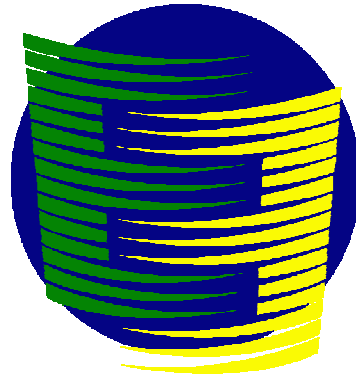


**PUTTING A PRICE ON ENERGY:  
INTERNATIONAL PRICING  
MECHANISMS FOR OIL AND GAS,  
WITH THE SPECIAL EMPHASIS ON  
RUSSIA-EU-CIS GAS RELATIONS**

**Dr. Andrey Konoplyanik,  
Deputy Secretary General,  
Energy Charter Secretariat**

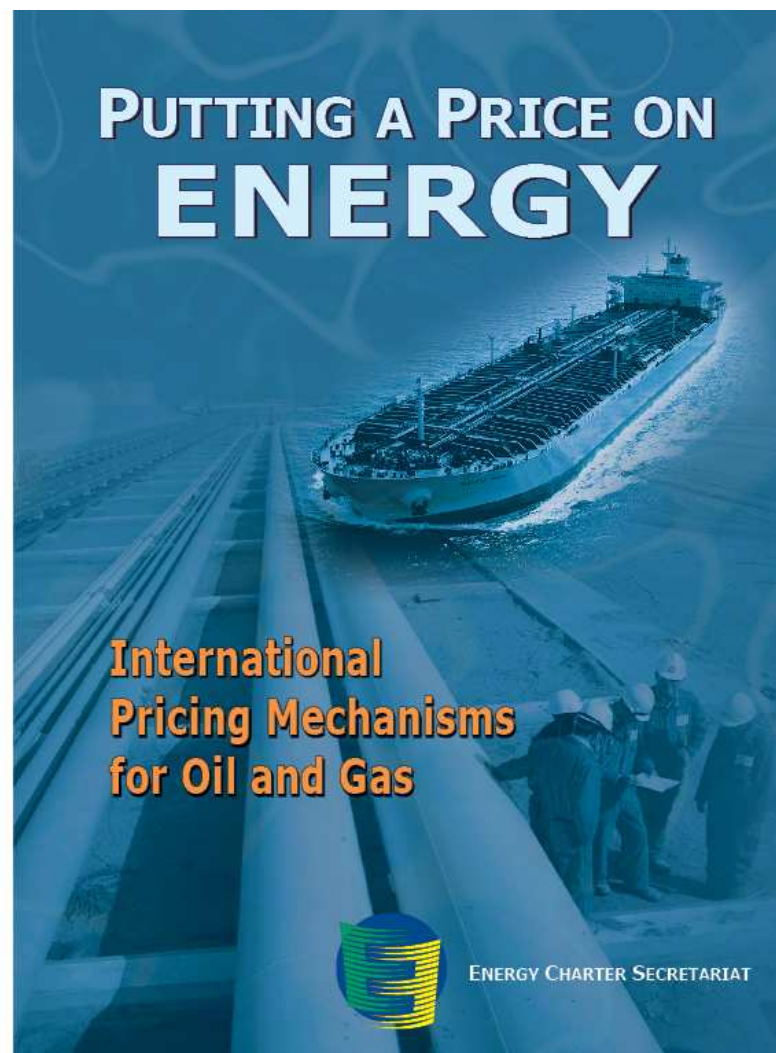
**CEPMLP Thursday Speaker Series Seminar**

**18 October 2007, University of Dundee, Scotland, UK**

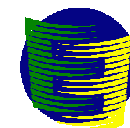


# THE STRUGGLE FOR HOTELLING RENT

# Report by the Energy Charter

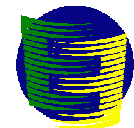


The Report can be downloaded free of charge at: [www.encharter.org](http://www.encharter.org)



# CONTENTS:

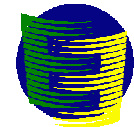
- 1. Pricing of non-renewable energy resources: economic theory & history**
2. Soviet / Russian gas supplies to Europe: contractual structure & its evolution
3. Russian gas & post-Soviet transformation of economic relations with CIS to market-based principles



# 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.”



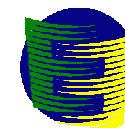
# Why Sovereignty over Resources Matters (both in theory and practice)

*Difference between*

- Economics of **manufacturing** sectors:
  - equal entry and exit conditions possible
  - competition will yield optimum

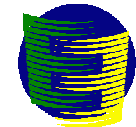
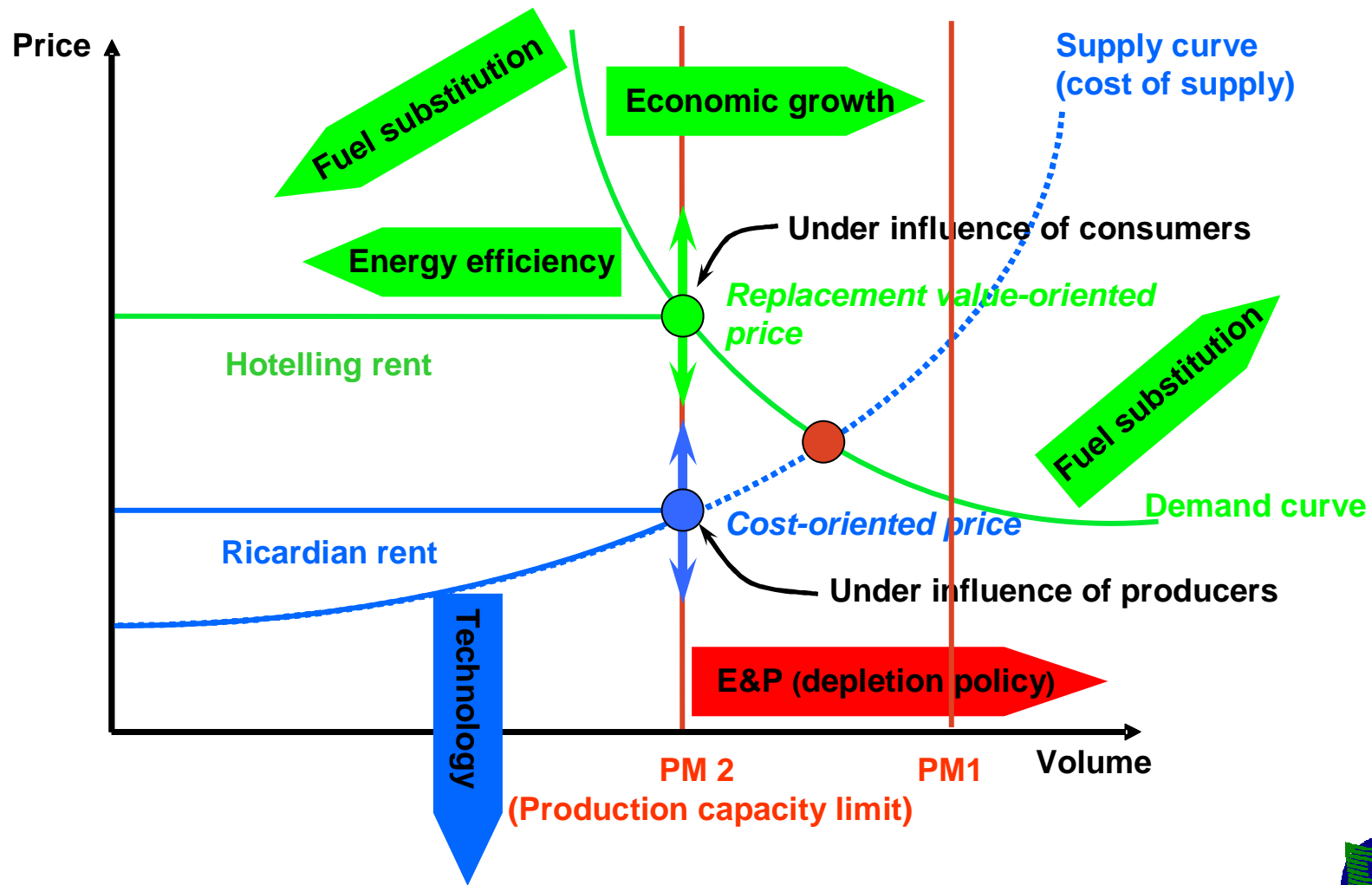
*and*

- **Resource** economics:
  - entry to sector subject to geology and sovereignty of national territorial states
  - different time horizon for host-state & investor



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

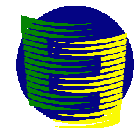
Ricardian rent + Hotelling rent = Resource rent



# Gas Export Pricing & Prices (1)

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

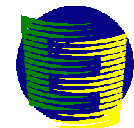




# Gas Export Pricing & Prices (2)

## 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) at the burner tip => can be realized, in case when domestic production capacities are below internal demand for gas
- **Net-back replacement value** = replacement value netted back to a point upstream of the burner tip in the delivery chain (delivery point) => Dutch (Groningen) model of long-term export contract (since 1962)



# The Groningen Concept

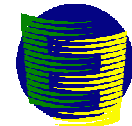
Developed by Nota de Pous (Note to Parliament in **1962**)  
For exports:

## Pricing:

- Replacement value principle at the consumer market (no production cost-related approach at the producer market)
- Net-back value, netted back from replacement value at the end-use market
- Regular price review, if no joint solution=> arbitration
- Price risk and reward for seller, marketing risk for buyer
- Protection against arbitrage by buyer (destination clauses)

## 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



# 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:

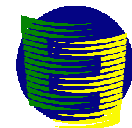
Long term: Maximise resource rent over time (in cash)

