compared to the underlying assumptions in the prevailing price provisions, each Party is entitled to an adjustment of the price provisions reflecting such changes. The price provisions shall in any case allow the gas to be economically marketed based on sound operation.
- Either Party shall be entitled to request a review of the price provisions for the first time with effect of xx/yy/zzzz and thereafter every three years.
- Each Party shall provide the necessary information to substantiate its claim.
- Following a request for a price review the Parties shall meet to examine whether an adjustment of the price provisions is justified. Failing an agreement within 120 days either Party may refer the matter to arbitration in line with the provisions on arbitration of the Contract.
- As long as no agreement has been reached or no arbitration has award been rendered all rights and obligations under the agreement –including the price provisions - shall remain applicable unchanged. Unless otherwise agreed or decided by the arbitral award, differences to the newly established price (by agreement or by arbitration) shall be retroactively compensated inclusive of interest on the difference calculated at an interest rate reflecting the conditions on the international financing market.



# Review of A Typical Net Back Gas Price Formula

$$P_m = P_o + 0.60 \times 0.80 \times 0.0078 \times (LFO_m - LFO_o) + 0.40 \times 0.90 \times 0.0076 \times (HFO_m - HFO_o)$$

Typical subjects of a price review:

- Shares of competing fuels / new competing fuels / gas to gas competition / switching possibilities
- Adjustment of  $P_o$  to reflect changed shares
- Adjustment of rent sharing / marketing incentive implicit in  $P_o$
- Ceilings and bottoms
- More technical elements: Reference fuels, time lags



# Session 1

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## Regional Specificity of International Pricing mechanisms for Gas



# Regional Specificity: Will Gas follow Oil to Become a Global Commodity?

Will Gas Follow Oil to Become a (Global) Commodity?						
North America and United Kingdom				Continental Europe and Japan / Korea		
➢ development based on own resources, no initial dependence on imports				➢ high import dependence from the start		
➢ supply based on small to medium sized gas fields				➢ supply based on imports from giant / super giant fields		
➢ standardised rent taking development decision by private players				➢ rent maximisation of exporting countries development decision by exporting country		
➢ demand elasticity from gas to power generation				➢ limited demand elasticity		
➢ gas-gas competition but price path for gas still tracks oil prices				➢ oil prices as reference in price formula		
			Linkages			
market restructuring as of 1980s			⇔ model for reform	market restructuring as of late 1990s		
North America		UK	LNG trade	Continental EU		Japan/Korea
Hubs created by industry, churn 100, many players, high LNG absorption potential.	⇔	NBP created by regulation, churn 15 to 10, many players, limited absorption of LNG.	no LNG Hub but LNG as price transmitter	⇔		no hub so far, few strong players, dominance LTCs.



## Session 2

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# Development of Long Term Gas Export Contracts





## Session 2

# Development of Long Term Gas Export Contracts

## Liquid markets: North America

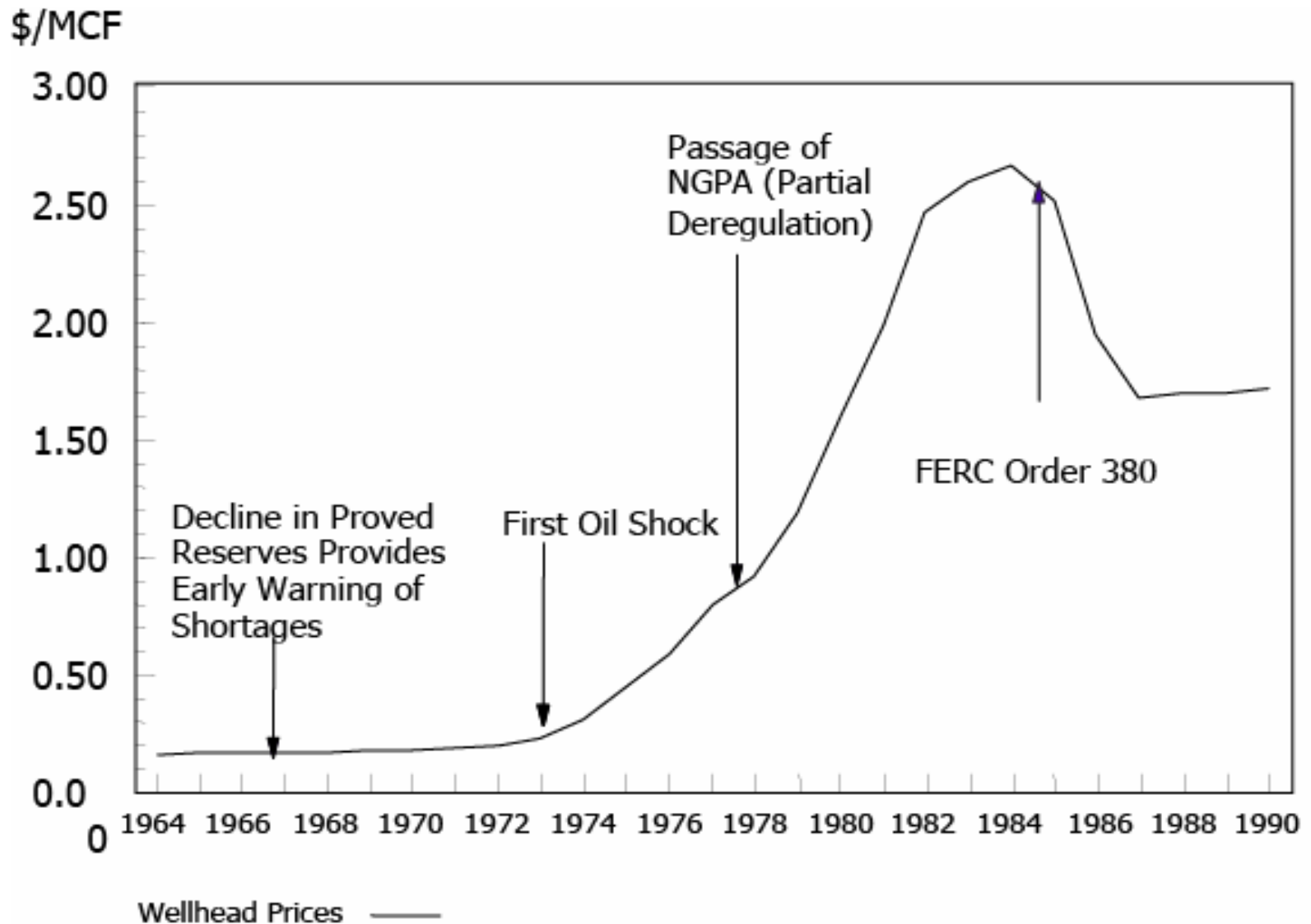


# Reform Policy of Market Prices

- Low price market – through 1954 (large reserves, lack of transportation)
- Regulation-induced shortages led to curtailments in 70s
- Natural Gas Policy Act of 1978 – partial deregulation =>
  - solving excessive demand problem
  - sharply higher gas prices
  - price control intrastate
- Cross-subsidies between price-controlled old supply and the newer contracts
- Average wellhead prices rose

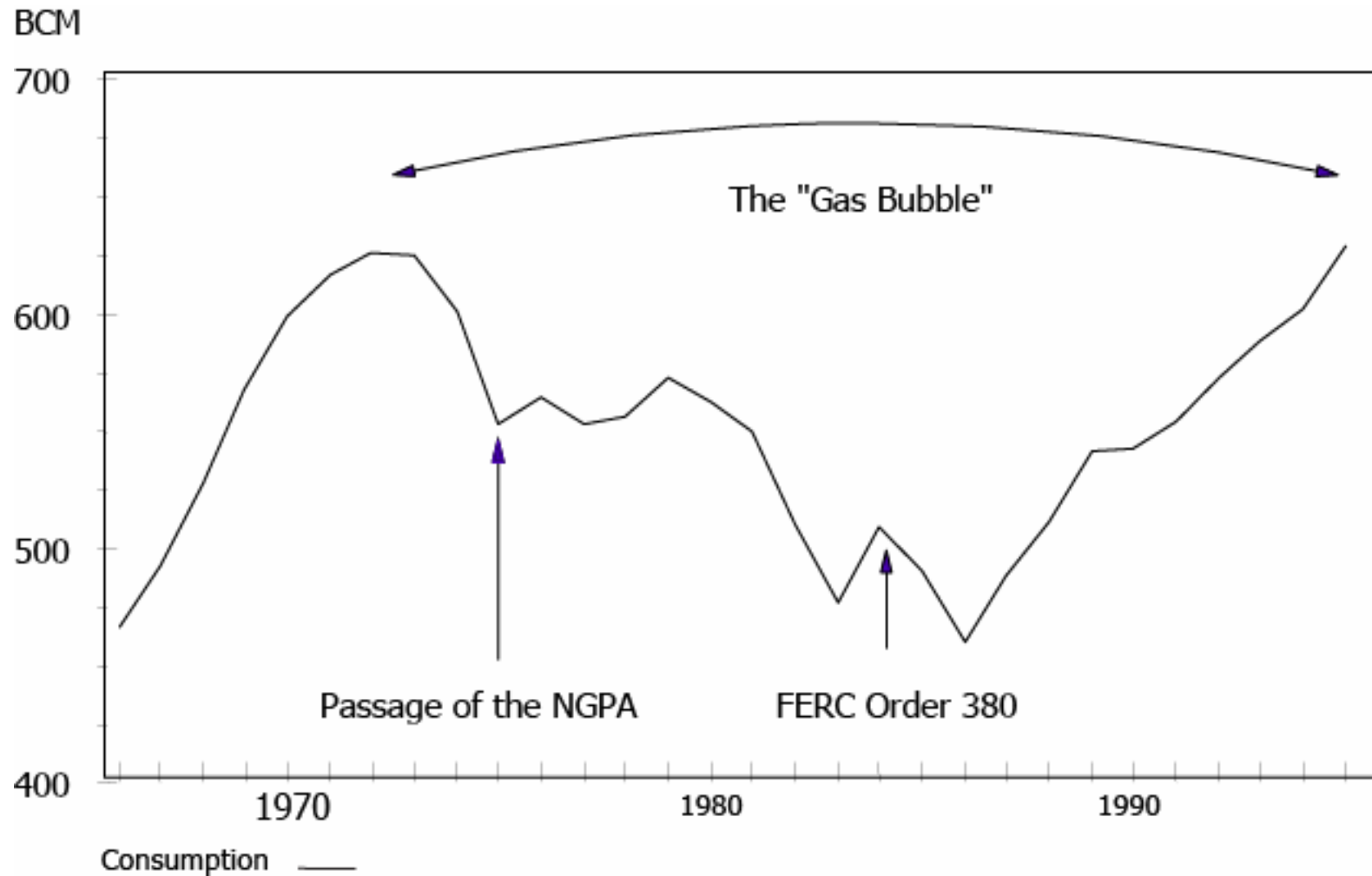


# Wellhead Price before and after the Natural Gas Policy Act of 1978



# US Natural Gas Consumption during the 'Gas Bubble' Period

Producers: removing price controls would solve the shortages  
=> the 'gas bubble' for 23 years



# Deregulation

- 1984-FERC Order 380 relieved utility purchasers from take obligation => could buy from producers lower cost gas
- BUT pipelines had take-or-pay obligations to producers
- FERC orders 436 and 636 – TPA to all users



# Operation of North American System

- Restructuring of US industry => highly liquid and transparent market for supplies and transportation
- System developed around “hubs” – pipeline interconnections of different gas flows that redistribute them to different market regions
- Henry Hub – natural physical trading point became center of NA gas pricing system
- Transactions take place during “bid week”

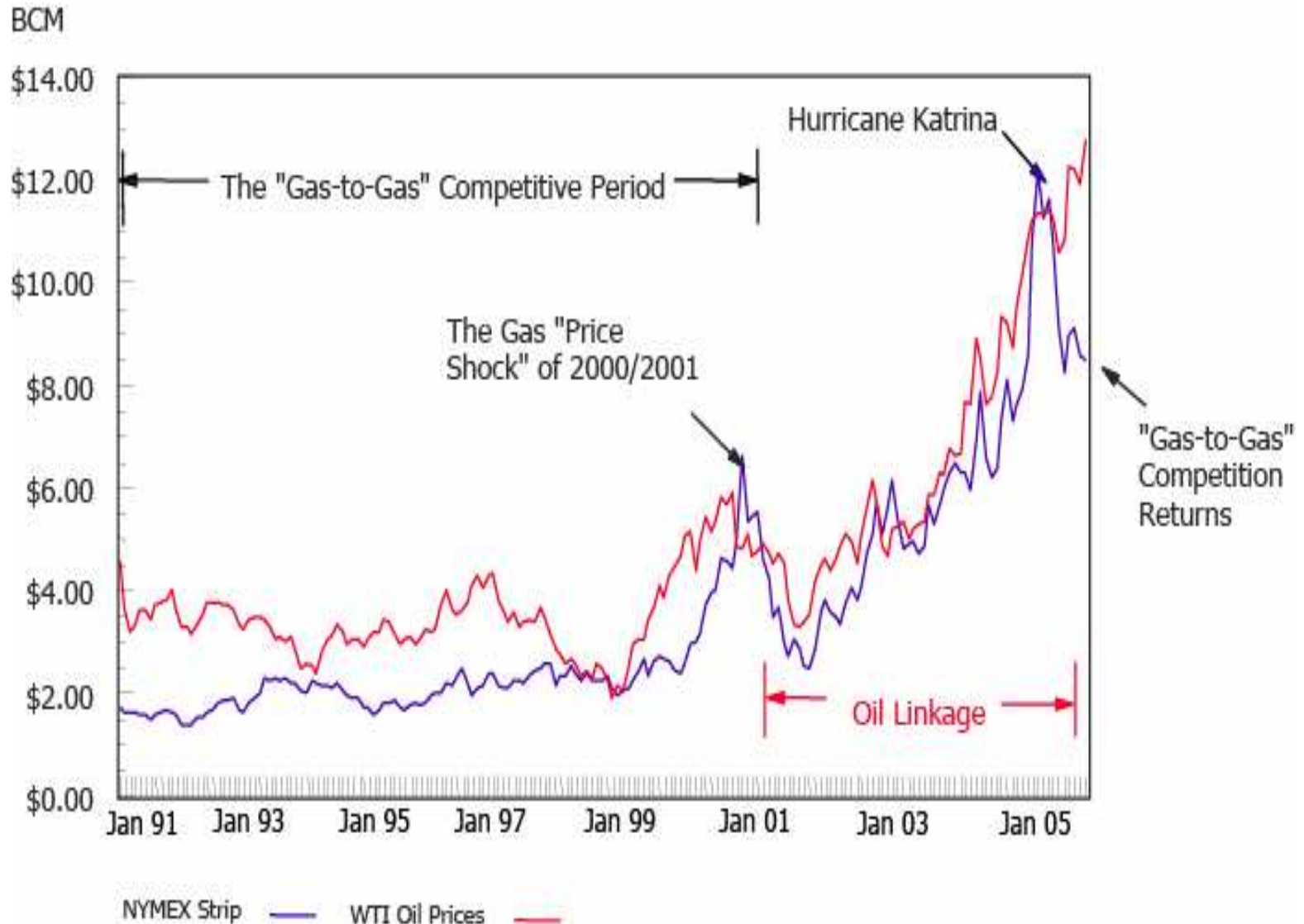


# Gas Prices in North America

- During gas bubble prices were low, oil was ineffective competitor
- Emergence of “gas-to-gas” competition
- Perception that oil pricing was no longer relevant
- BUT ‘gas-shock’ of the winter of 2000/2001 => buyers bid up gas prices
- Dual-fired power generation users forced to switch to residual fuel oil =>
- Indirect linkage between gas prices and oil prices was re-established
- Recently surpluses returned => new decoupling of oil and gas pricing



# The Pattern of Henry Hub Gas Prices since 1991



# Session 2

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## Development of Long-Term Gas Export Contracts

### Liquid Markets: UK





# Gas Sector Reform in UK

- Gas and electricity were government monopolies
- Domestic gas with surplus of low-cost gas
- Expansion of power sector
- Natural Gas Act of 1986:
  - Privatised British Gas
  - Created a regulatory authority Ofgas
  - Required Third Party Access
- Electricity Act of 1989
  - Freed power generators from an obligation to purchase British coal => setting "dash for gas"