Keep supplies reliable but tight

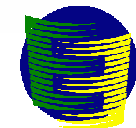
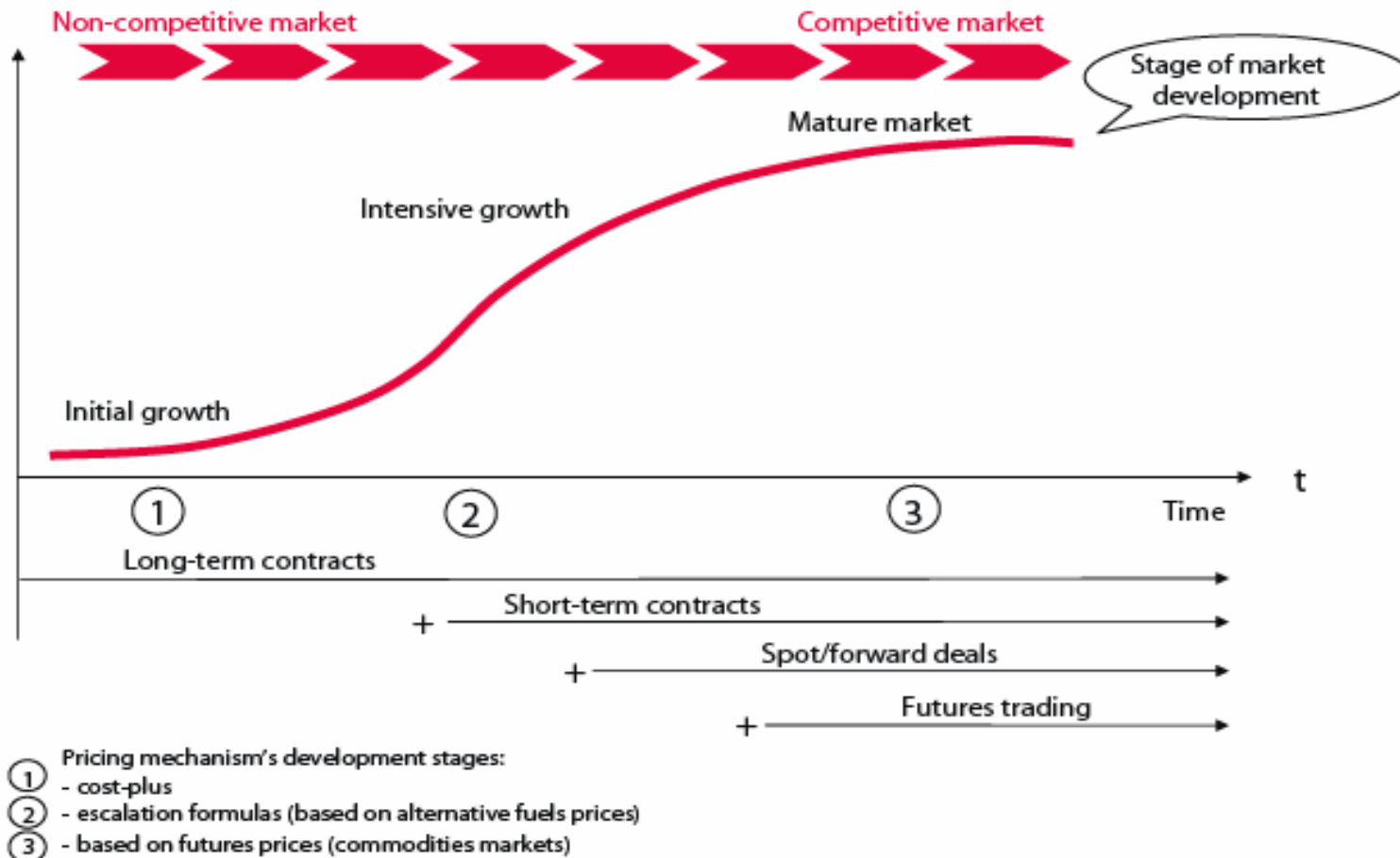
Ensure a defined sales volume

Replacement value pricing (periodical adjustment)

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

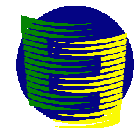


# Gas markets development



# CONTENTS:

1. Pricing of non-renewable energy resources: economic theory & history
- 2. Soviet / Russian gas to Europe: contractual structure & its evolution**
3. Russian gas & post-Soviet transformation of economic relations with CIS to market-based principles

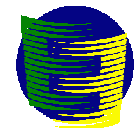


# Soviet/Russian Gas to Europe: Contractual Structure Based on Groningen *LTGEC* Concept (1)

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*)

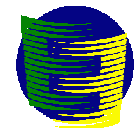


## Soviet/Russian Gas to Europe: Contractual Structure Based on Groningen *LTGEC* Concept (2)

Groningen *LTGEC* concept =

= LTC +  
replacement value +  
regular price rebate +  
minimum pay obligations +  
net back +  
destination clauses

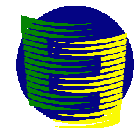
More than 250 BCM/y of gas imports to continental Europe based on this concept



## **Soviet/Russian Gas to Europe: Contractual Structure Based on Groningen *LTGEC* Concept (3)**

Groningen LTGEC concept originated in 1962 (+ adaptation period) vs. USSR gas export to EU started in early 1970s

Russian gas export contractual structure, based on Groningen concept, proved its validity & reliability through Cold War and post-Soviet transformation periods



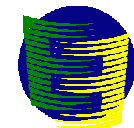


## **Soviet/Russian Gas to Europe: Contractual Structure Based on Groningen *LTGEC* Concept (4)**

Groningen LTGEC concept: No political problems ever - related to regular price rebates within LTC structures - nor with Dutch (\*), nor with Soviet/Russian gas exports (pure commercial & depoliticized issues)

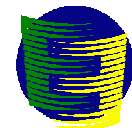
Russia-Ukraine (2005/06) & Russia-Belarus (2006/07) gas disputes – results of painful transition from political to market-based export pricing to be finally based on Groningen LTGEC concept

(\* ) except one case in 1980/81 – “Spierenburg round”,

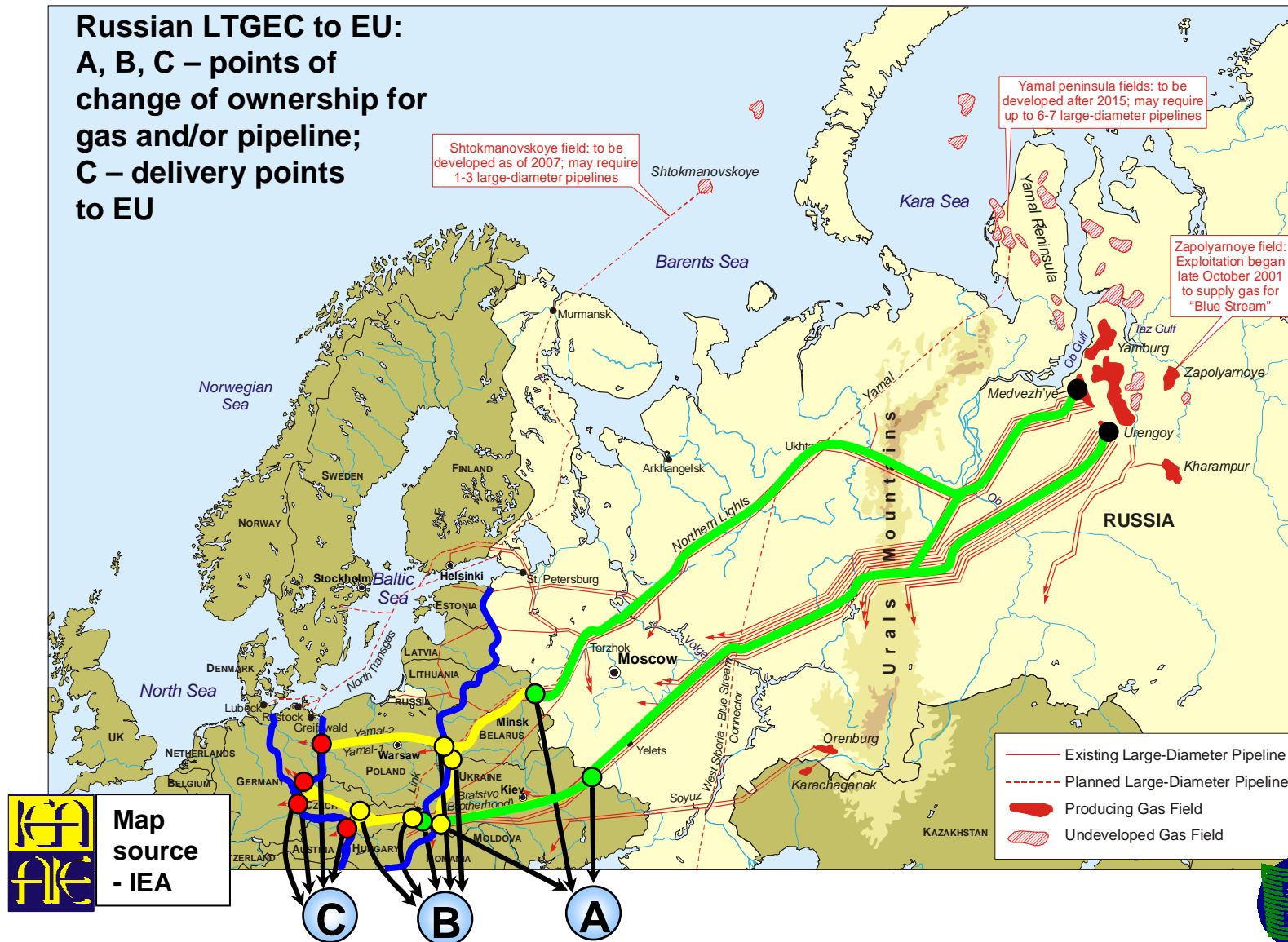


# Soviet/Russian Gas to Europe: Contractual Structure

- 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 compensation for transportation costs from end-market to delivery point)
- Protection against arbitrage (destination clauses)
- Multiple transit (increasingly important: compared to other exporters & after USSR/COMECON dissolutions)



# Soviet/Russian Gas Export to EU-15: on-border Sales and Transit Legs (pre/post 1991 & 2004)

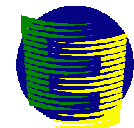


# A Typical Net Back Gas Price Formula

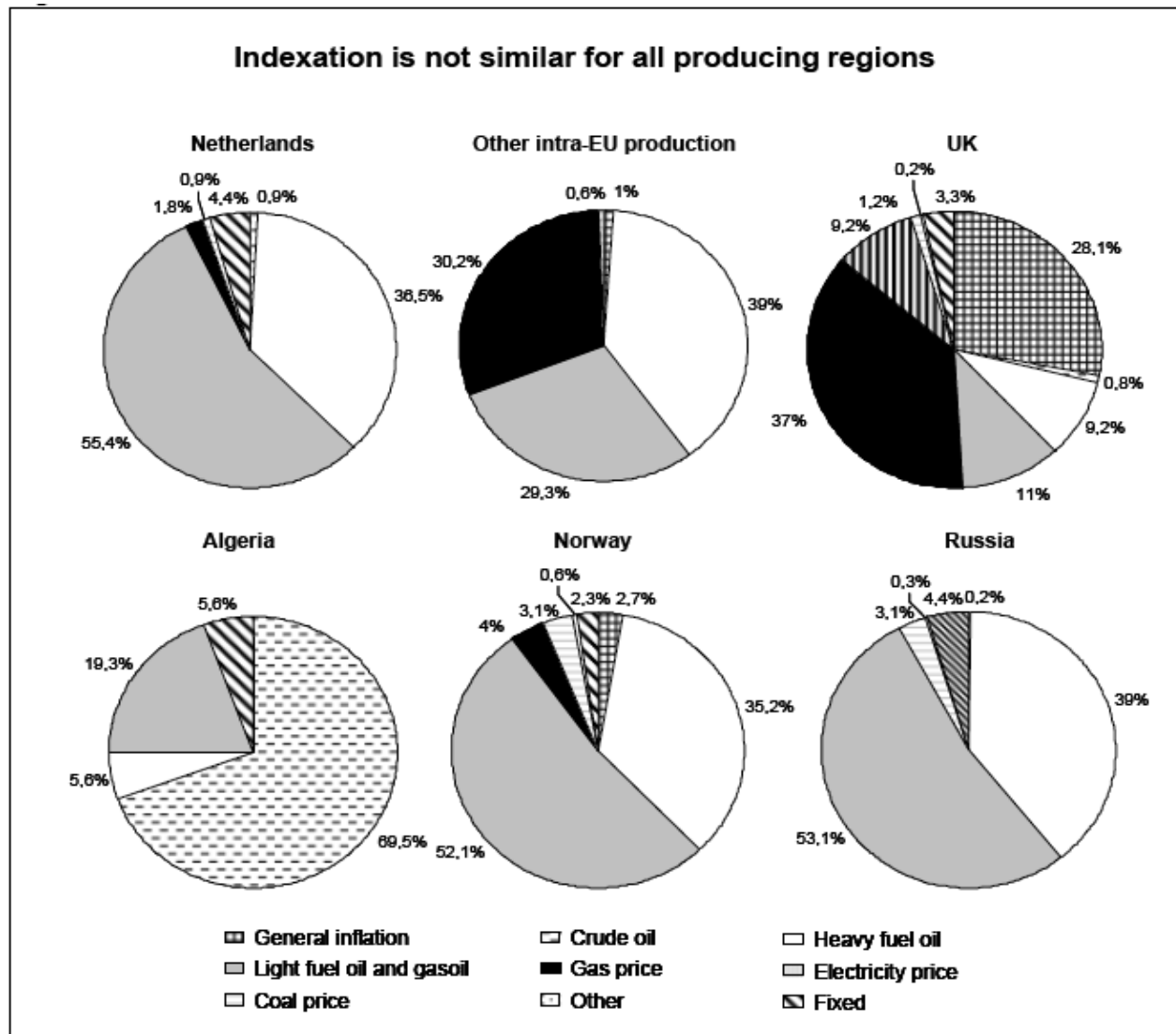
$$P_m = P_o + 0.60 \times 0.80 \times 0.0078 \times (LFO_m - LFO_o) + 0.40 \times 0.90 \times 0.0076 \times (HFO_m - HFO_o)$$

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

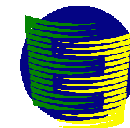
- the starting gas price  $P_o$
- and the price development of competing fuels Light Fuel Oil (LFO) and Heavy Fuel Oil (HFO)



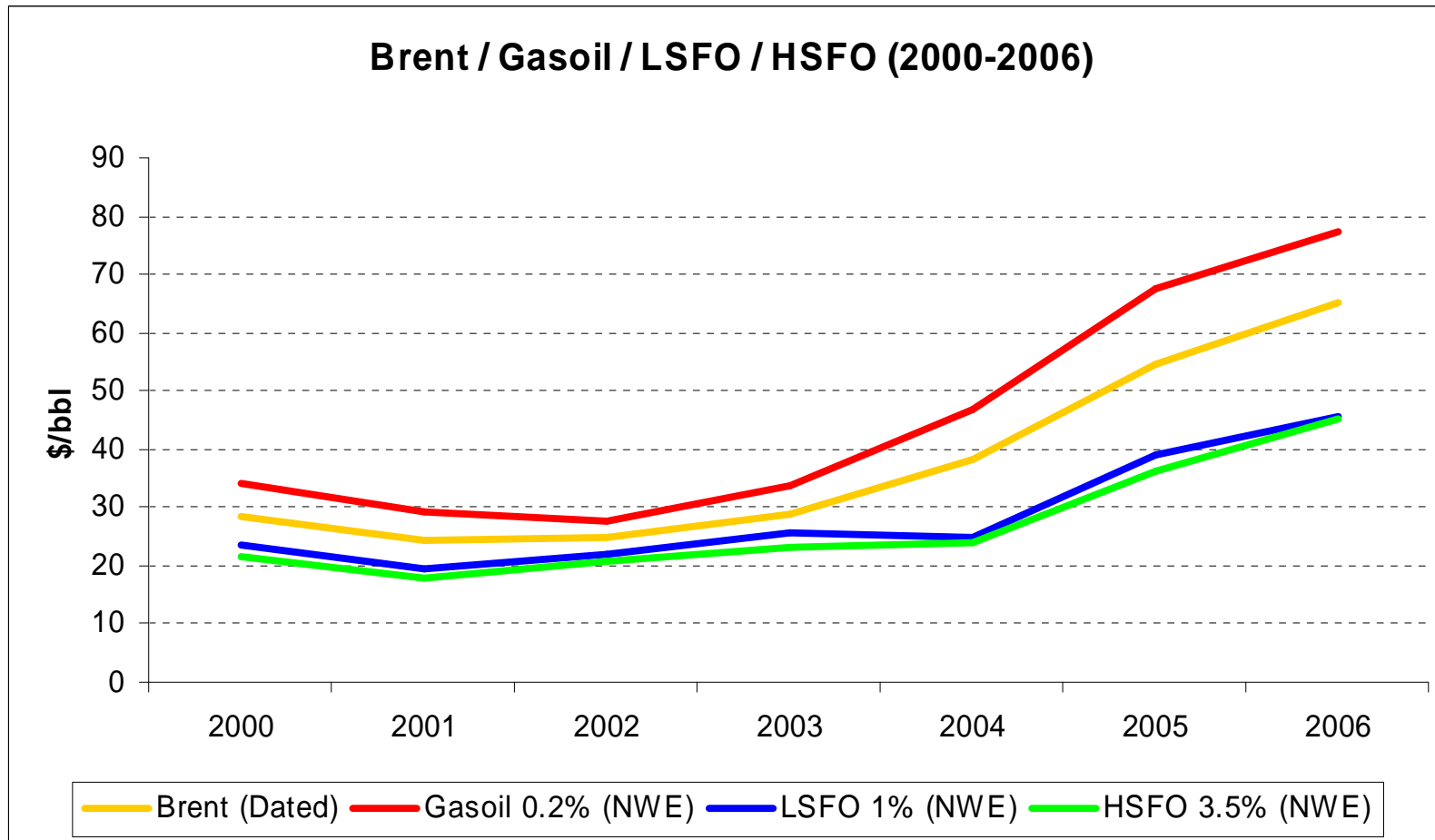
# LTGEC: Indexation by Producer



Source: Energy Sector Inquiry 2005/2006

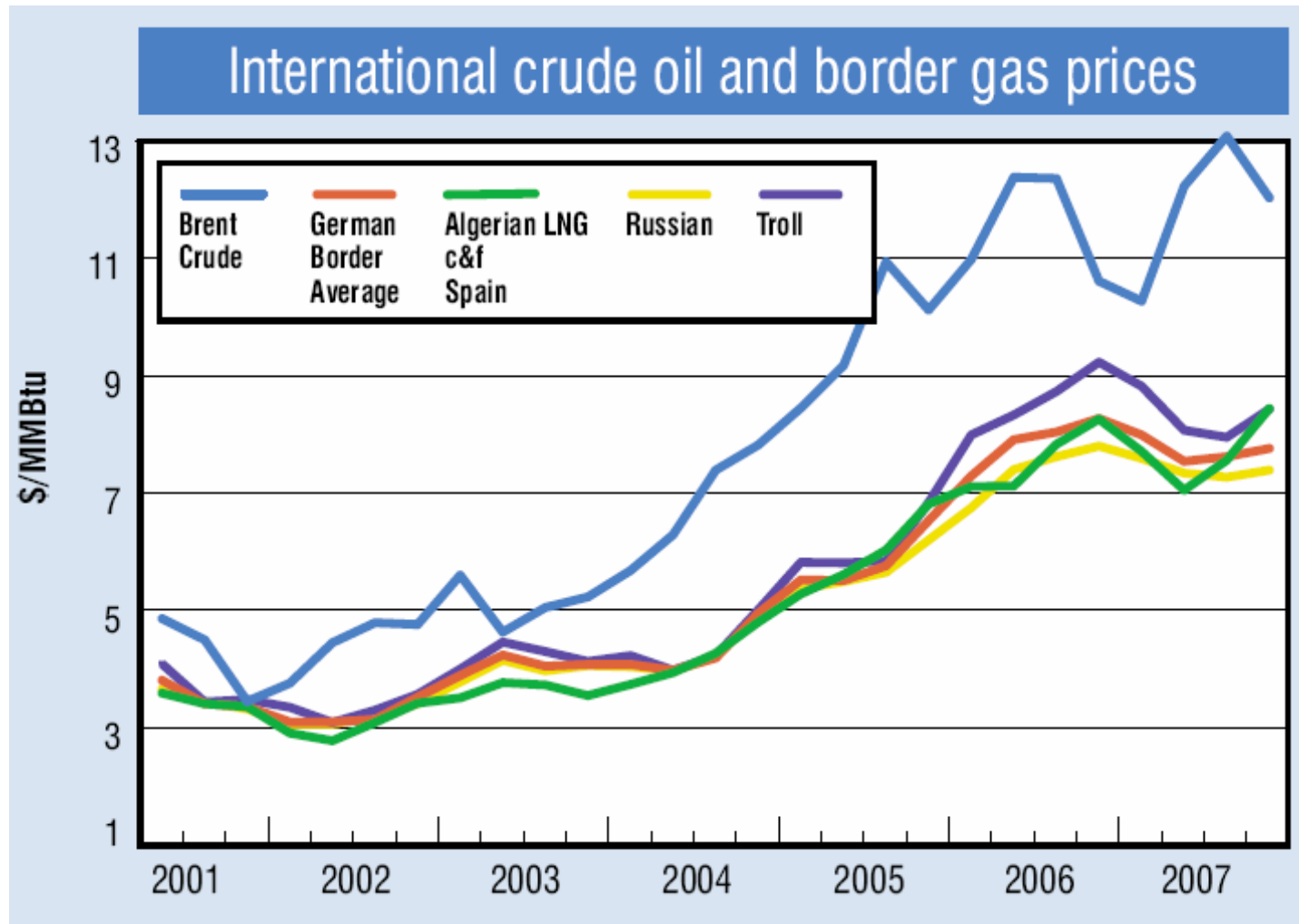


# Rotterdam petroleum product prices



**Source: IEA**

# Europe: International crude oil & border gas prices



GAS MATTERS – SEPTEMBER 2007

# A Typical Net Back Gas Price Formula & its Review

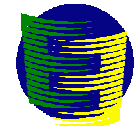
$$\begin{aligned} P_m = & P_o \\ & + [0.60] \times [0.80] \times 0.0078 \times (LFO_m - LFO_o) \\ & + [0.40] \times [0.90] \times 0.0076 \times (HFO_m - HFO_o) \\ & [+ \dots ] \\ & [+ \dots ] \end{aligned}$$

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)