# Creation of Competitive Gas Market

- Industry restructuring completed in 1990s
- Restricting British Gas to 90% of new fields => creating supplies for competitors
- Freeing British Gas customers of an obligation to purchase => creating new buyers for supply
- North Sea gas surplus



# Natural Gas Transportation System

- National Grid, 5 terminals, offshore pipelines connect to the grid
- TPA on basis of entrance/exit charge
- Trading happens at hypothetical National Balancing Point
- 1998 – construction of Interconnector => exports to Continent based on
  - LTCs with min pay and replacement pricing (but smaller volumes and shorter duration)
  - Claw back clauses allow for arbitrage
  - Elements in price review allow for gas-to-gas competition
- Seasonality caused reverse flow
- Production peaked in 2000 => in 2004 net import position

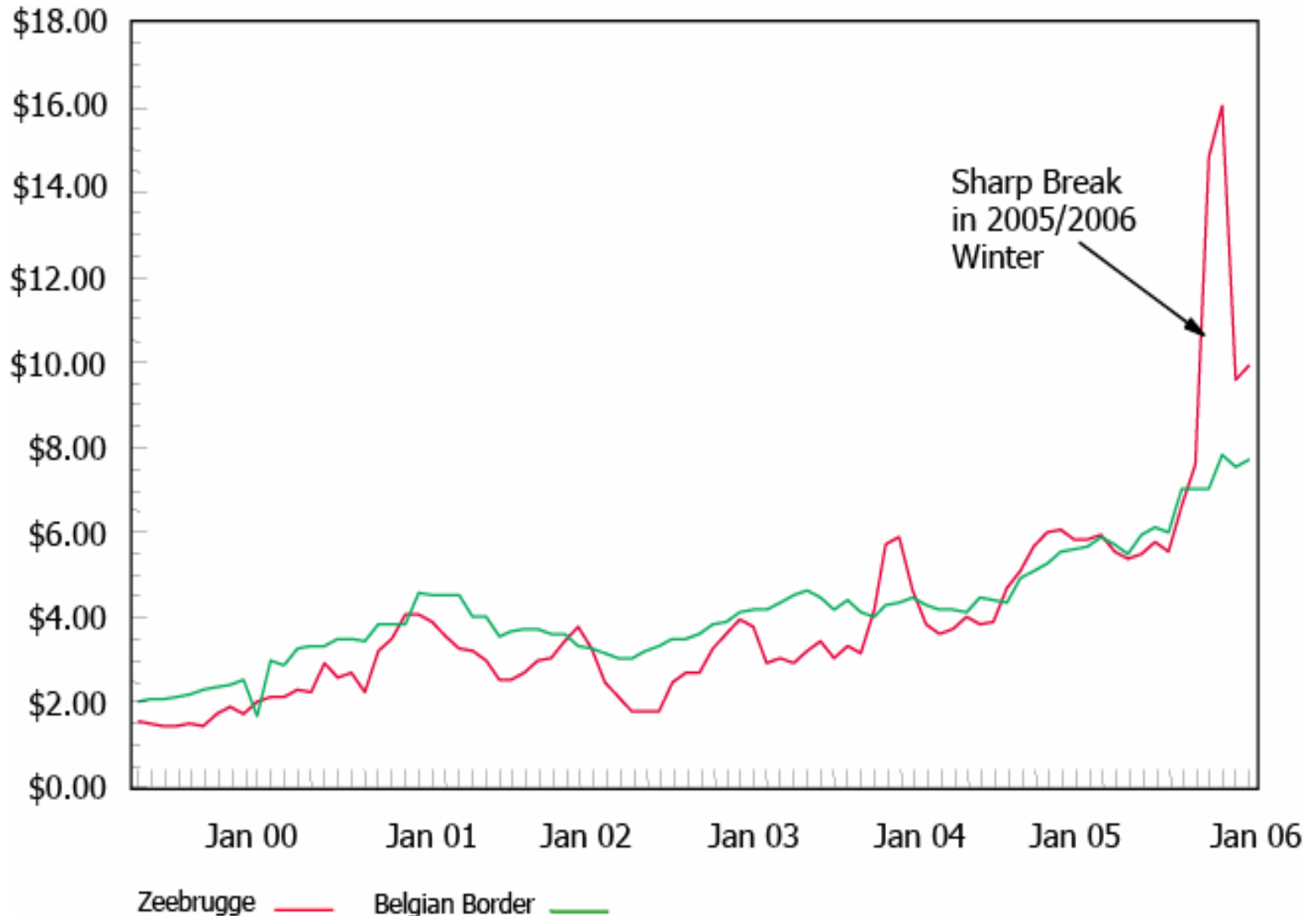


# Pricing in UK

- British Gas was monopsony buyer with final say on wellhead price at UKCS
- With Natural Gas Act users allowed to buy from third parties
- Centrica ended up with LTCs, take-or-pay liabilities and surplus gas
- Supply increased faster than demand
- Volume of associated gas rose from 17% to 51% in 2001
- Growing production + willingness to sell at discount => drop in gas spot prices
- Now prices are set by competition
- Prices reported for a notional location in system "The National Balancing Point" with churn 10
- UK has liquid market that responds quickly to supply/demand signals and bottlenecks



# Comparison of Zeebrugge and Belgian Border Prices



# UK - Summary

- Gas industry's transition from government monopoly to market competition complete
- New transition from a net exporter to a net importer
- New gas imports:
  - mixture of traditional LTCs
  - arbitrage gas flows between UK and Continent
  - LNG supply subject to arbitrage with US
- How will UK spot market pricing and continental contract-driven pricing interact?
- Interconnector => channel for price signals to travel between UK and Continent
- Seasonal flows with peak deliveries to UK in winter



## Session 2

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# Development of Long-Term Gas Export Contracts:

## Continental Western Europe





# After Groningen

- Dutch experience encouraged exploration for gas and other gas supplies
- Replacement pricing concept => basis for investment and expansion of continental European gas network
- Increased gas exports from the Soviet Union, Norway, Algeria – more than 250 bcm/year imported based on Groningen concept



# Pricing After Groningen

Pricing developed by new contracts and by price reviews based on Groningen concept:

- NL as “trendsetter”, later also Troll
- Heavy fuel oil share decreased, the share of light fuel oil increased (now about 65%)
- Algerian exports partly pegged to crude oil (Algerian crude oil parity campaign early 80s)
- More recent: a small share of coal or electricity indicators, gas-to-gas price indicators.

● Arbitration was seldom invoked

=> comparable price levels and similar pegging

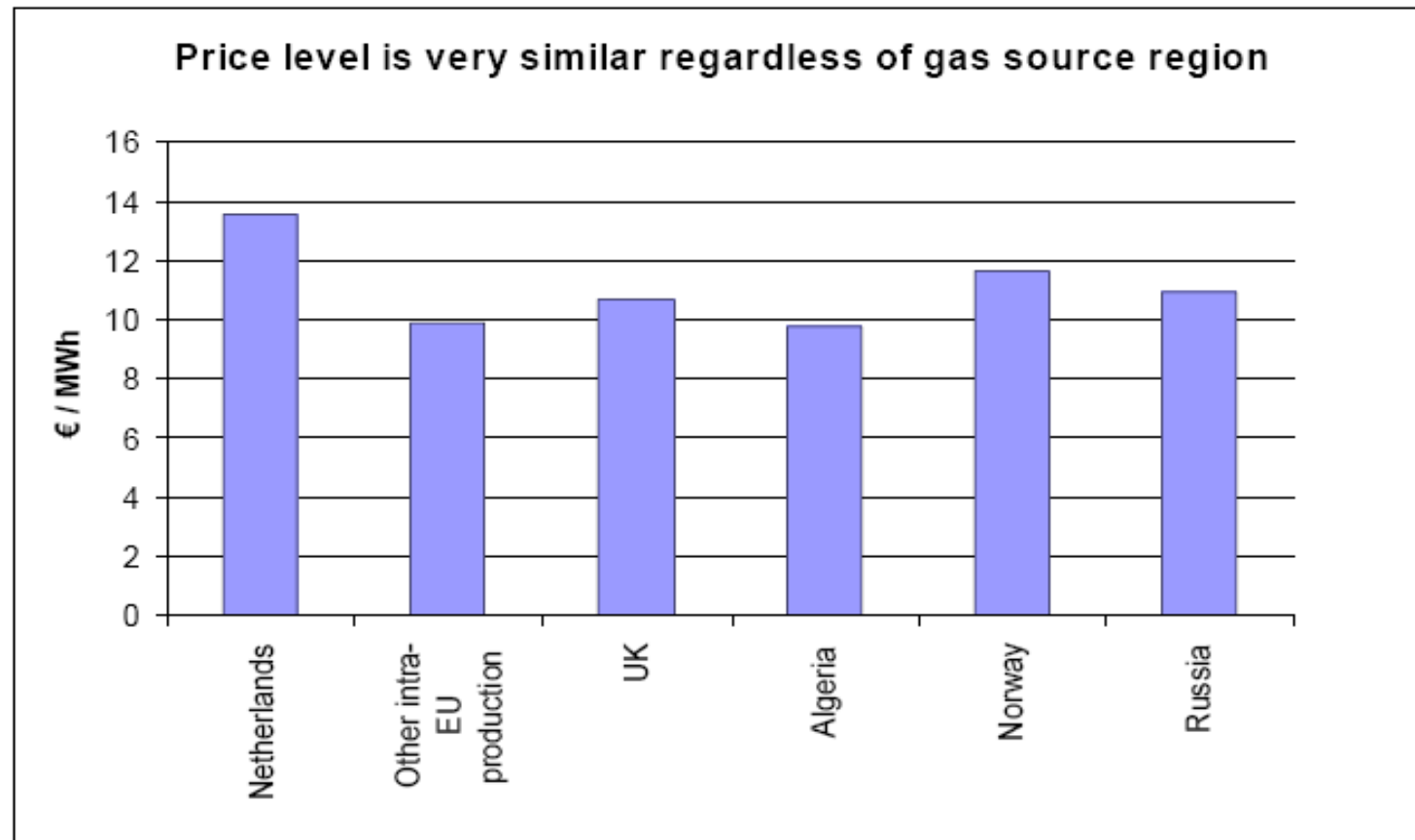




# Performance of LTCs so far

- In place since 40 years for pipeline and LNG, duration LTCs in place today: up to three decades
- Predominant share of World gas trade
- Review clause provided flexibility for LTCs to adopt to changes in the market:
  - from fixed price to pegging to heavy fuel oil, to more gas oil, inclusion of coal, power and gas to gas competition
  - Coped with oil price increases in 1973/74, 1979/80 as well as oil price slump in 1985, fall of the Berlin Wall in 1989, major technological developments
- Adopted to a liquid market place like UK (Gasunie – Centrica / Statoil – Centrica)

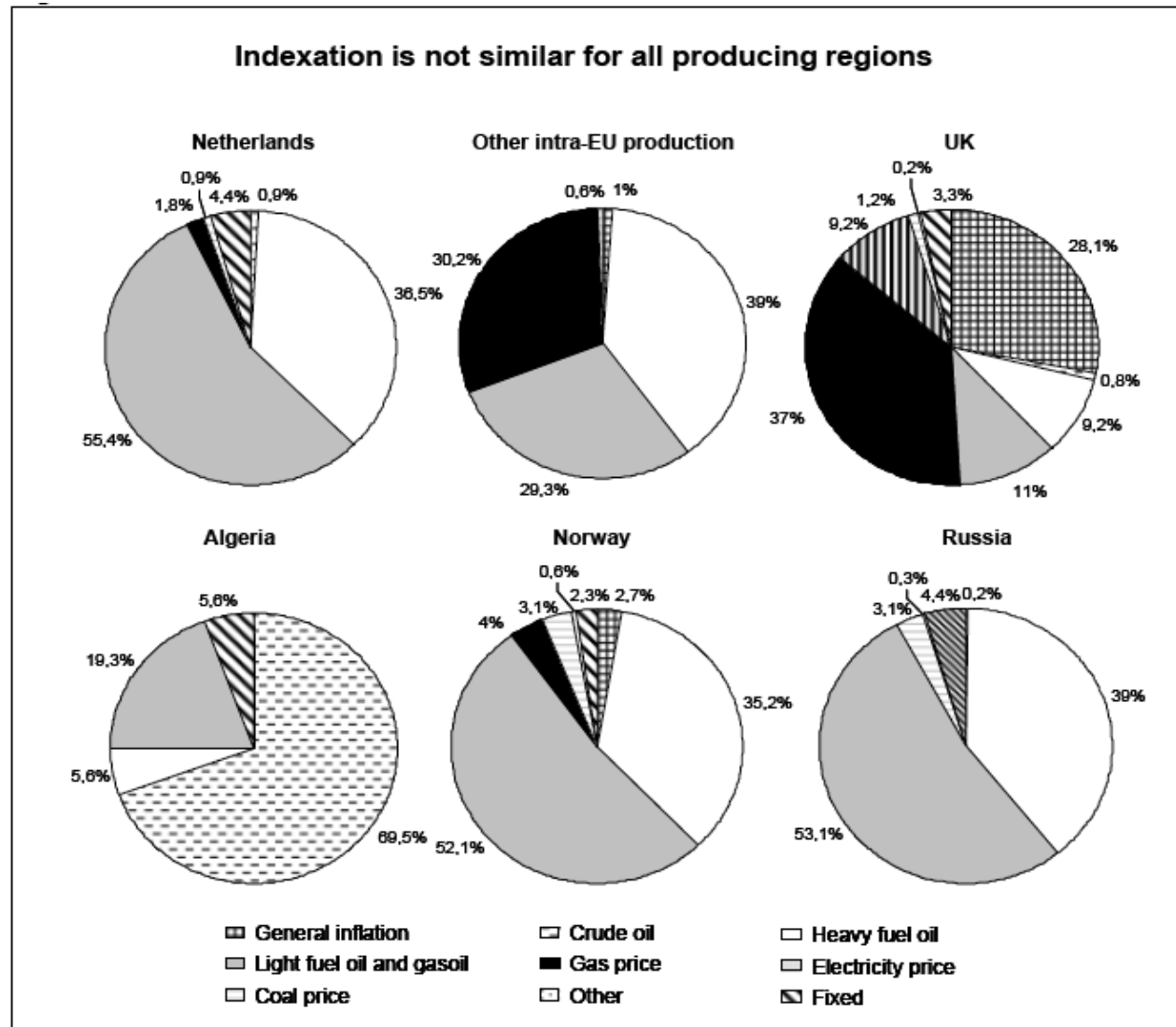
# LTC: Price Levels



Source: Energy Sector Inquiry 2005/2006



# LTC: Indexation by Producer

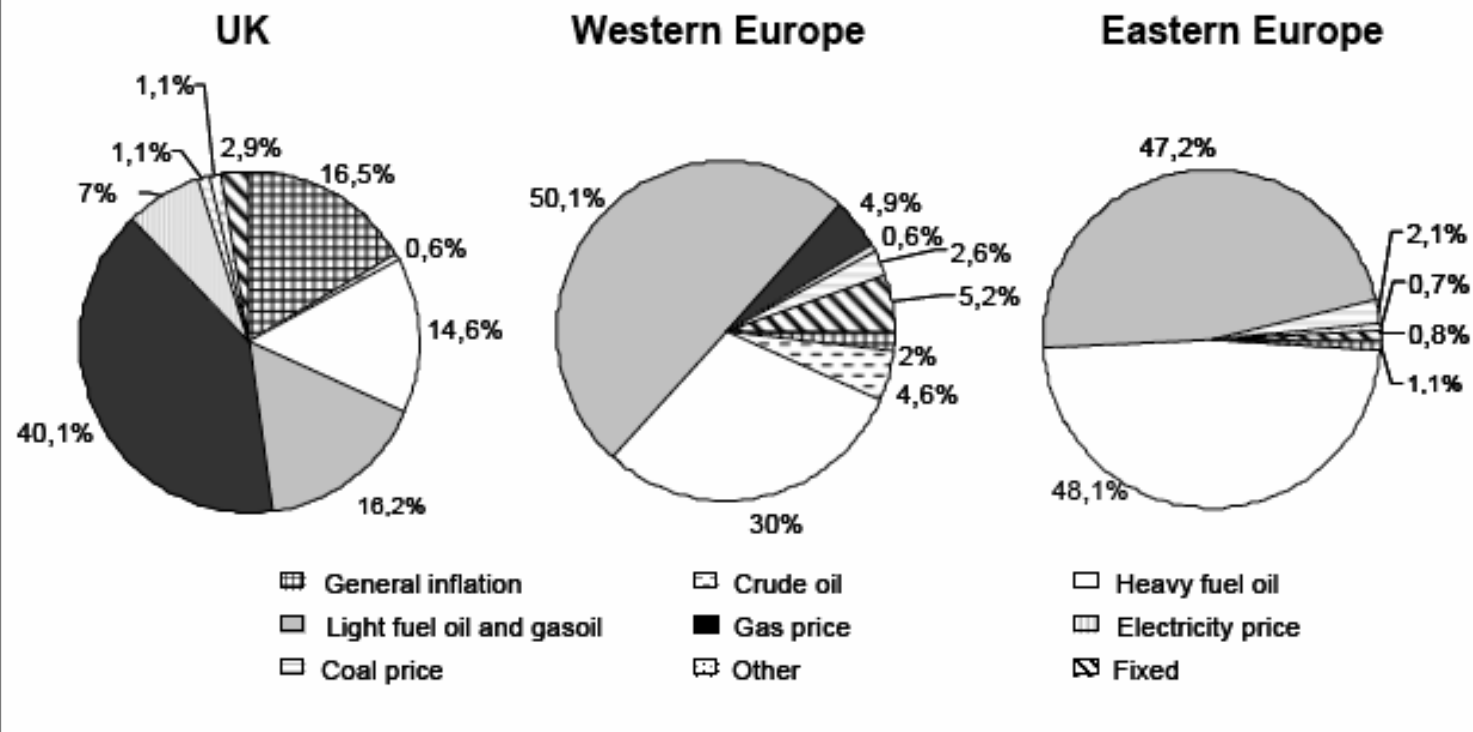


Source: Energy Sector Inquiry 2005/2006



# LTC: Indexation by EU Region

UK price indexation is very different to that in continental Europe



Source: Energy Sector Inquiry 2005/2006



## Session 2

# Development of Long-Term Gas Export Contracts :

**Former COMECON,  
Former USSR/CIS**



## Soviet/Russian Gas to Europe - Contractual Structure Based on Groningen *LTGEC* Concept

Soviet / Russian gas export contracts to:

- the EU (historically),
- former COMECON (since USSR dissolution), and
- FSU (since recently)

are based on Groningen (Dutch) concept of long-term gas export contract (*LTGEC*)

Groningen concept = LTC + replacement value + regular price rebate + minimum pay obligations+ net back + destination clauses. More than 250 BCM/y of gas imports to continental Europe based on this concept

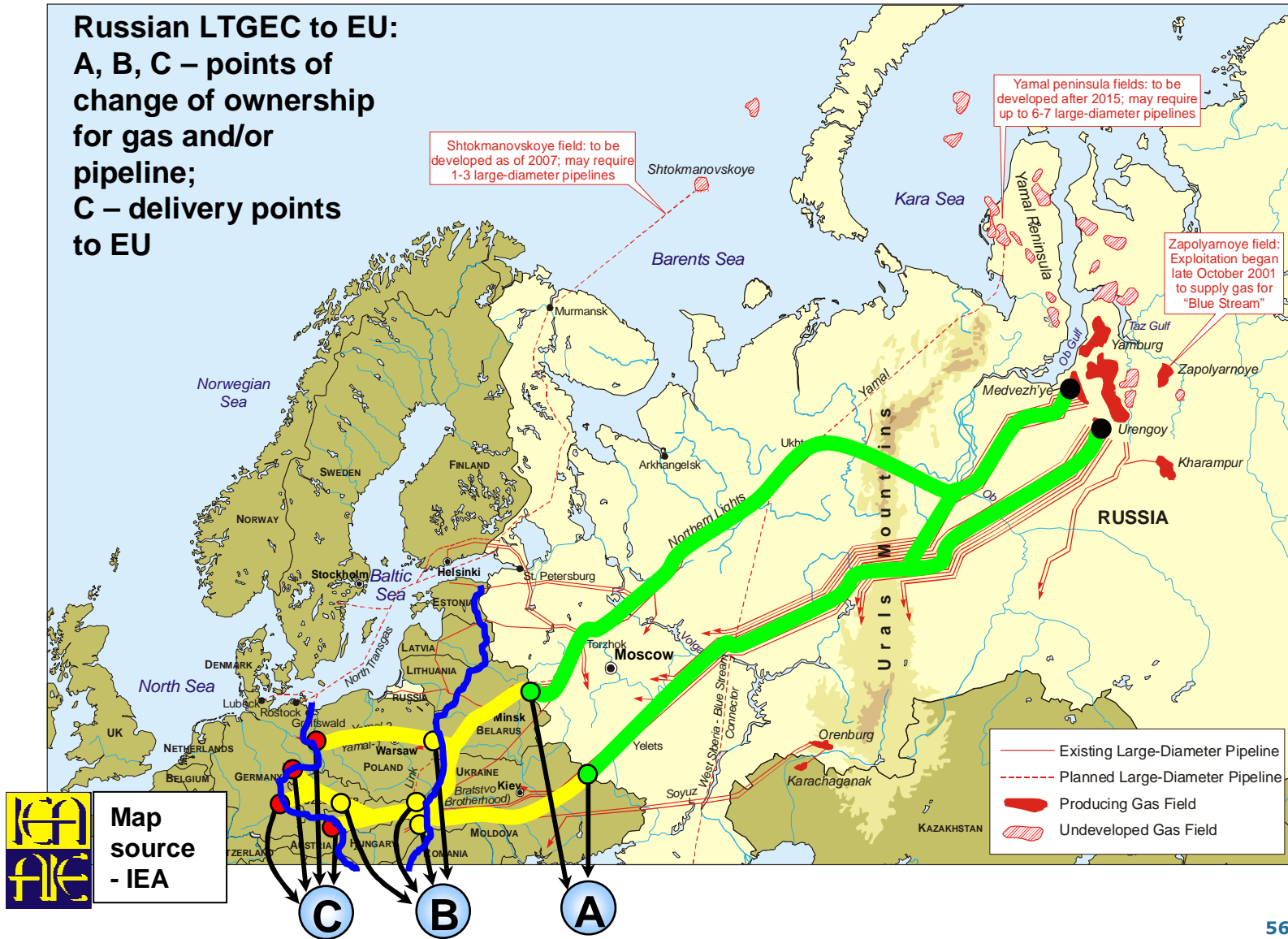
Groningen concept originated in 1962 vs. USSR gas export to EU started in early 1970s. Groningen concept-based Russian gas export contractual structure proved its validity & reliability through Cold War and post-Soviet transformation periods



# Russian Gas Export to Europe: on-border Sales and Transit Legs

Russian LTGEC to EU:

A, B, C – points of change of ownership for gas and/or pipeline;  
C – delivery points to EU



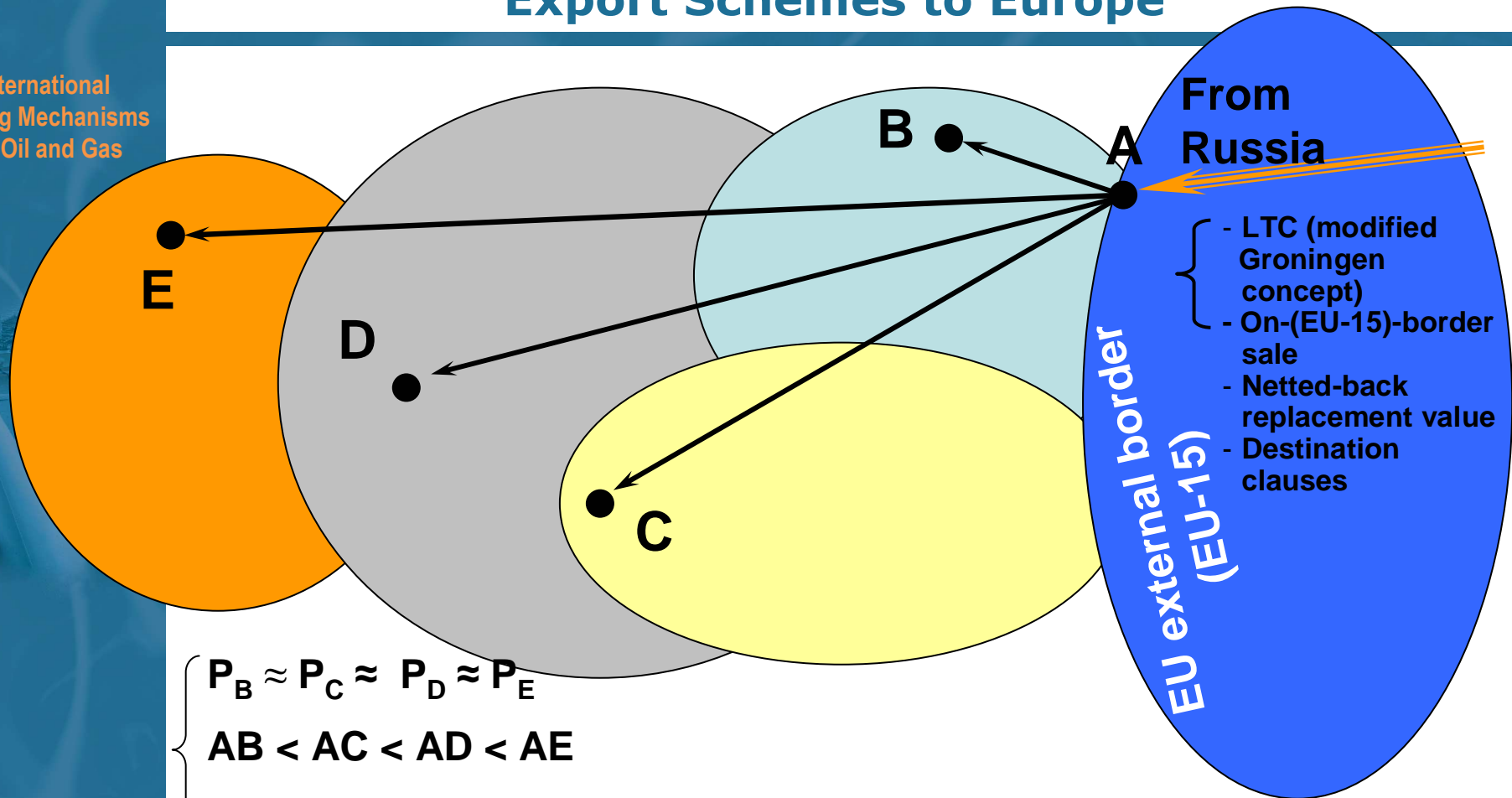


# Soviet/Russian Gas to Europe: Contractual Structure

- Long-term gas export contracts (LTGEC)
- On-border EU (-15) sales (delivery points upstream to end-markets)
- Pricing: netted-back from replacement value at the end-market (e.g. less cost of transportation from end-market to delivery point)
- Protection against arbitrage (destination clauses)
- Multiple transit (increasingly important: compared to other exporters & after USSR/COMECON dissolutions)



# Destination Clauses: Economically Motivated Integral Part of Historically Existing Russian Export Schemes to Europe

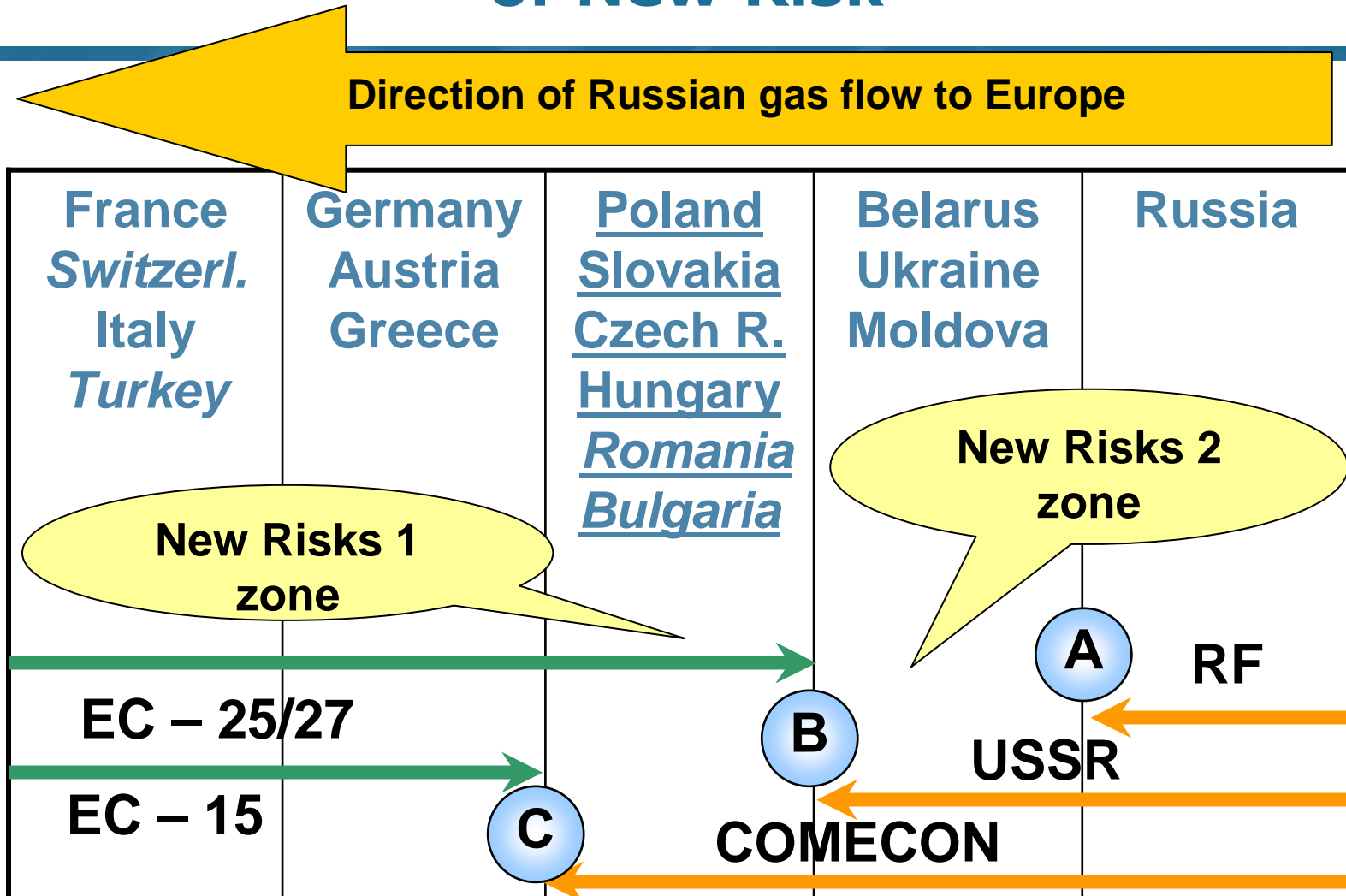


$$\begin{cases}
 P_B \approx P_C \approx P_D \approx P_E \\
 AB < AC < AD < AE \\
 P_{A \triangleright B} < P_{A \triangleright C} < P_{A \triangleright D} < P_{A \triangleright E}
 \end{cases}$$

“Destination clauses” allowed gas supplier to sell gas to different buyers at different prices and other contractual terms at one and the same delivery point to protect its competitiveness at the end market (to prevent arbitrage by buyers).



# Russian Gas Supplies to Europe: Zones of New Risk



*Italic* – non-EU countries; New EU accession states: underlined – since 01.05.2004, *underlined + italic* – since 1.01.2007; A, B, C – points of change of ownership for Russian gas and/or pipeline on its way to Europe



## Soviet/Russian Gas Supplies to COMECON/CIS: *Prior to* Dissolution of the USSR

- **Political (friendship) pricing => :**
  - subsidized (notional) export prices
  - transfer of Hotelling rent from producer-state to consumer-state
  - portion of resource rent is left to importer in exchange on his political concessions to exporter
  - sharing USSR resources (which today are mostly Russian resources) within USSR and with COMECON countries
- **Barter & quasi-barter deals**
- **Transportation system – but not transit system**
- **No transit within USSR**
- **Export & transit supplies are not contractually separated within COMECON**



## Soviet/Russian Gas Supplies to COMECON/CIS: *After* Dissolution of the USSR

- Long & painful transition to :
  - Contractual separation of transit & export supplies
  - Formation of domestic transport vs. transit legislation
  - From barter to cash payments
  - From politically-subsidized - to market-based pricing & prices:
    - Transit tariffs methodologies
    - Market-oriented export pricing & prices

Energy  
Charter role:  
draft Transit  
Protocol +  
gas/transit-  
related  
activities:  
e.g. Transit  
tariffs study  
(Jan'06),  
Pricing  
study  
(March'07),  
etc.