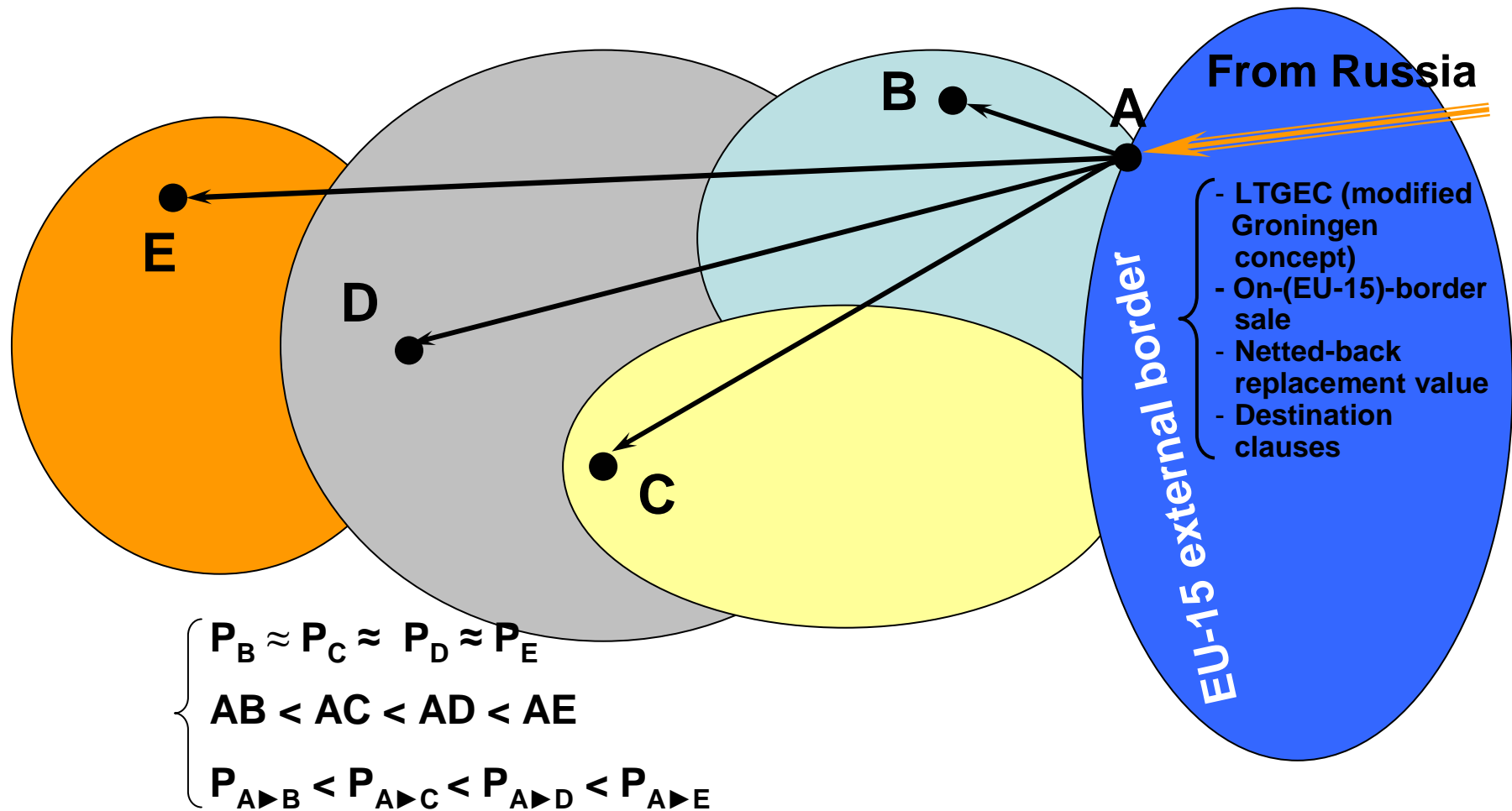
Typical subjects of a price review:

- 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

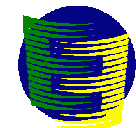




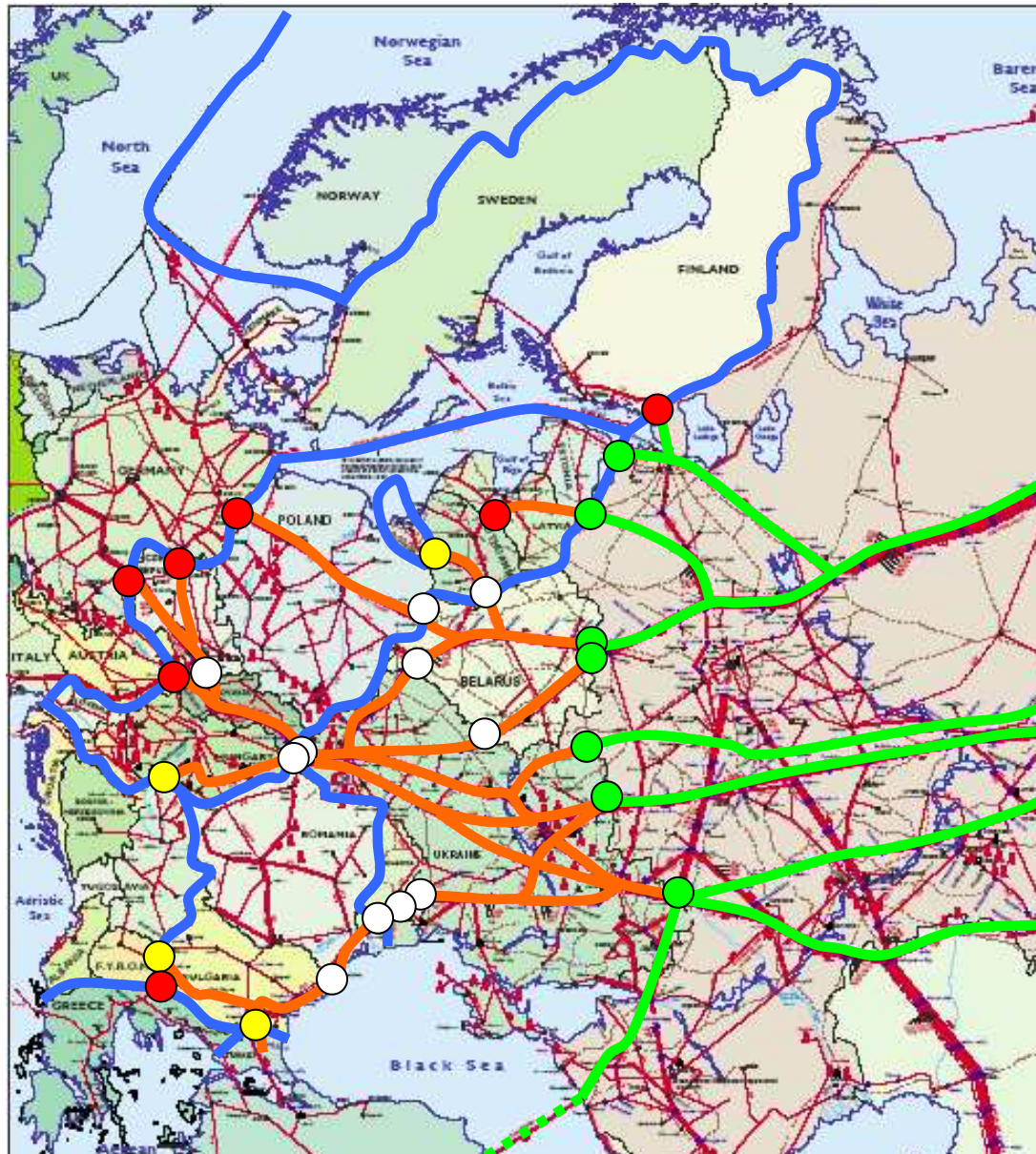
# Destination Clauses: Economically Motivated Integral Part of Soviet / Russian Export Schemes to Europe



“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-use market (to prevent arbitrage by buyers)



# Russian Gas Export to/through EU: on-border Sales and Transit Legs (post 2007)



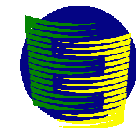
█ Pipelines within Russia  
█ Pipelines outside Russia

█ EU - 15 ▶ EU - 25 ▶ EU - 27

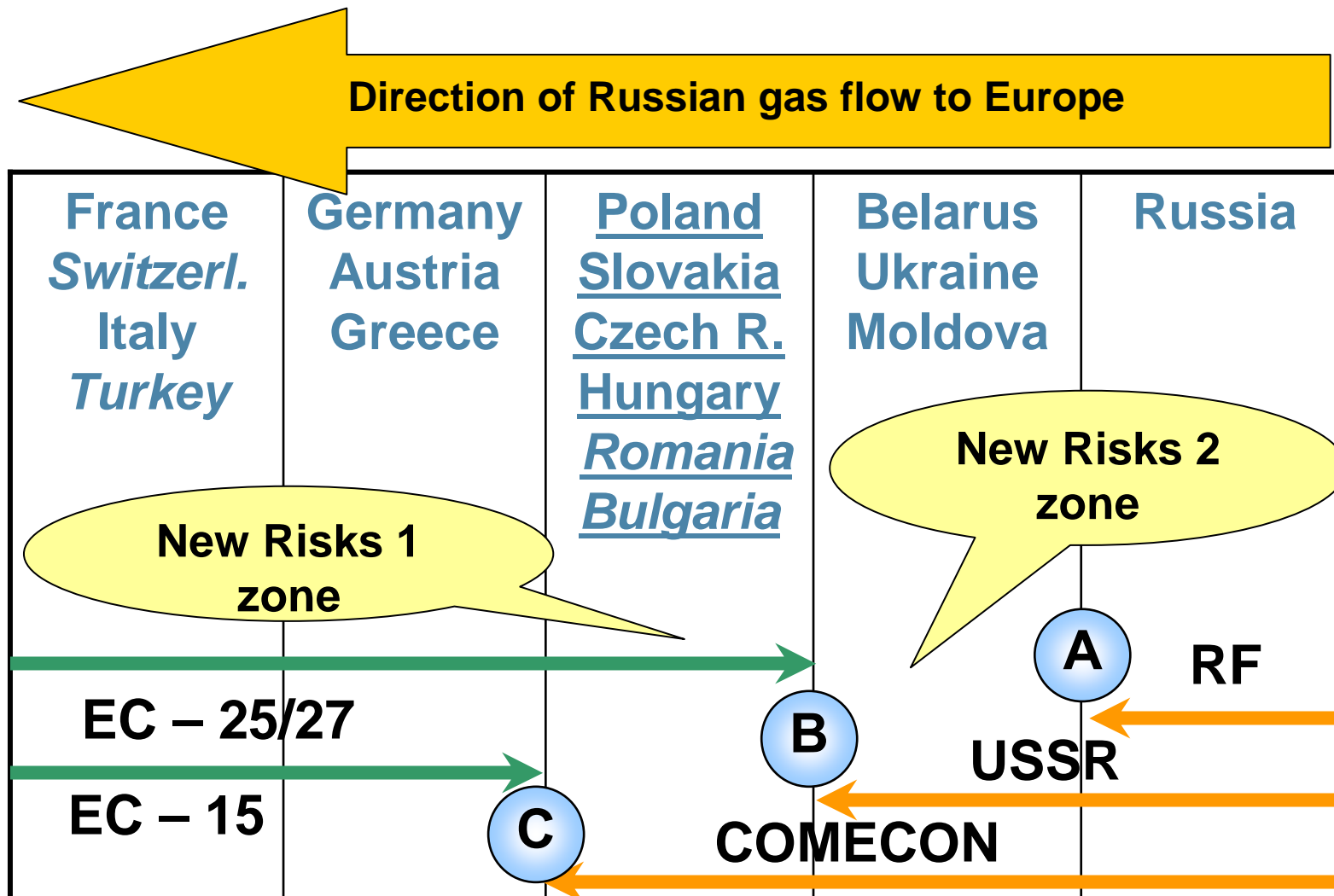
● A  
○ B  
● C  
● D

**Russian LTGEC to EU:**  
 A, B, C – points of change of ownership for gas and/or pipeline;  
 C – delivery points to EU;  
 D – delivery points through EU as REIO