Gas problems in post-Soviet area = result & long-term economic consequences of dissolution of USSR / COMECON political system = objective long-term economic problems of transition period



## Ukraine/Belarus: Export and Transit of Russian Gas *Prior to* 4 January/30 December 2006

- Export & transit are not contractually separated
- Quasi-barter deals
- Notional export prices & transit tariffs – to balance gas supplies to Ukraine/Belarus
- Export pricing:
  - “cost-plus” – on the basis of the marginal costs (supply curve) for Russia
- Who receive the resource rent (Ricardian & Hotelling rents):
  - Ricardian rent – producer / exporting state (Russia),
  - (at least part of) Hotelling rent – consumer / importing state (Ukraine/Belarus) => ECT Art.18



## Ukraine: Export and Transit of Gas from Russia *After* 4 January 2006

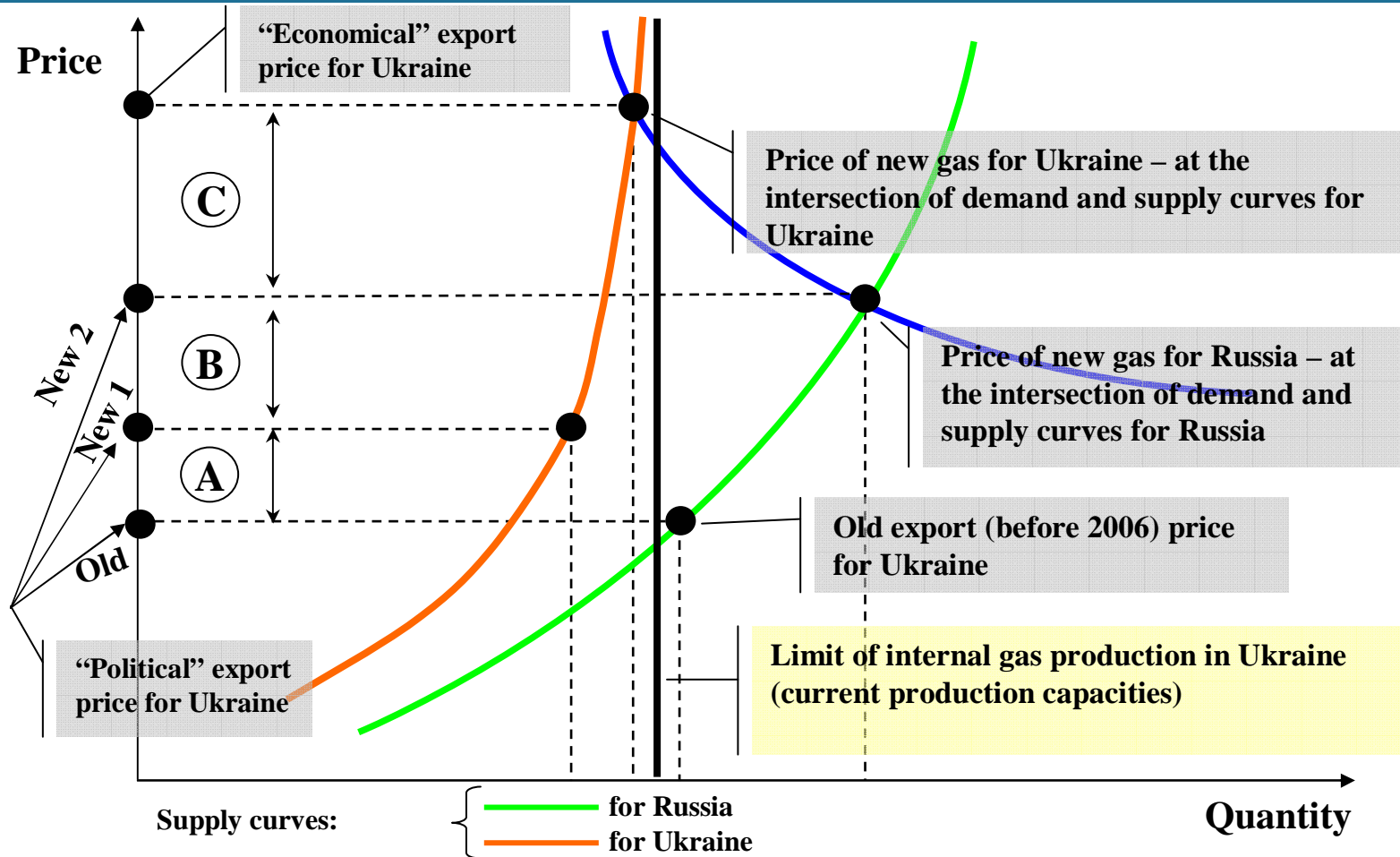
- Transit and export are contractually separated
- Cash payments
- Export price => average based on cocktail from two sources: Russia and Central Asia (CA)
- Export pricing:
  - for Russian gas - by net-back calculation => based on *demand-curve* => replacement value within EU netted-back (less transportation costs) to Russia-Ukraine border
  - for Central Asian gas - by cost-plus calculation => based on *supply curve* => negotiated price at external border of exporting CA country above its cost-plus level plus transportation costs to Russia-Ukraine border
- Who receive the resource rent (Ricardian & Hotelling rents):
  - on Russian gas – both rents go to producing/exporting-state (Russia)
  - on Central Asian gas – *Ricardian* rent goes to CA producing / exporting states; *Hotelling* rent shared between Ukraine & CA producers/exporters => ECT Art.18



# Putting a Price on ENERGY

International Pricing Mechanisms for Oil and Gas

## Pricing in Russia-Ukraine Gas Relations & Economic Theory



### “Political” export price for Ukraine :

**Old** = current internal Russian price plus cost of transportation to Russia-Ukraine border (Russian export subsidy to Ukraine = A+B+C)

**New 1** = equated to production costs («cost-plus» in Ukraine) of replacing resources, based purely on the possibility of their production within the internal market of Ukraine (Russian export subsidy to Ukraine = B+C)

**New 2** = equated to internal Russian price (production costs/“cost-plus” in Russia) of new Russian gas (Russian export subsidy to Ukraine = C)

**“Economic” export price for Ukraine** = gas replacement value at the internal EU market (calculated on long-term contracts gas pricing formulas) netted-back to Russia-Ukraine border

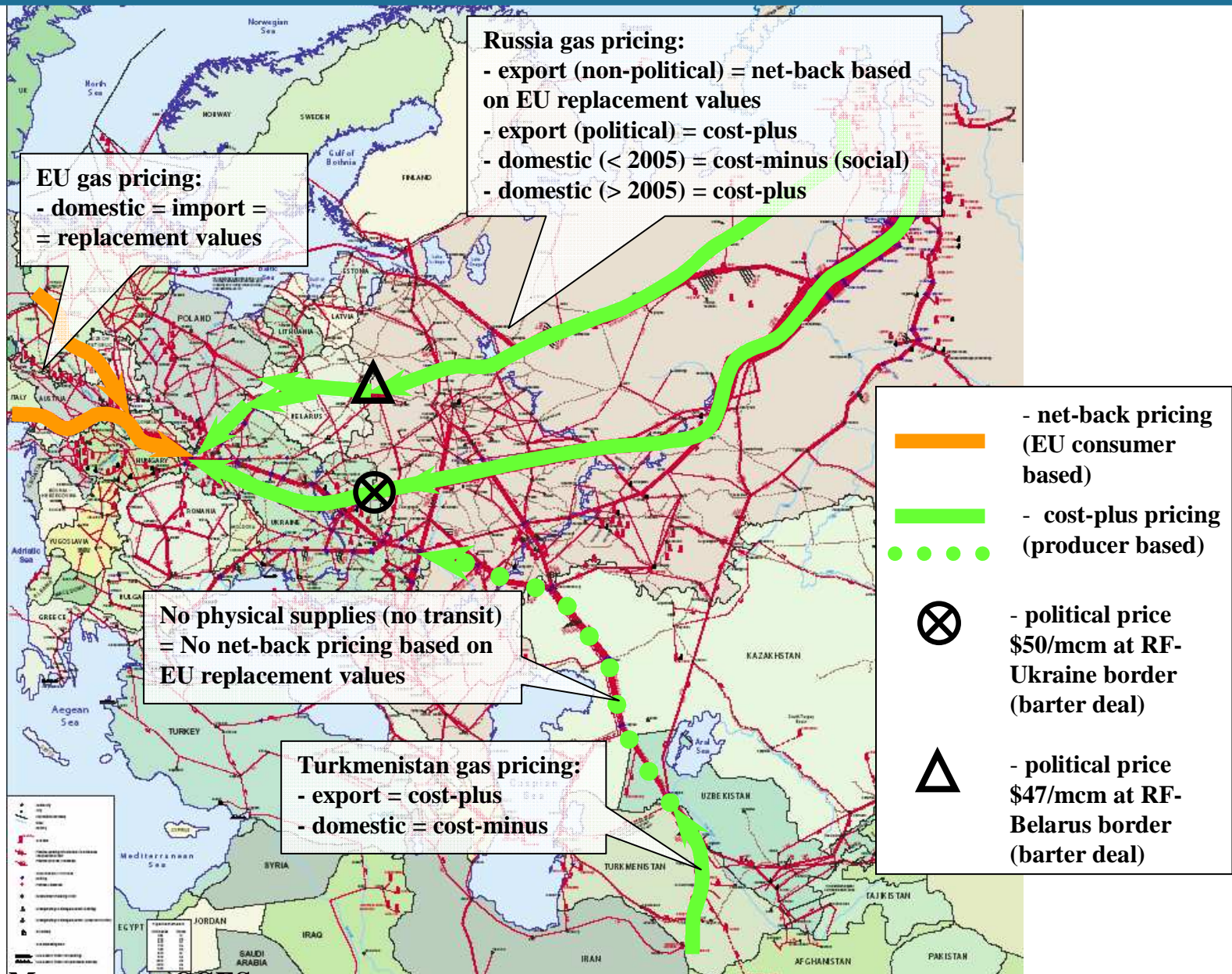




Putting a Price on ENERGY

International Pricing Mechanisms for Oil and Gas

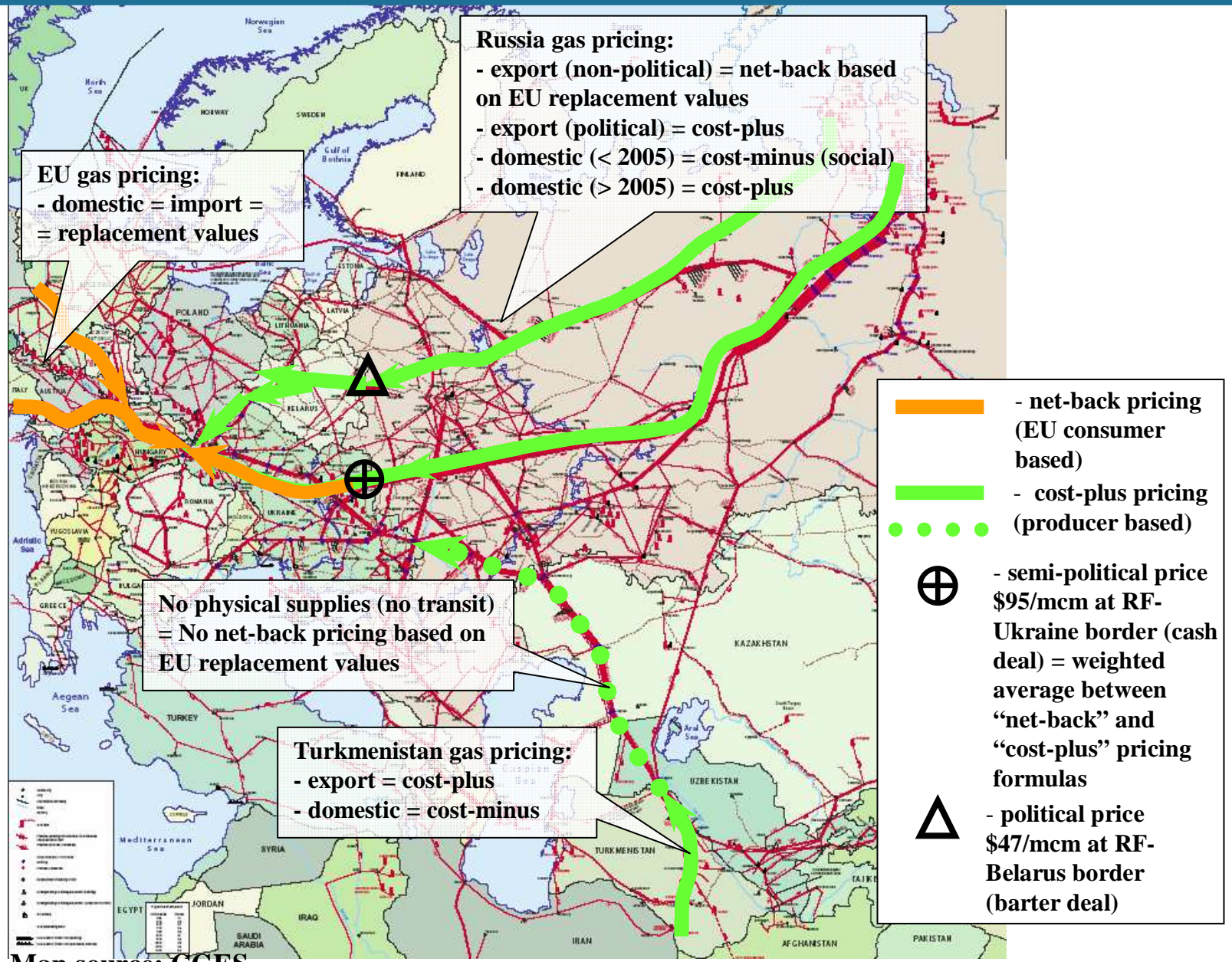
# Russian Gas Export: "Political" and "Non-Political" Pricing Zones (Ukraine & Belarus Cases, pre-January 4, 2006 )