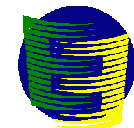
Map source: CGES



# Russian Gas Supplies to Europe: Zones of New Risks

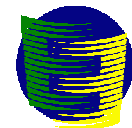


*Italic* – non-EU countries; New EU accession states: underlined – since 01.05.2004, *underlined + italic* – since 1.01.2007; A, B, C – points of change of ownership for Russian gas and/or pipeline on its way to Europe



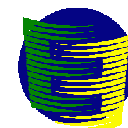
# NEW RISKS FOR RUSSIA'S GAS SUPPLY TO EUROPE: WHICH, WHEN & WHERE

- Since 1991: upstream to delivery points, within CIS/NIS
  - USSR dissolution + diversified supply routes => new transit risks
- Since 2002/03: + at delivery points (consequences for Russian gas at end-use EU markets?)
  - solution on destination clauses = package deal, but whether it balanced? (e.g. TAG Dec'05 capacity allocation procedure)
- Since 2004/07: + downstream to delivery points, within enlarged EU-25/27
  - combined result of EU expansion + EU gas market liberalization => new prospective transit/transportation risks

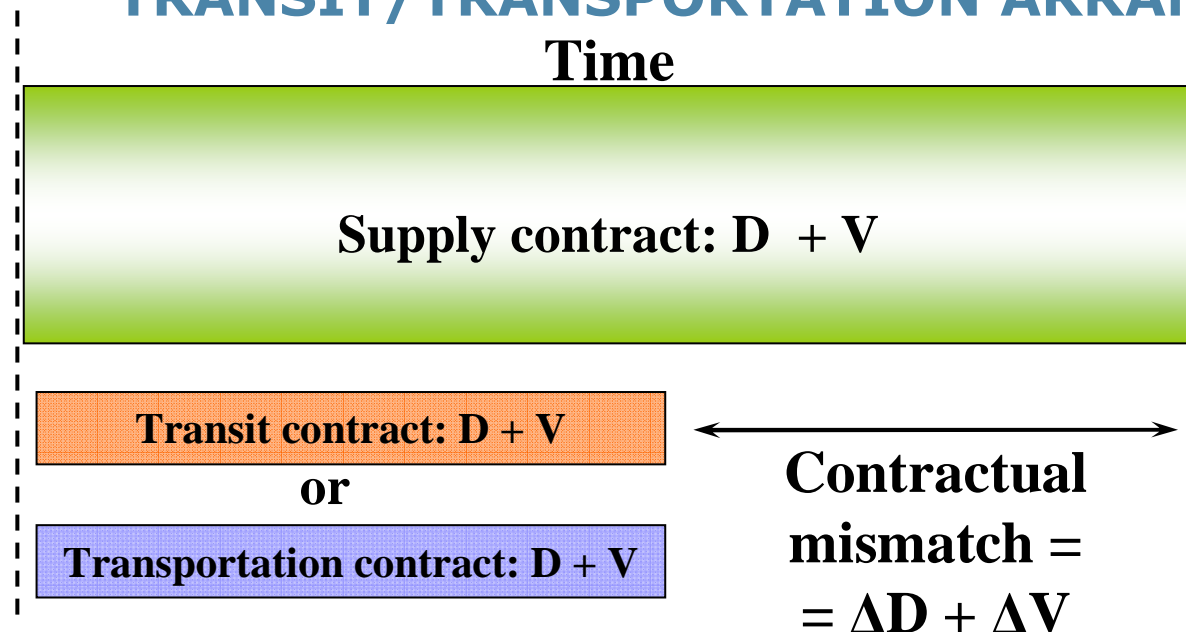


## NEW RISKS 1: EU-RELATED (SINCE 2004/2007) (1)

- No transit of Russian gas inside EU up to May'2004 (EU-15)
- Transit of Russian gas inside EU since May'2004 (EU-25) and even more since Jan'2007 (EU-27)
- Transit / transportation risks for imported Russian & other non-EU gas inside EU:
  - No clear transit rules for internal EU gas market (domestic transportation = free flow of goods inside EU)
    - but: ECT signed/ratified by both the EU and by individual EU member-states
  - Problem of contractual mismatch (long-term access to infrastructure for transit flows to match existing LTGEC supply obligations)
  - Major elements of EU liberalization (unbundling + mandatory TPA) + contractual mismatch => creates new transit / transportation risks

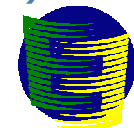


# CONTRACTUAL MISMATCH: CORRELATION IN DURATION (D) & VOLUME (V) OF LONG-TERM SUPPLY CONTRACT VS. TRANSIT/TRANSPORTATION ARRANGEMENT



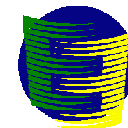
Mismatch between (a) expiration dates & volumes of long term supply (delivery) contract and (b) transit/transportation contract as integral part to fulfill delivery contract => creates a risk for producer/supplier of non-renewal of his transit/ transportation contract => of non-fulfillment of his delivery obligations.

Core issue: to guarantee access for producer/supplier to adequate transportation capacity within the duration of existing (in force) delivery (supply) contract.



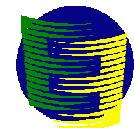
## NEW RISKS 1: EU-RELATED (SINCE 2004/2007) (2)

- New EU-related risks for Russian gas supplies to Europe = combined result of
  - unclear EU rules on gas transit through single EU member states +
  - EU liberalization +
  - EU expansion= transitional risk of EU liberalization
- Impact of Third EU Liberalization Package (announced 19 September 2007) ?



# CONTENTS:

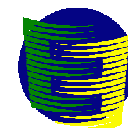
1. Pricing of non-renewable energy resources: economic theory & history
2. Soviet / Russian gas to Europe: contractual structure & its evolution
- 3. Russian gas & post-Soviet transformation of economic relations with CIS to market-based principles**





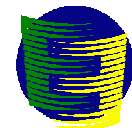
## NEW RISKS 2: COMECON / CIS RELATED (SINCE 1991)

- New CIS-related risks for Russian gas supplies to Europe:
  - result & long-term economic consequences of dissolution of USSR / COMECON political system
  - reflect objective long-term economic problems of (soft !) transition from political pricing / supply obligations within unified political system of USSR / COMECON to market-based pricing and supply obligations between sovereign states and their commercial entities



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

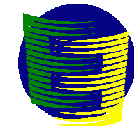
- Political (friendship) pricing => :
  - subsidized (notional) export prices
  - transfer of Hotelling rent from producer-state to consumer-state
  - portion of resource rent is left to importer in exchange on his political concessions to exporter
  - sharing USSR resources (which today are mostly Russian 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

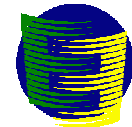
- Long & painful transition to :
  - Contractual separation of transit & export supplies
  - Formation of domestic transport vs. transit legislation
  - From barter to cash payments
  - From politically-subsidized - to market-based pricing & prices:
    - Transit tariffs methodologies
    - Market-oriented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

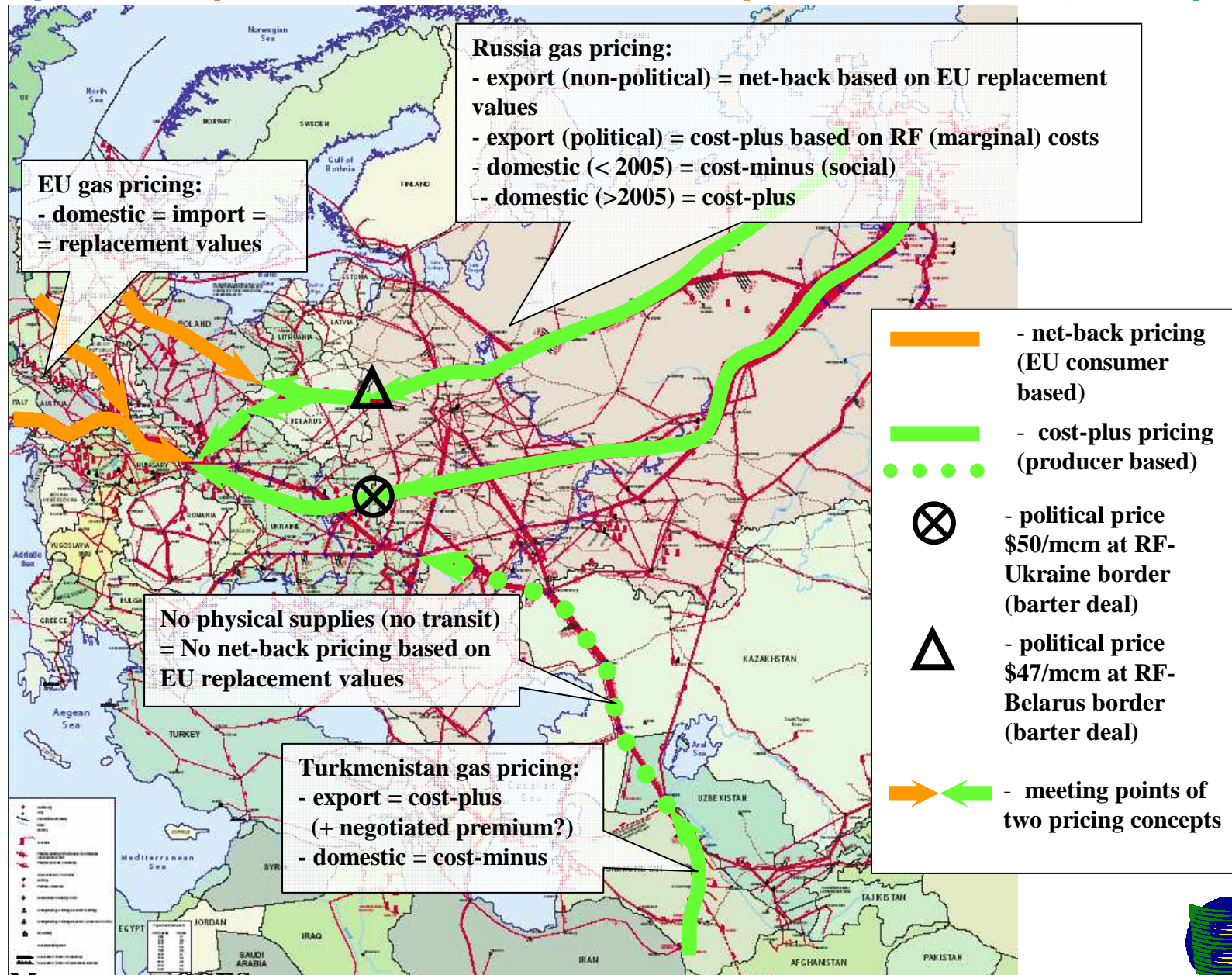


## Ukraine/Belarus: Export and Transit of Russian Gas *Prior to 4 January/30 December 2006*

- 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



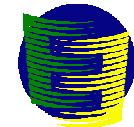
# Russian Gas Export: "Political" and "Non-Political" Pricing Zones (Ukraine, pre-Jan.4, 2006, & Belarus, pre-Dec.30, 2006, cases)



Map source: CGES

Konoplyanik A., CEPMLP - 18 October 2007

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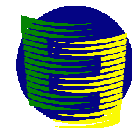


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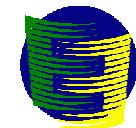
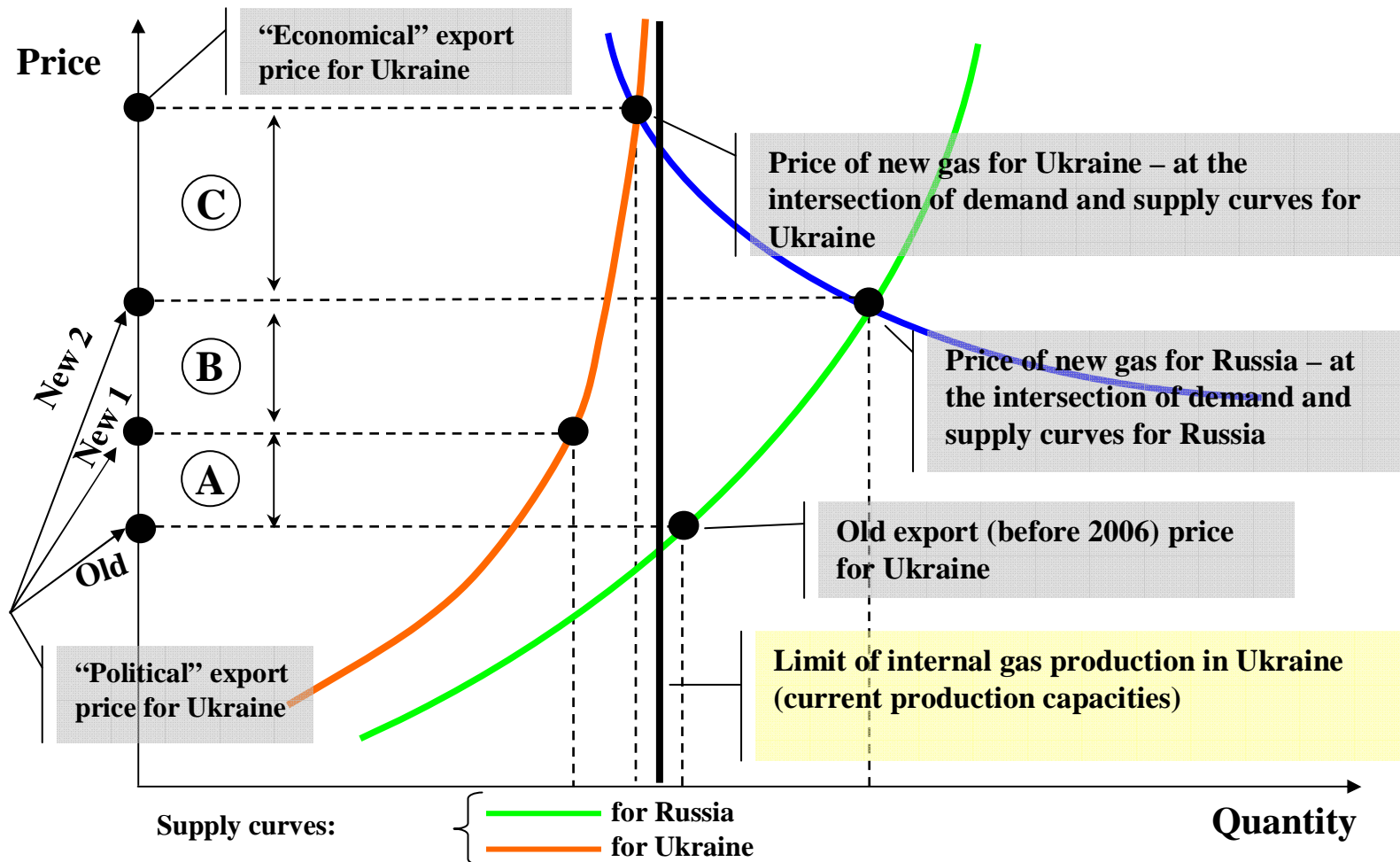
# Ukraine: Export and Transit of Gas from Russia

## *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



# Pricing in Russia - Ukraine Gas Relations & Economic Theory (1)



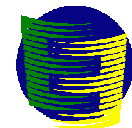
# Pricing in Russia-Ukraine Gas Relations & Economic Theory (2)

## “Political” export price for Ukraine :

- **Old** = current internal Russian price plus cost of transportation to Russia-Ukraine border
  - (Russian gas export price 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 gas export price subsidy to Ukraine =  $B+C$ )
- **New 2** = equated to internal Russian price (production costs/“cost-plus” in Russia) of new Russian gas
  - (Russian gas export price 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
  - (No Russian gas export price subsidy to Ukraine)

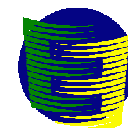




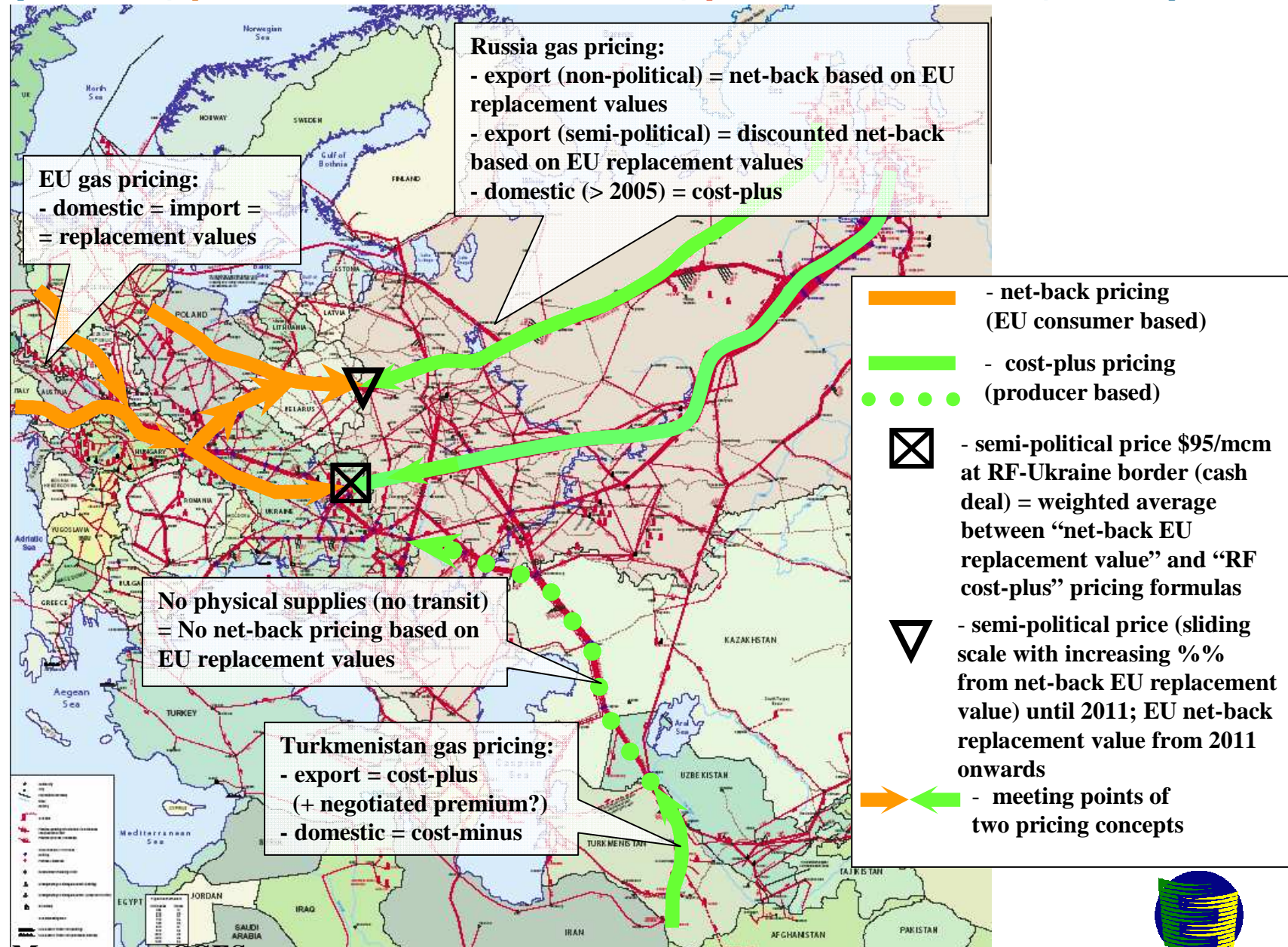
# Belarus: Export and Transit of Russian Gas

## **After 30 December 2006**

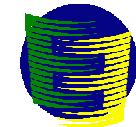
- Transit and export are contractually separated
- Cash payments
- Export pricing: by net-back calculation => based on demand-curve => replacement value within EU netted-back (less transportation costs) to Russia-Belarus border (market price)
- Export price => calculated as increasing %% of market price (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



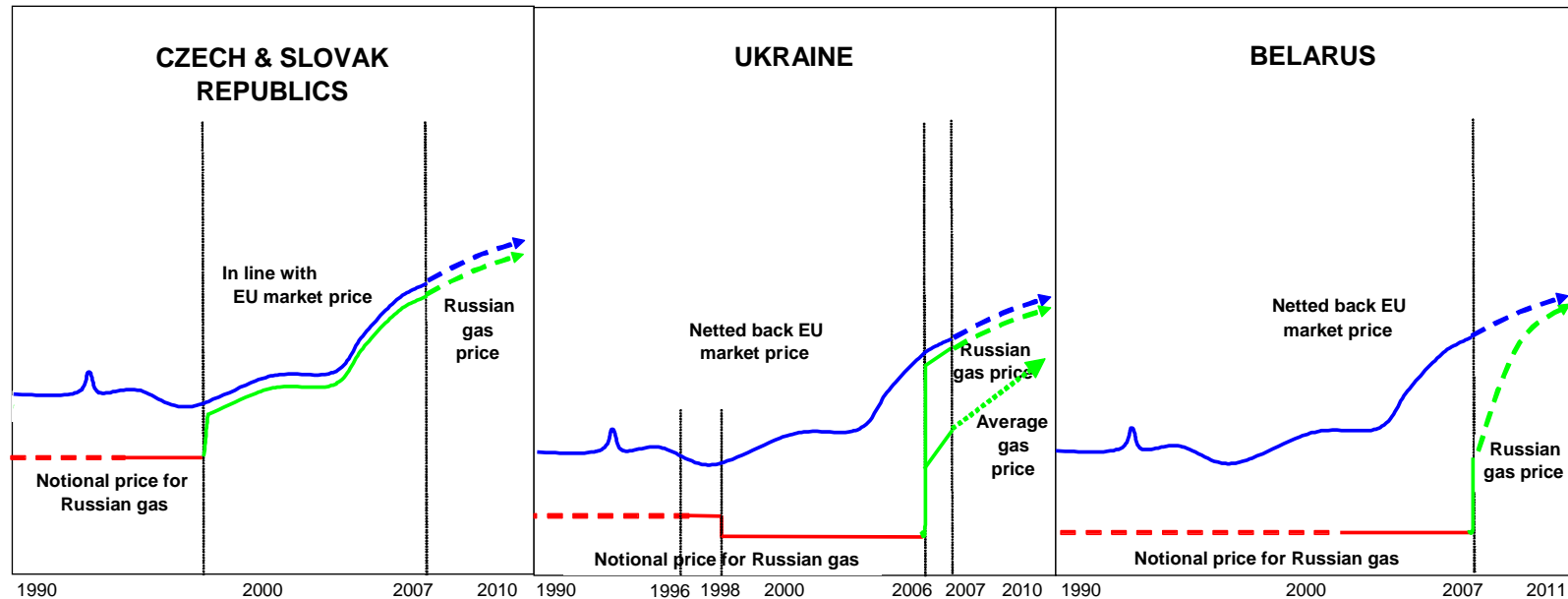
# Russian Gas Export: "Political" and "Non-Political" Pricing Zones (Ukraine, post-Jan.4,2006, & Belarus, post-Dec.30, 2006, cases)