Map source: CGES



# Russian Gas Export: "Political" and "Non-Political" Pricing Zones (Ukraine & Belarus Cases, post-January 4, 2006 )



Map source: CGES



# Belarus: Export and Transit of Russian Gas *After* 30 December 2006

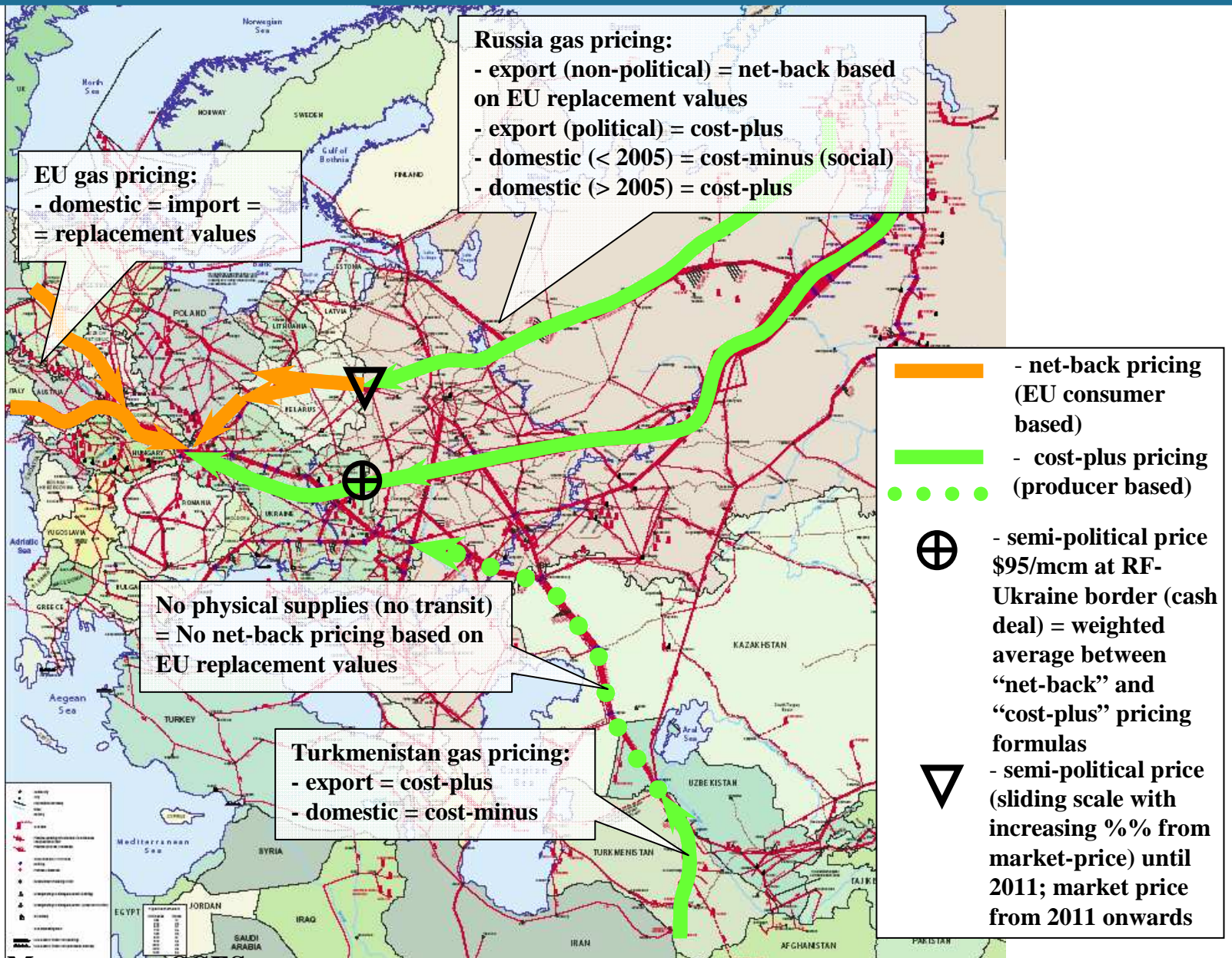
- Transit and export are contractually separated
- Cash payments
- Export pricing: by net-back calculation => based on demand-curve => replacement value within EU netted-back (less transportation costs) to Russia-Belarus border (market price)
- Export price => calculated as increasing %% of market price (from its current discounted level), to reach market price level in 2011, in line with Russia domestic gas price increase for industrial users
- Who receive the resource rent (Ricardian & Hotelling rents):
  - *Ricardian* rent – goes to producer/exporting-state (Russia)
  - *Hotelling* rent - until 2011 shared between producer/exporter (Russia) & importer (Belarus); since 2011 – goes to producer/exporter (Russia) => ECT Art.18



Putting a Price on ENERGY

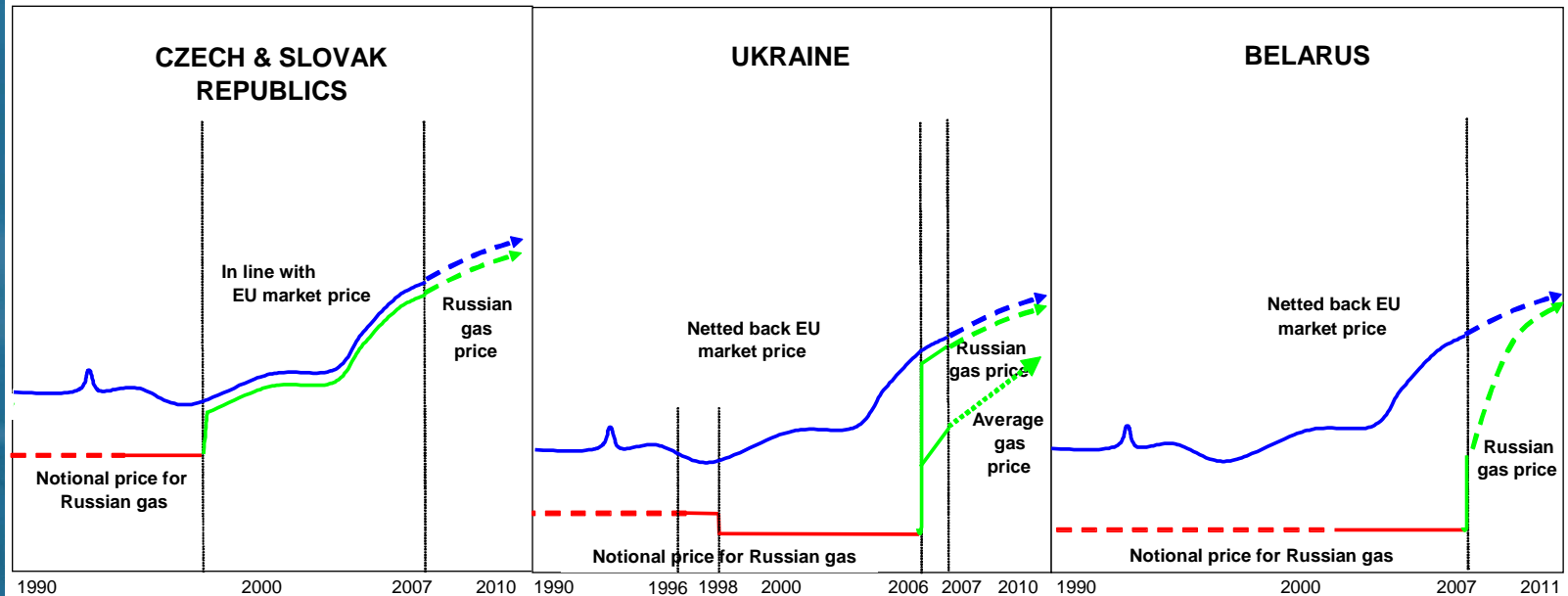
International Pricing Mechanisms for Oil and Gas

# Russian Gas Export: "Political" and "Non-Political" Pricing Zones (Ukraine & Belarus Cases, post-December 30 2006 )



Map source: CGES

# Russian Gas Prices to the EU and Countries along the Pipe



- Remarks:**
- 1- The figures are entirely for illustration purposes and, therefore, may not fully reflect the actual price levels and movements
  - 2- The illustration for "Netted back EU market prices" are based on the IEA's World Energy Outlook, 2006
  - 3- Estimates for future gas price movements beyond 2007 are entirely illustrative.
  - 4- Recent actual price figures for Ukraine and Belarus, based on information from public sources, are as follows:  
 For Ukraine - Russian gas price: 230 \$/mcm (2006) ; Average gas price (for a mixture of Russian / Central Asian gas): 95 and 135 \$/mcm (2006 and 2007, respectively)  
 For Belarus - Russian gas price: 100 \$/mcm (2007) It will reach market price level by 2011 in agreed upon steps (67, 80, 90 and 100% from 2008 to 2011)
  - 5- Notinal prices for Russian gas were used to determine volumes of gas as compensation for transit services.  
 For Ukraine: 80 \$/mcm until 1998; 50 \$/mcm from 1998 to 2006  
 For Belarus: 47 \$/mcm most recently until 2007



## Russia & Former COMECON/USSR: Different Sensitivity of Transition to Market-based Gas Prices

	Czech & Slovak Republics	Ukraine	Belarus
Internal motivation vs. external political obligations to move to market pricing / prices	(No?) / Yes (accession to EU)	No / No	No / No
Price gap (market vs. political price): value (USD/mcm) & trend prior to transition	10- (1998); diminishing	15 (1998), 160 (2005); growing	25 (1998), 170+ (2006); growing
Relative economic value / political sensitivity	Low	High	Highest (Union state)



# Conclusions

- Russian gas exports are based on Groningen (Dutch) LTGEC concept & proved its validity over 30-40 years
- Market gas export prices/pricing in continental Europe: gas replacement value at importer market netted back to delivery point + regular price rebate in LTGEC; regular practice since early 1960's
- Export prices/pricing to former COMECON & FSU states: step-by-step transformed from cost-plus-based political to market-based pricing/prices
- To soften transition to market export prices, for some countries (e.g. Ukraine, Belarus) different transition mechanisms introduced – in line with industrial gas price increase at Russia's domestic market
- Russian gas pricing to *all* destinations is being rearranged to universal market approach: replacement value in EU country netted-back to export point (Gazprom stated aim: equal financial results from operations at all its export markets)
  - Practical consequences for non-EU oriented exports?





## Session 2

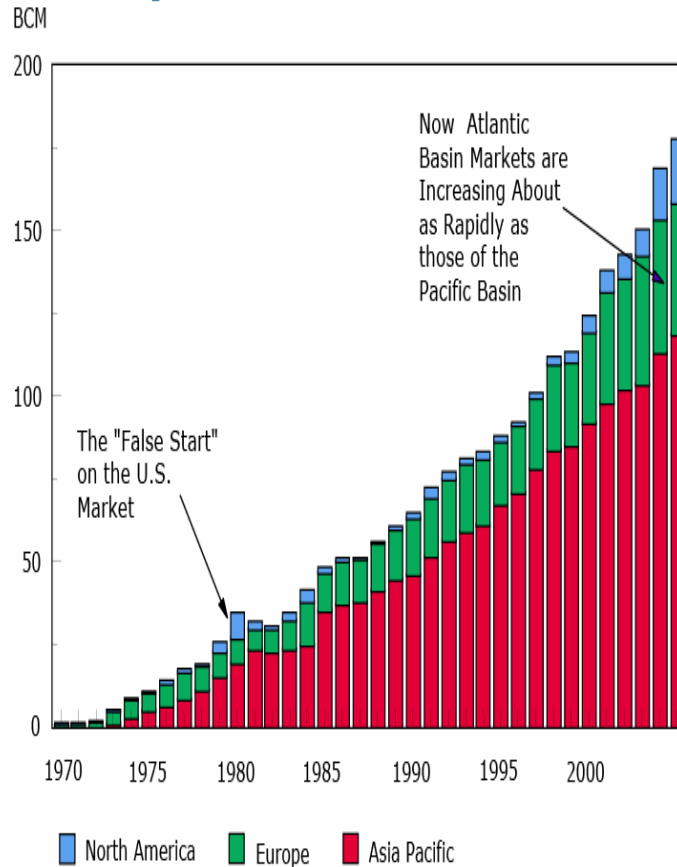
# Development of Long-Term Gas Export Contracts:

## LNG

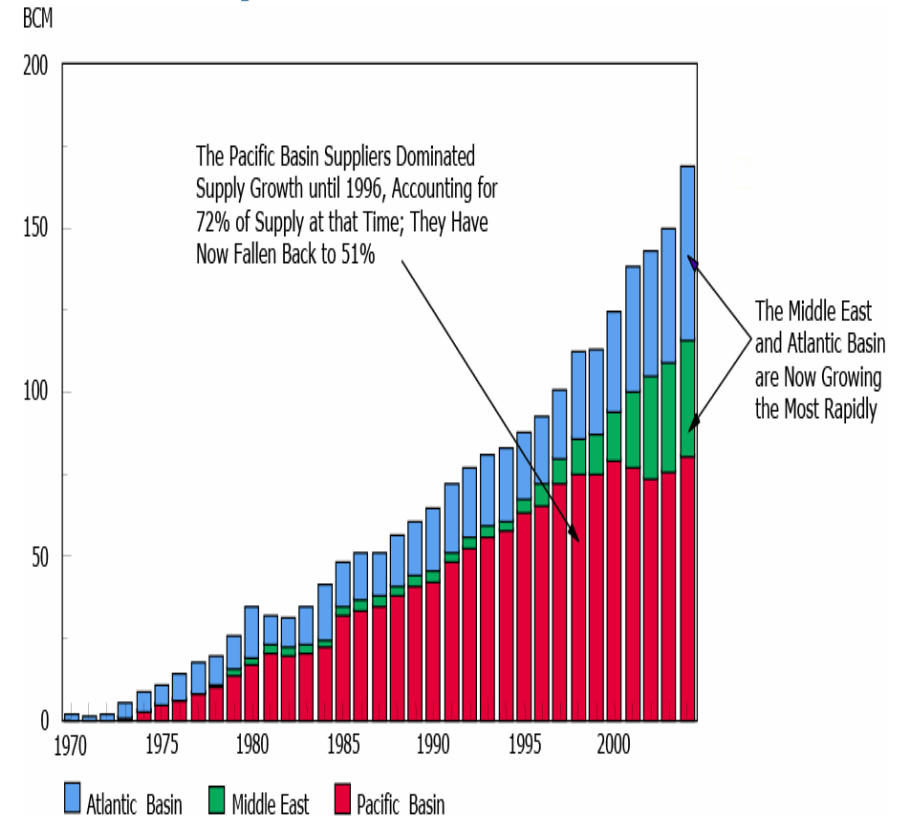


# Growth of LNG Imports

## By market



## By source



# Long-term Contracts in LNG Trade

- Sale and Purchase Agreement (SPA)
- Long term contracts – traditional pattern - 20 years or longer
- Risk sharing – buyers take volume risk (take-or-pay), sellers – price risk (price escalation clause)
- Flexibility through swapping cargoes
- Early indexation clauses used oil



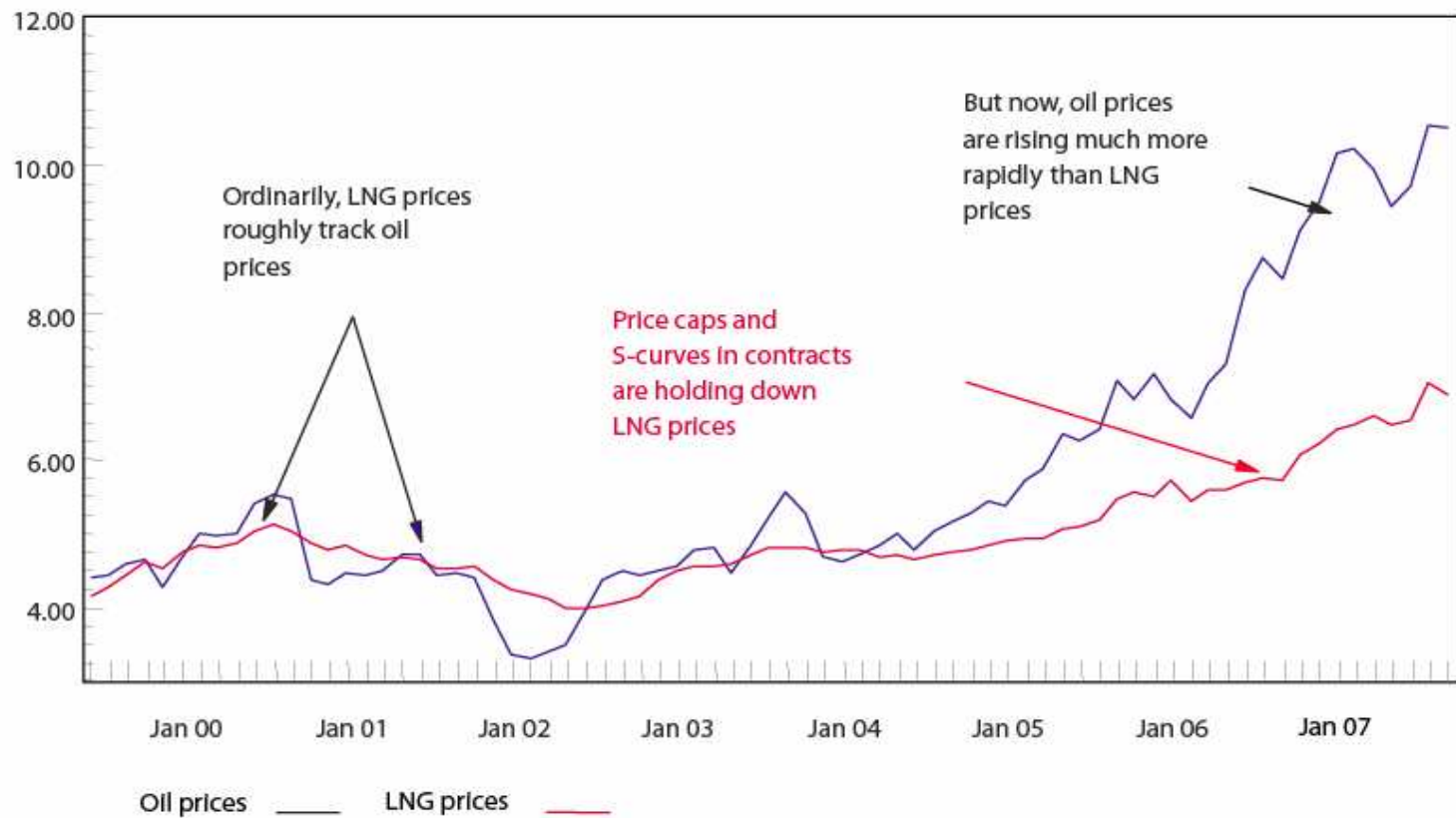


# Development of Pricing - Pacific Basin

- First Japan's project from Alaska focused on electric utility market
- Interest in replacing oil in power generation => LNG major goal
- Concern over sulphur pollution => premium pay for LNG
- Crude oil was early reference
- Since 1987 – almost all contracts use Japanese Customs Clearing price for crude oil (“Japanese Crude Cocktail”)
- South Korea and Taiwan adopted JCC approach
- To avoid oil price volatility buyers insisted on price re-opener triggered at certain price level
- Sellers interested in floor price

# JCC Compared with LNG Import Prices

Price In \$/MMBtu



# New Trends in LNG Activities

- Traditionally high take-or-pay threshold
- Buyers insist on more “take” flexibility =>
- Emergence of new LNG suppliers outside Asia Pacific + reemergence of US market
- Flexibility in new contracts:
  - disappearing of floor price
  - shorter term
  - smaller off-take
  - destination flexibility
  - buyers negotiating equity position upstream
- Important flexibility through self-contracting
- While LTC remain, they become more flexible



# Northeast Asia and Continental Europe

- Traditional contracting patterns remain important
- Prices linked to oil
- Northeast Asia – crude oil as reference
- Cont. Europe – mixes of fuel oil, gas oil, crude oil + review clause after 3 years
- Cont. Europe – generally traditional contracting, except where use in power generation (e.g. Spain)
- Continent will be affected by competition with UK's liberalised pricing via Interconnector



# North America and UK

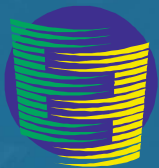
- Restructuring influenced the market in US and UK
- Short-term contracts dominate in US
- LTCs still dominate in UK
- LTCs refer to gas market indicators (Henry Hub or NBP)
- Oil linkage doesn't work for power generation customers
- => self-contracting, integrating downstream to sell directly to smaller resellers and end users
- Reliance on self-contracting and LTC with gas indicators likely to remain the basis for LNG trade in North America and UK



Putting a Price  
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International  
Pricing Mechanisms  
for Oil and Gas

# International Pricing Mechanisms for Oil and Gas: Main Results



Energy Charter Secretariat



# Main Results

## Oil:

Liquid markets are **not** necessarily competitive markets

## Gas is unlikely to follow oil soon:

Lower energy density means higher specific costs for transport and storage  
=> Hindrance to a global market and to liquid market places

## Major factors for gas pricing mechanisms:

- Resource rent optimisation by resource owning country
- Import dependence => **Limited regulatory reach**
- High specificity of pipelines, tying partner for a long time together

## Long Term (Import) Contracts:

- concept for **international** gas trade developed by the Netherlands in 1962
  - Predominant part of international gas trade
  - Increasingly replaces annual compensation deals in FSU countries
- LTCs able to adopt to changes, e.g. reduction in fuel oil pegging
- LTCs a reality of international trade which can only be changed by consensus

## LNG:

- Bulk still under long term contracts (for financing)
- Now flexibility for opportunity driven changes
- Serves as price transmitter (of high prices so far), **but** no market place



# Session 3

## Questions and Answers, Discussion and Conclusions

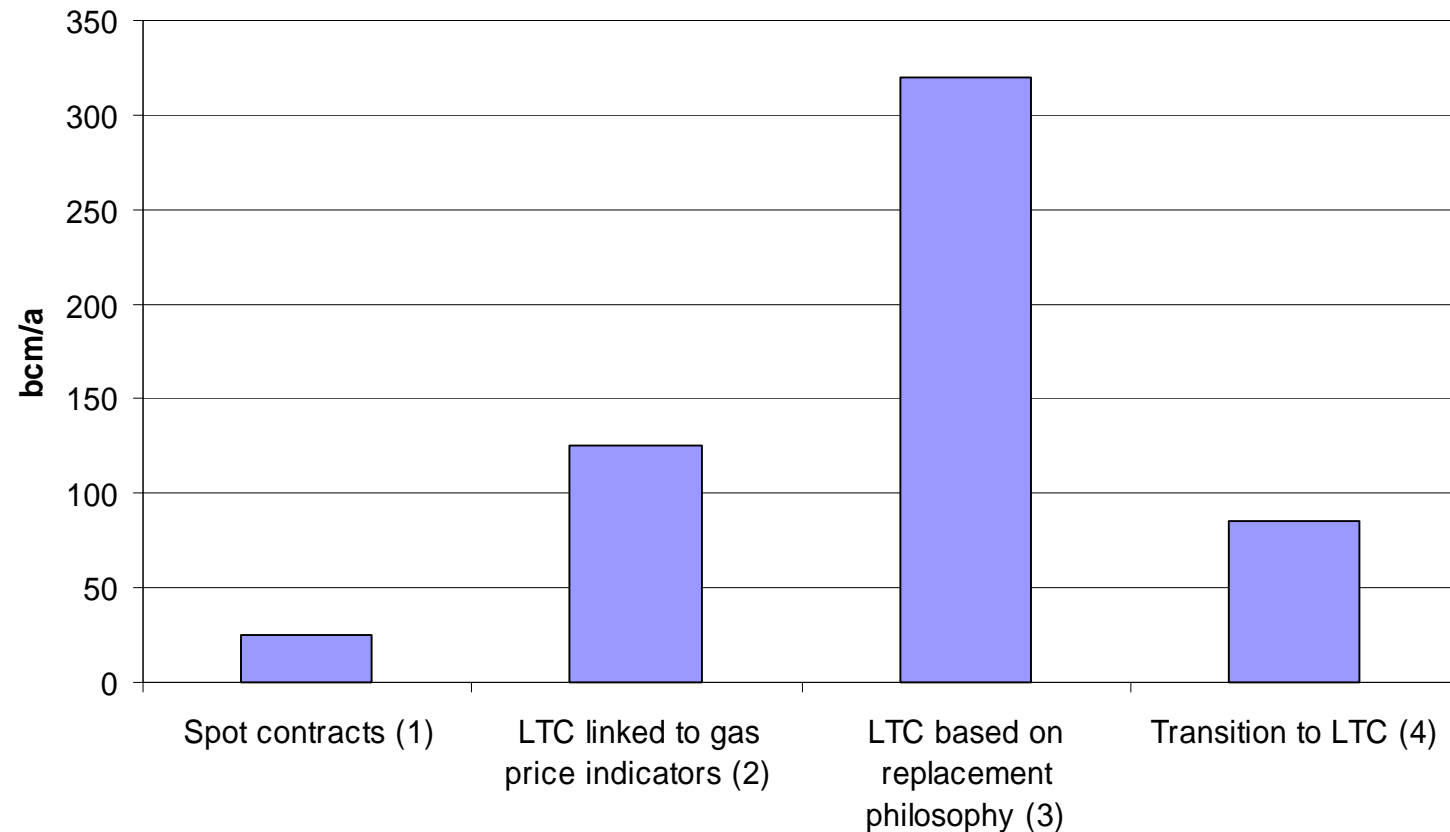


# Will Gas follow Oil to Become a (Global) Commodity?

Will Gas Follow Oil to Become a (Global) Commodity?						
North America and United Kingdom			Continental Europe and Japan / Korea			
➤ development based on own resources, no initial dependence on imports			➤ high import dependence from the start			
➤ supply based on small to medium sized gas fields			➤ supply based on imports from giant / super giant fields			
➤ standardised rent taking development decision by private players			➤ rent maximisation of exporting countries development decision by exporting country			
➤ demand elasticity from gas to power generation			➤ limited demand elasticity			
➤ gas-gas competition but price path for gas still tracks oil prices			➤ oil prices as reference in price formula			
			<i>Linkages</i>			
market restructuring as of 1980s			⇄ model for reform			
North America		UK	LNG trade	Continental EU		Japan/Korea
Hubs created by industry, churn 100, many players, high LNG absorption potential.	⇄	NBP created by regulation, churn 1.5 to 10, many players, limited absorption of LNG.	⇄	few industry hubs, churn <10, few strong players, dominance LTCs.	⇄	no hub so far, few strong players, dominance LTCs.



# Estimated International Gas Trade (2005): Different Pricing Mechanisms for Main Regions



Source: BP (2006) (1) LNG to USA, UK and other spot LNG; arbitrage on the UK-Belgium Interconnector  
(2) Pipeline Canada-USA, pipelines to UK (BBL, Langeled) and new Dutch exports  
(3) All imports by Continental Europe (incl. accession countries) less spot LNG under (1)  
(4) Trade with FSU now in transition from quasi-barter deals to LTCs, 2004 figures



# Ormen Lange: A Project without LTC

- Ormen Lange – the first upstream gas export project (field + pipeline) w/out LTC:
  - Feasibility study – initially with LTC (internal motivation of investors)
  - No LTC due to political and commercial considerations
- Aimed at UK Market:
  - NBP price (more volatile) vs. LTC price (more stable), but
  - For UK: Price at NBP prevails anyhow
  - UK: Most liberal & liquid market, but totally different from Continental Europe
- Self-contracting
  - Each company of consortia responsible for marketing its own share of gas produced
- Low breakeven price of the project (BEPP)
  - Result of technological & managerial improvements
  - Big gap between NBP & breakeven price diminishes risks & secures from/compensates for lack of LTC



# 2004-2006 FLAME Polls on Gas-to-oil Price Pegging

Q 2004-05: When will European LTC gas prices “break loose” from oil prices and be ruled by spot/futures quotations?			Q 2006: To what extent will spot pricing in gas markets replace oil price pegging formulas?	
By yearend 2005	1	-	Very considerably	4
By yearend 2008	-	5	Considerably	28
By yearend 2010	24	17	To some extent	44
By yearend 2015	36	23	Slightly	23
After 2015	15	30	Nil	1
Never	24	25		



# Questions

## **Will gas follow oil to a worldwide commodity pricing mechanism?**

- Implications of import dependence
- Impact of liquid national markets

## **The future of long term contracts:**

- Mix between liquid markets and LTCs
- Pegging to fuel oils
- Reasons for long term contracts to stay

## **Impact of arbitrage by LNG on pricing**

## **Other important questions ?**



# Where will it go?

## Two possible directions

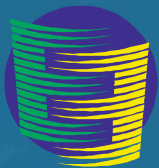
### Present situation:

tight supplies, competition between consumers,  
price peaks transferred by arbitrage

### Future situation:

**Case 1:** More import dependence of North-America, UK  
=> liquidity of the market places (churn) decreases  
=> supply governed by LTC and vertical integration

**Case 2:** Attractive, deep and liquid market places  
(US,UK) => more resources developed for export,  
liquidity provided by LNG  
=> increasing supply competition  
=> LTC with replacement pricing leading to  
=> LTC (also on the Continent) pegged to gas-to-  
gas competition => more spot deliveries





# Alternative / Complementary Concepts

- **So far: LNG to US,UK and arbitrage on Interconnector**
- Expanding models of national gas market places to international trade:
  - Demand side flexibility by deep and liquid US market
  - Supply flexibility by LNG?
- **BUT:**
- Liquid markets not necessarily competitive
- Tight gas / LNG supply: more regasification than liquefaction terminals under way
- LNG: vertical integration / self contracting / arbitrage

**So far: gas prices follow trend of oil prices**



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The Report can be down loaded at:  
**[www.encharter.org](http://www.encharter.org)**



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# Reserve slides

# Driver for Groningen Concept: Optimizing the resource rent

**Specificity of investment and resource base**

**Replacement value principle (domestic and export):**

**Max price consumer will pay compared to  
Alternatives**

**If gas-to-gas competition:**

**replacement value => gas market price**

**Otherwise defined by costs of replacement fuels**

**Export:**

**Long term: Maximise resource rent over time (incash)**

**Keep supplies reliable but tight**

**Ensure a defined sales volume**

**Replacement value pricing (periodical adjustment)**

**Net back to supply point: Consumers pay, but costs  
of infrastructure deducted from revenue of resource  
owner**



# Basis of Concept - Domestic

- Segment of small users could bring highest revenues as demand is price-inelastic
  - Technical superiority of gas for production processes of downstream energy-intensive industries
  - Gas made available to domestic users on large scale in many appliances (cooking, warm water, heat)
- => Replacement value concept: price for consumers just attractive compared to use of alternative fuels
- => Requires:
- regular review
  - keeping gas supplies tight

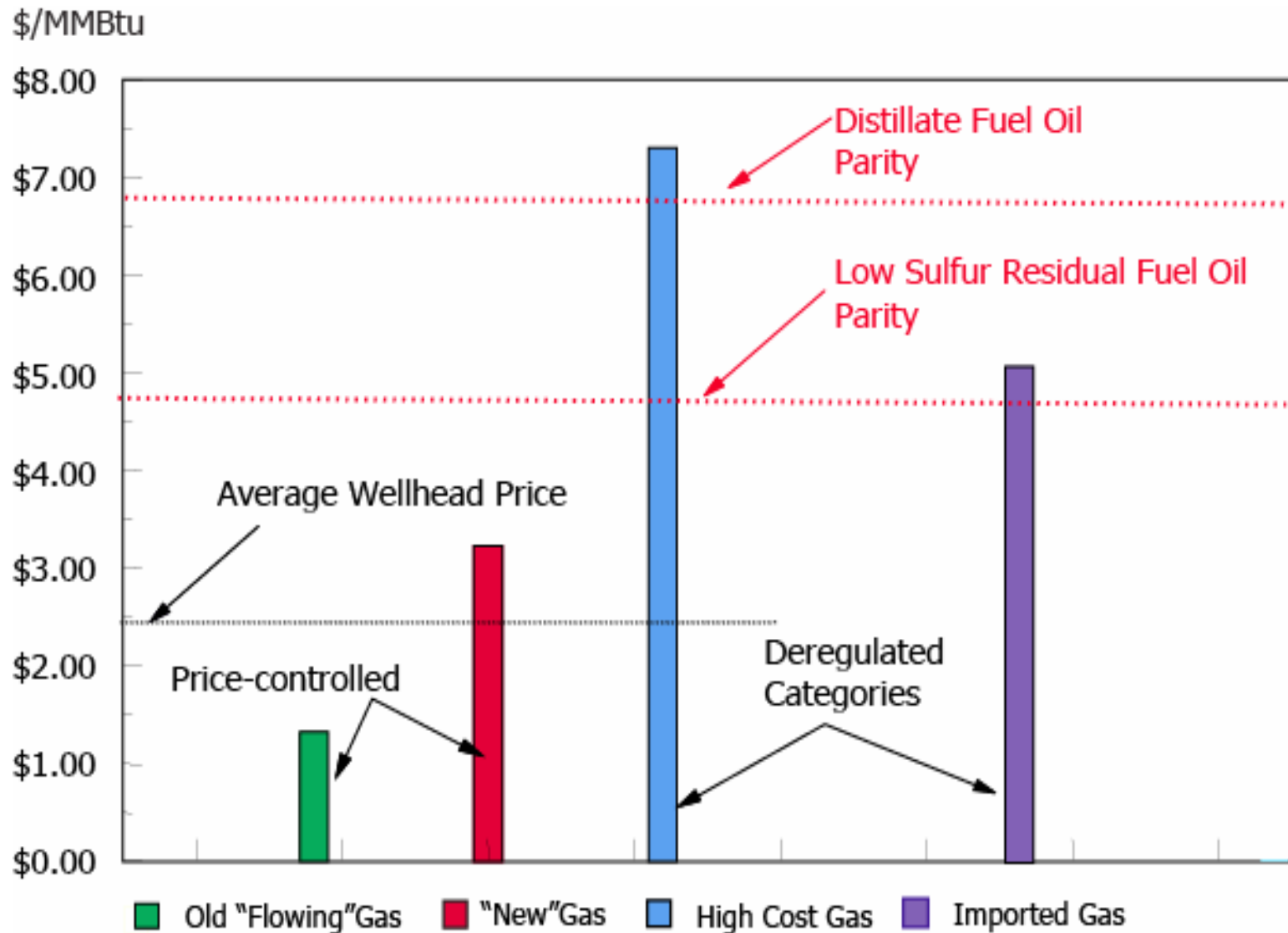


# Gas Regulation in the US

- “Commerce clause” of Constitution restricts Federal regulation to interstate commerce
- Matters of state regulation of oil and gas production / local gas distribution - preserve of state governments =>
- ⇒ Regulator lacks authority to adopt policies
- Natural Policy Gas Act 1938
- Federal jurisdiction over natural gas companies operating in interstate commerce
- Authority to regulate the gas industry - Federal Energy Regulatory Commission (FERC).
- Requiring that companies charge ‘just and reasonable’ rates.