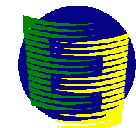
Map source: CGES



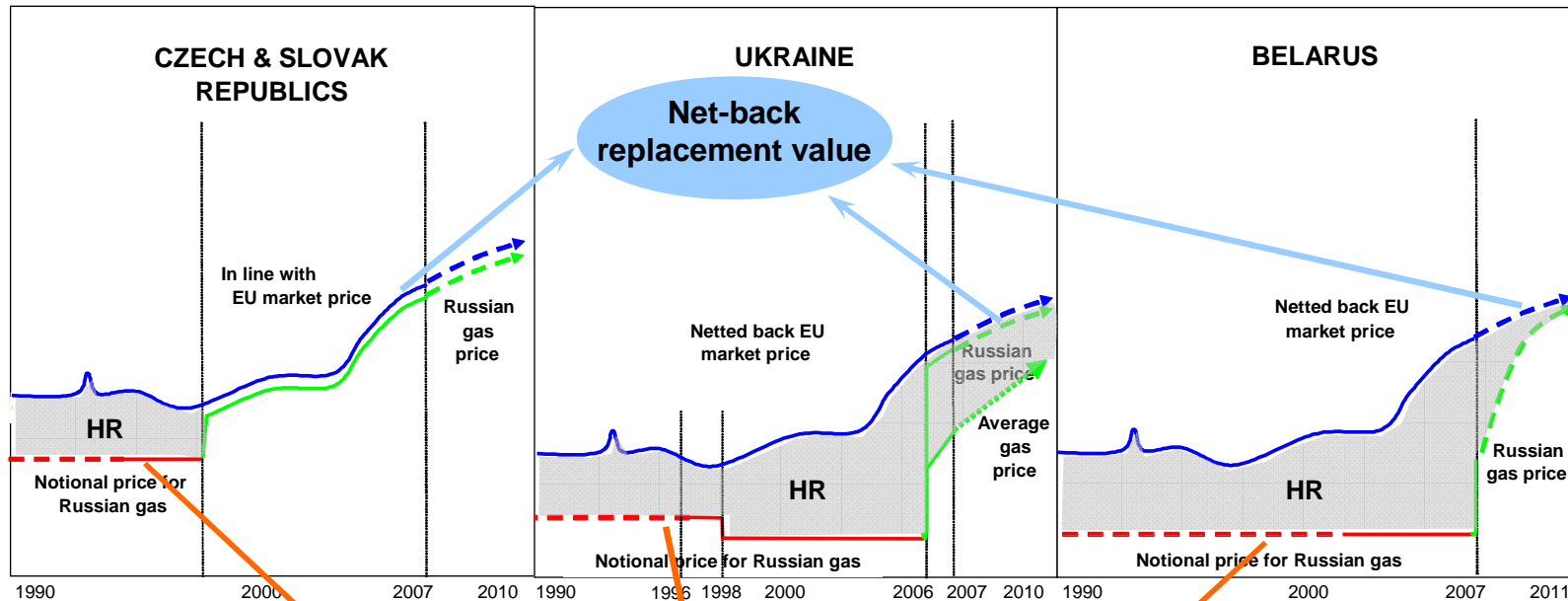
# Russian Gas Prices to the EU and Countries along the Pipe



- 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



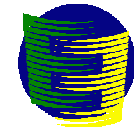
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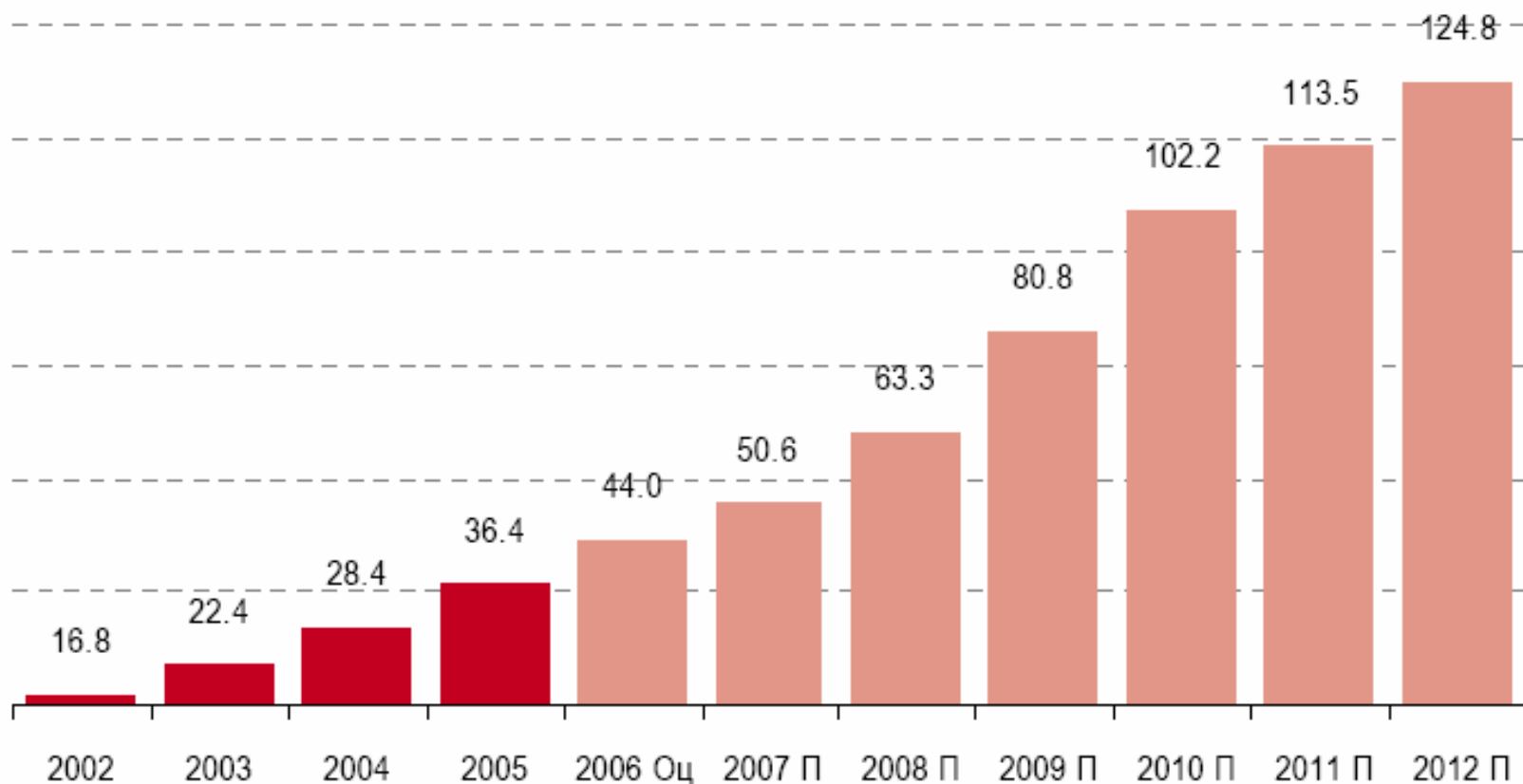
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— Hotelling Rent

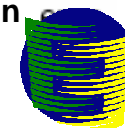
**Cost-plus ?**



# Russian internal wholesale gas prices dynamics forecast, \$/1000m<sup>3</sup>

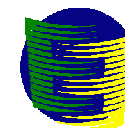


Source: Ministry of Industry and Energy of the Russian Federation



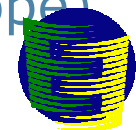
## Russia & Former COMECON/USSR: Different Sensitivity of Transition to Market-based Gas Prices

	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)

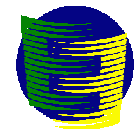


# Conclusions

- 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 debate in LTGEC; regular practice since early 1960's
- Export pricing/prices to former COMECON & FSU states: step-by-step transformation 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
- Most recently 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 [equal return at the wellhead?] from operations at all its export markets")
- LTGEC are to stay as dominant contractual instrument in continental Europe gas trade (incl. Russian gas to Europe) with flexible pricing formulas



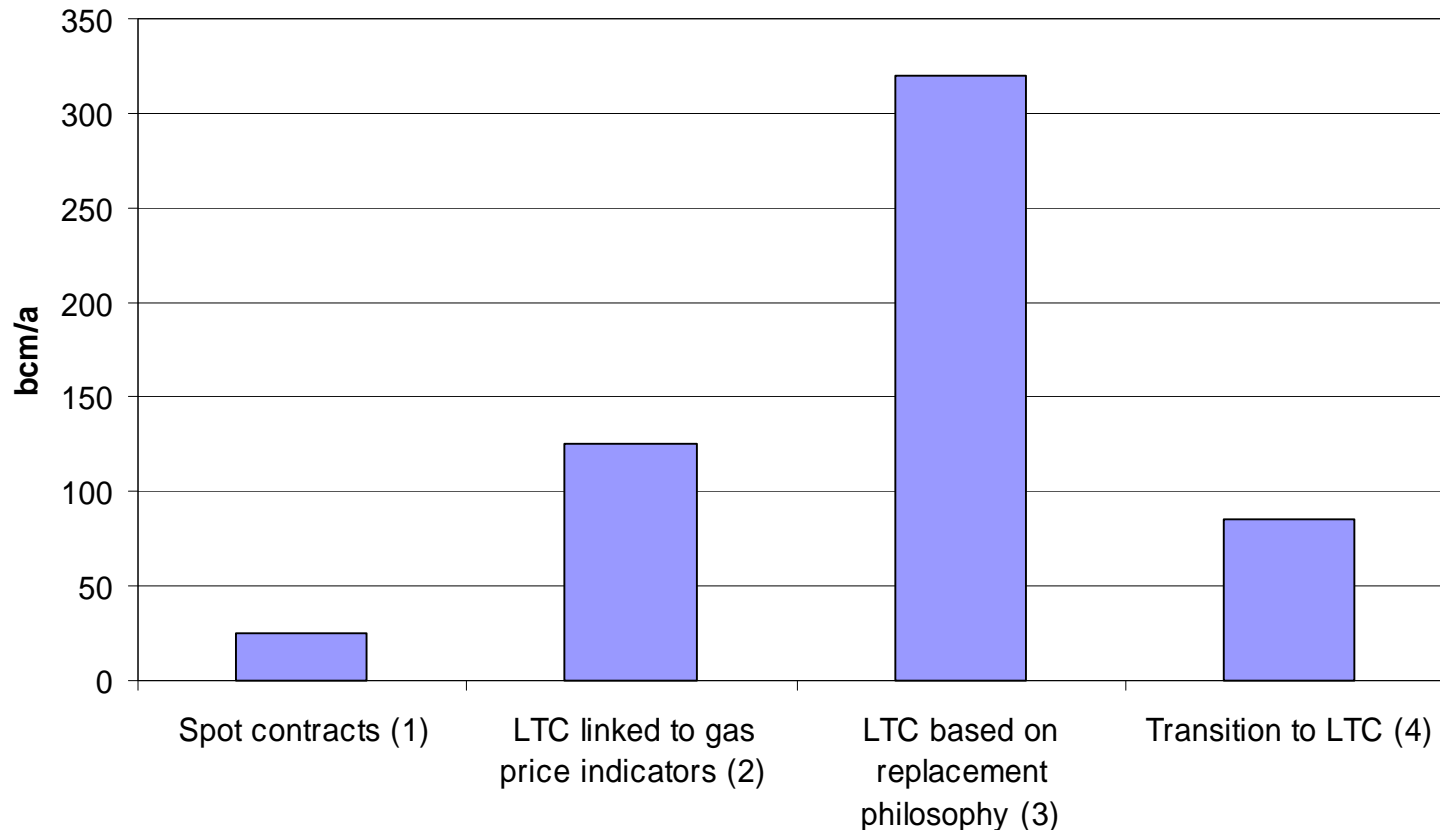
**P.S.**



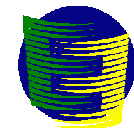
[www.encharter.org](http://www.encharter.org)