# Different Categories of Gas Prices After Deregulation





## Effect of US Reform on Canada

- Originally no wellhead price control
- Prices - on netback basis from interfuel competition
- US pipelines bid up for Canadian not price-controlled imports
- Introduced export price control through a single border price for exports
- Domestic price control – in 1975
- During US “gas bubble” system had problems
- Reduction of imports from Canada
- Halloween Agreement dismantled the price control system - competitive market pricing and TPA

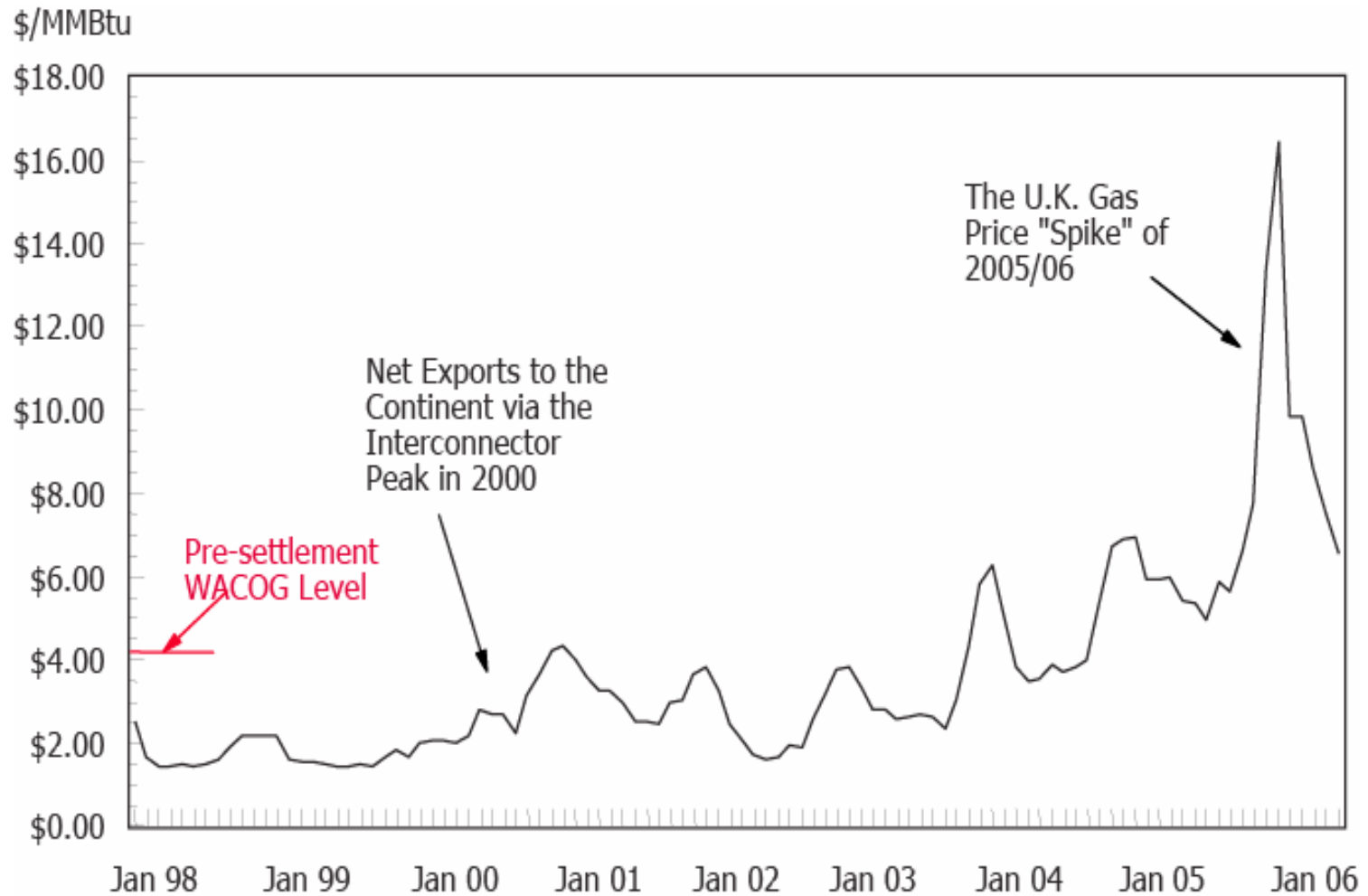


# US/Canada Summary

- The US and Canadian markets have a fully integrated market-responsive pricing system with similar regulatory oversight
- Both restructured to encourage market pricing
- Both tried more restrictive regulation before liberalizing
- In surplus, gas-to-gas competition sets prices – oil prices are irrelevant
- In tight markets interfuel competition sets prices
- Other fuels (e.g. coal) may set pricing targets
- US/Canada supply problems => recent sharp increase in prices and interest in LNG



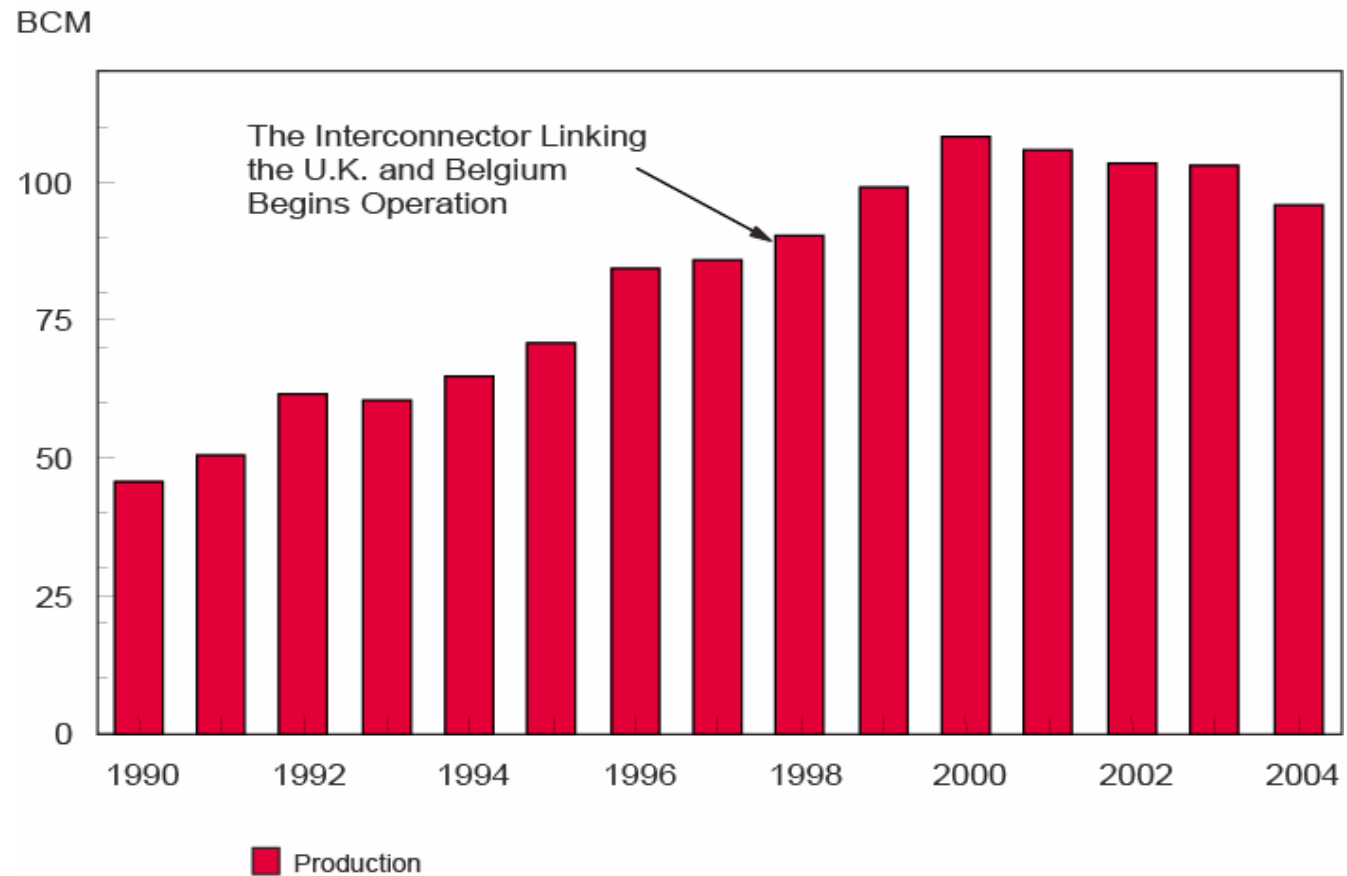
# UK National Balancing Point Prices



NBP —



# UK Gas Production





# Brief History of LNG Trade

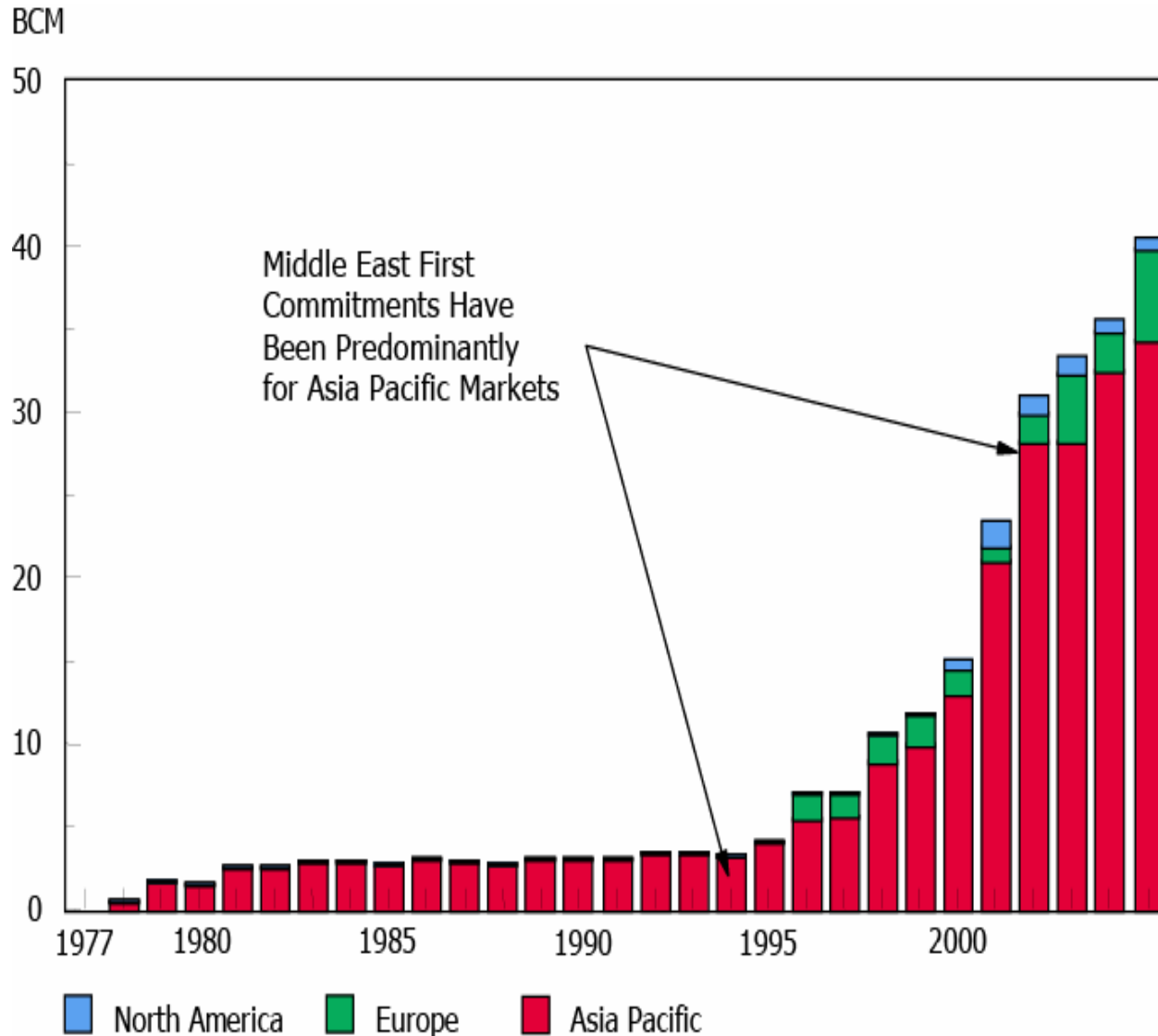
- Start of LNG – 1964, from Algeria to UK and France
- + Libya to Italy and Spain, Alaska to Japan, supplies to US from 1972
- Slow increase of trade to Europe, but US market contracted
- 70-90s – Asia Pacific dominates
- Japan increased exports, esp. from Indonesia
- Korea and Taiwan emerged as importers in 1986/ 1990, Malaysia and Australia as exporters in 1983/ 1989
- Now Europe and North America returned as major markets
- Trinidad and Nigeria in 1999
- Atlantic basin and Middle East supplies growing

# China and India

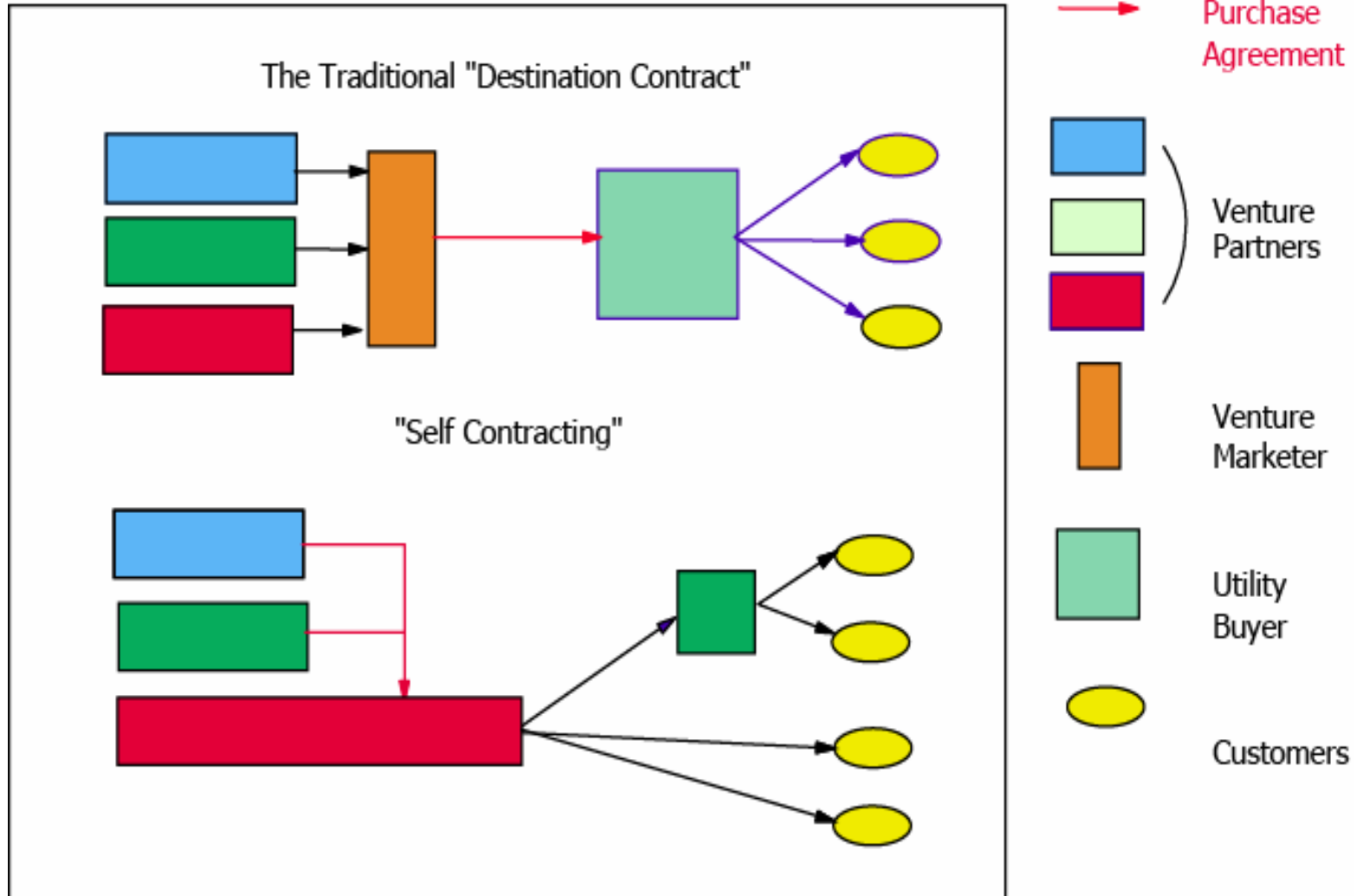
- Favorable contracts before LNG market got tight/oil prices rose
- China – Australia's Northwest Shelf project
- Contract renegotiation for contracts with re-opening or expiring
- Problem to provide LNG at prices acceptable to Indian power generators based on low-cost coal => difficult to set new terminals in India
- Market tightened, but price caps restrained rise of LNG prices