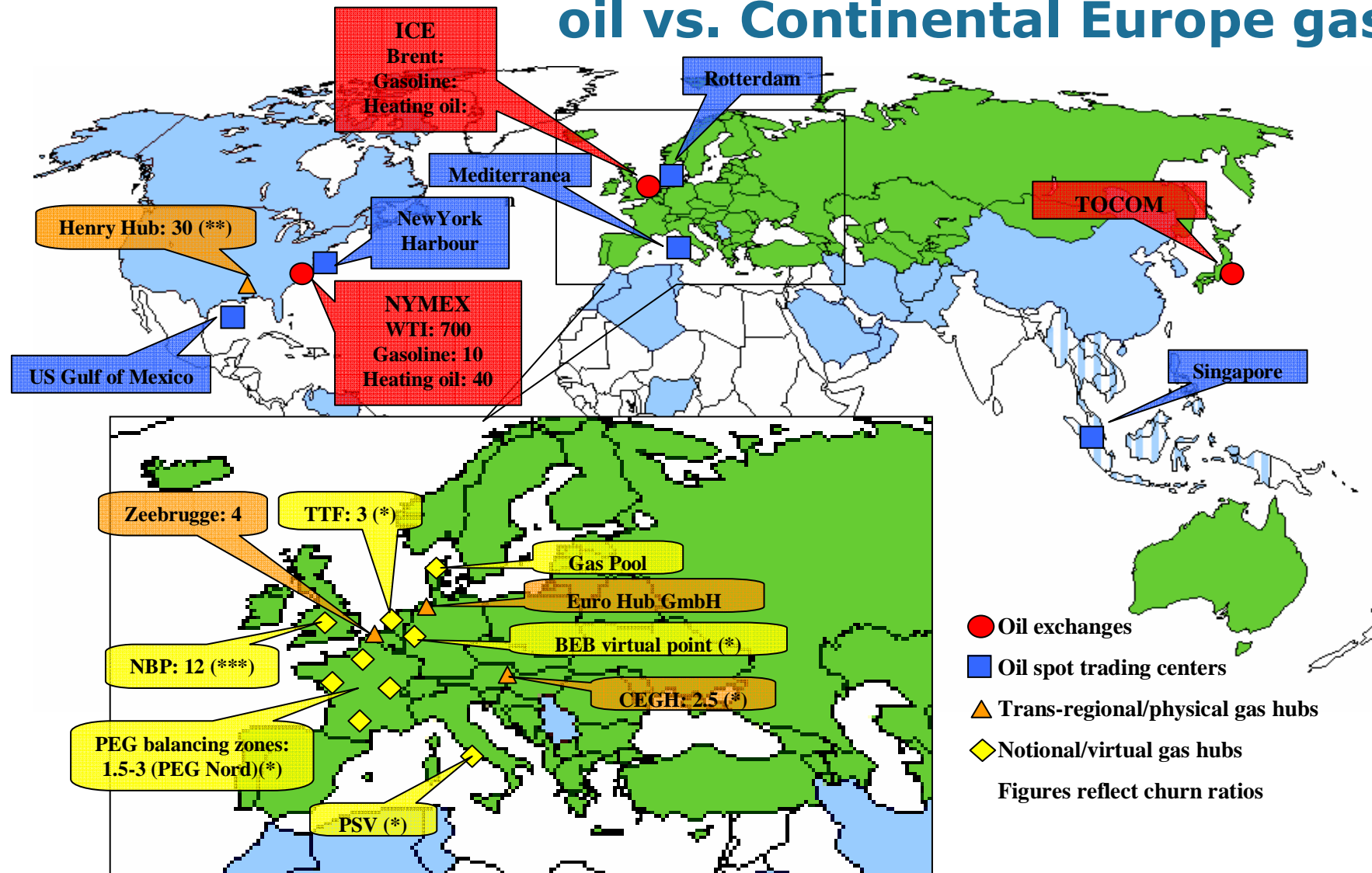
# Estimated International Gas Trade (2005): Different Pricing Mechanisms for Main Regions



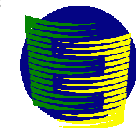
Source: BP (2006) (1) LNG to USA, UK and other spot LNG; arbitrage on the UK-Belgium Interconnector  
(2) Pipeline Canada-USA, pipelines to UK (BBL, Langeled) and new Dutch exports  
(3) All imports by Continental Europe (incl. accession countries) less spot LNG under (1)  
(4) Trade with FSU now in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



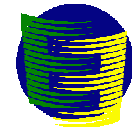
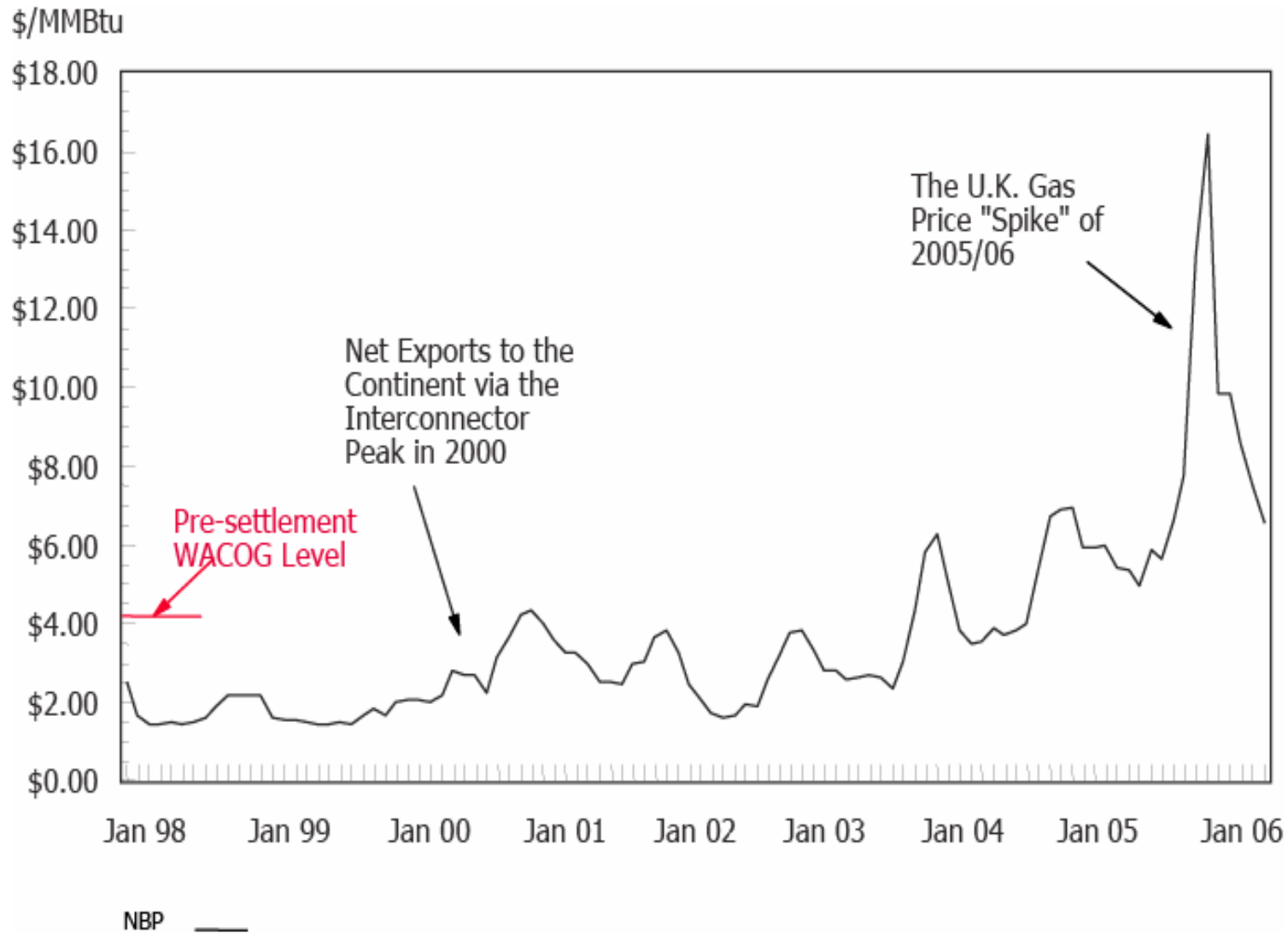
# Comparative liquidity of marketplaces: worldwide oil vs. Continental Europe gas



(\*) BEB hub = Bunde (Germany) at German/Dutch border, CEGH = Central European gas hub (Baumgarten, Austria), NBP = Notional Balancing Point (UK hub), PEGs = French hubs (GdF), PSV = Punto di Scambio Virtuale (Italian hub), TTF = Title Transfer Facility (Dutch hub);  
 (\*\*) 2004 – 2006 average; (\*\*\*) 8-14 during the 2004 – 2006 period



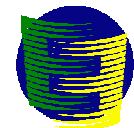
# UK National Balancing Point Prices



# UK liquid market: whether it is immune from nudges and kicks?

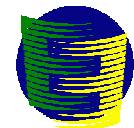
- “What seems to be happening is that the NBP and its lesser siblings in Holland and Belgium are increasingly feeling the stresses and pressures of playing in an international market. The UK market is large and liquid but it is not so big that it is immune from nudges and kicks from large players”

– “Gas Matters”, September 2007, p.38



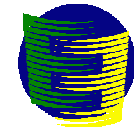
# The most intriguing question

- is => the difficulties and risks of transition from a system with strong players to a system with one/few liquid market places & many players
- Representative of a gas-producing company at Energy Charter IAP meeting: "Producers are interested and know how to supply their gas to a market with deep liquidity, or to a market with low liquidity but with strong players; however, markets with low liquidity and weak players are difficult to supply" (Putting a price on Energy, p. 166)

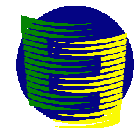


# 2004-2006 FLAME Polls on Gas-to-Oil Price Pegging

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		



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