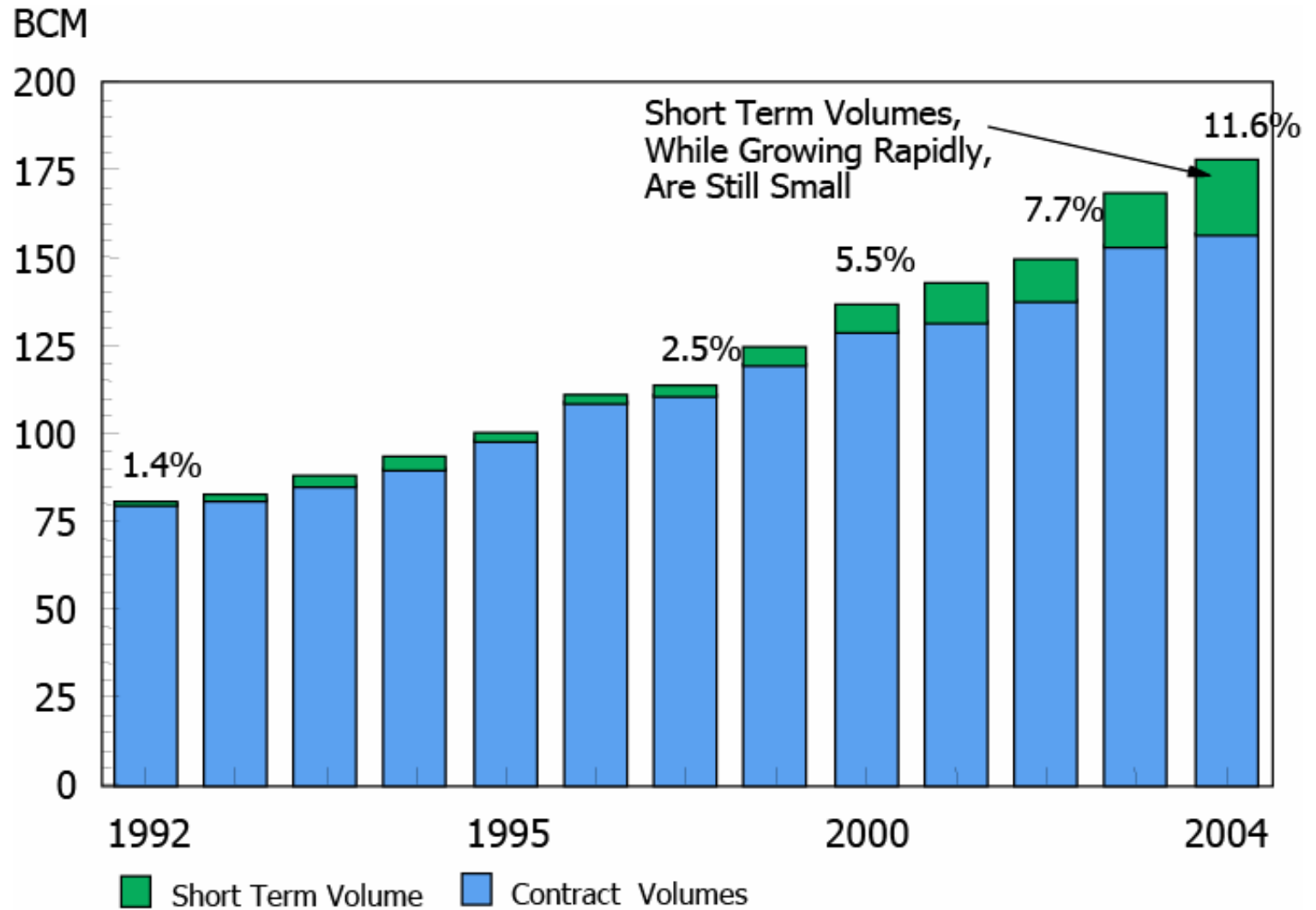
# The Middle East Expands and Shifts its Export Focus (Bcm)



# 'Self-contracting' Approach to LNG Marketing



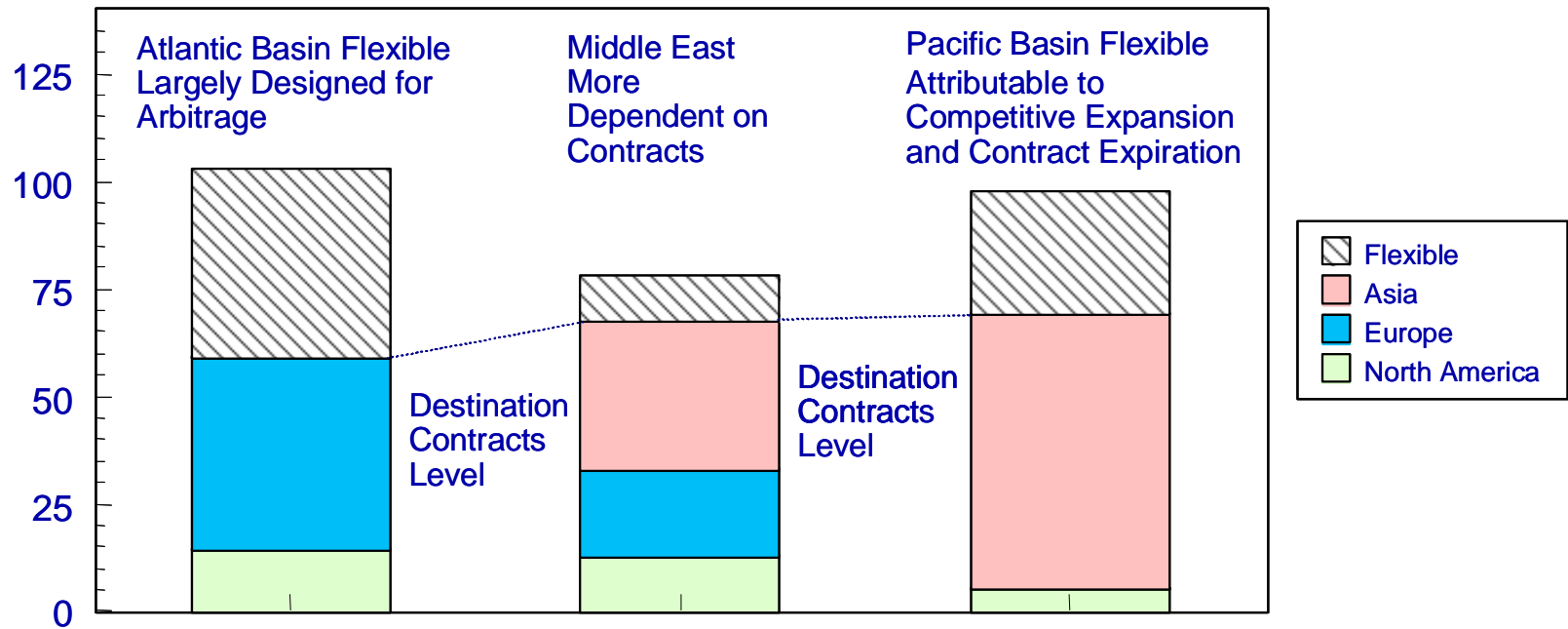
# LNG Trade Showing the Growing Role of Short-term Sales (Bcm)





# Estimated [1] Contractual Status of Firm and Probable LNG Capacity in Place by 2010 Million Tons of LNG

Million Tons



[1] Jensen Estimates Assuming Current Schedules

ATLANTIC BASIN

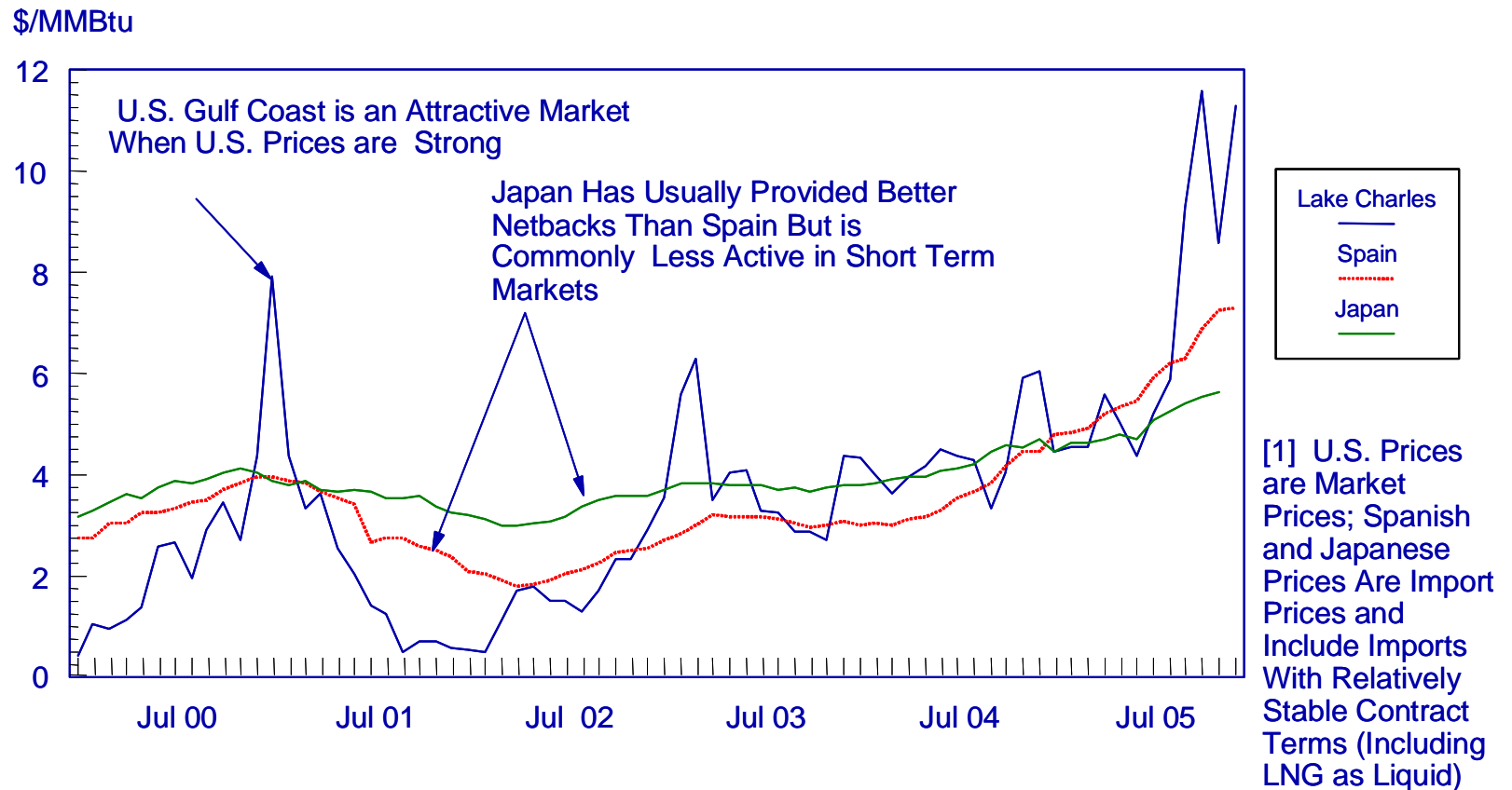
MIDDLE EAST

PACIFIC BASIN

Jensen



# Illustrative Netbacks [1] from the US Gulf Coast, Spain and Japan to the Middle East Showing Arbitrage Patterns



# Putting a Price on ENERGY

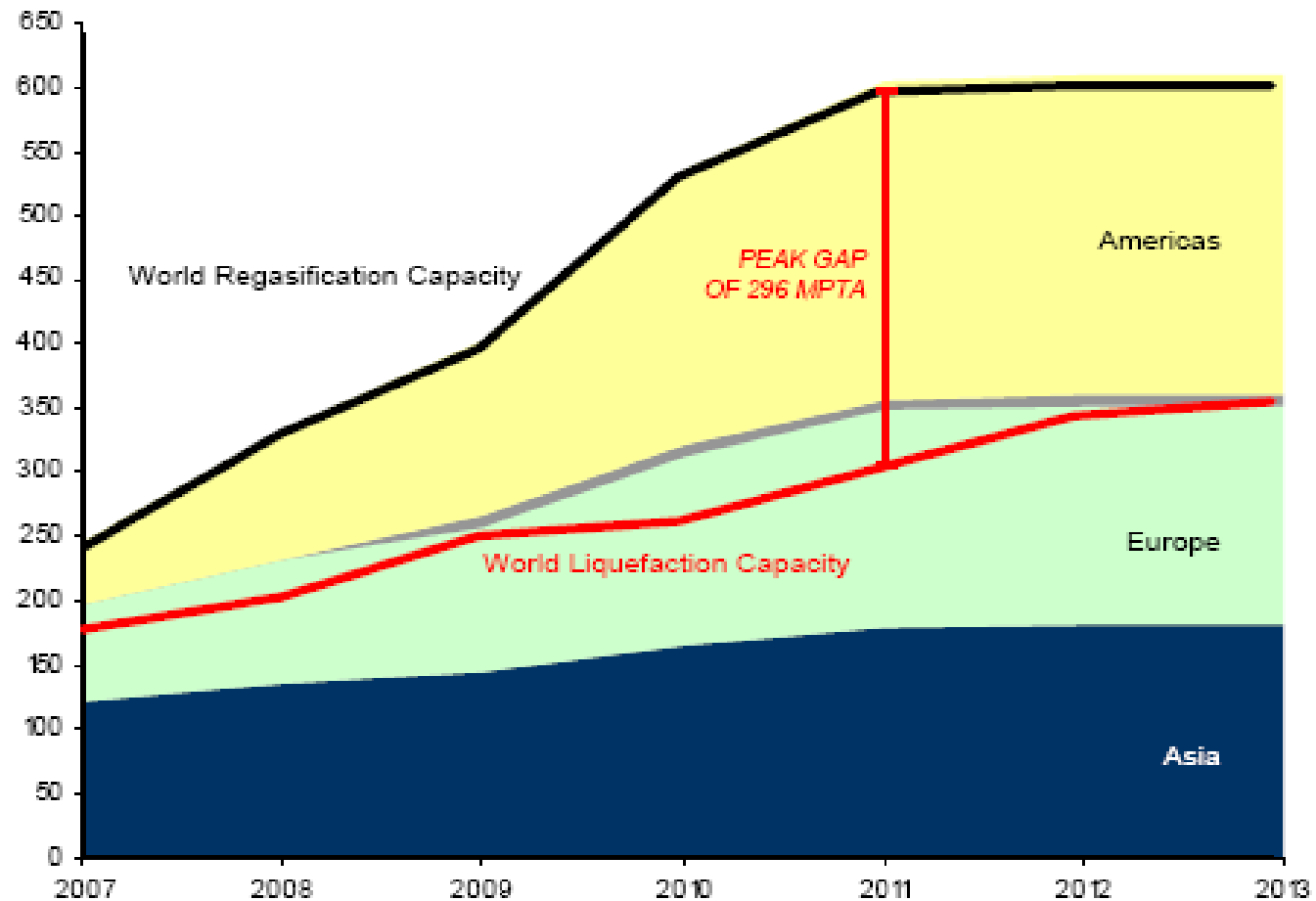
International Pricing Mechanisms for Oil and Gas



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## ...Resulting in Regasification Exceeding Liquefaction...

Projected World Regasification vs. Liquefaction Capacity (MTPA)



Source: MGA