

# Shale gas: Economic and Geopolitical Implications for Russia

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Presentation at the *Transatlantic Energy Governance Dialogue Conference*  
"Shale Gas. A game changer for European energy security?",  
Central European University, Budapest, Hungary, 12-13 May 2011

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- **What economic implications does the current change in gas market arrangements have for Gazprom's business?**
- What implications does shale gas have for the Russian gas sector?

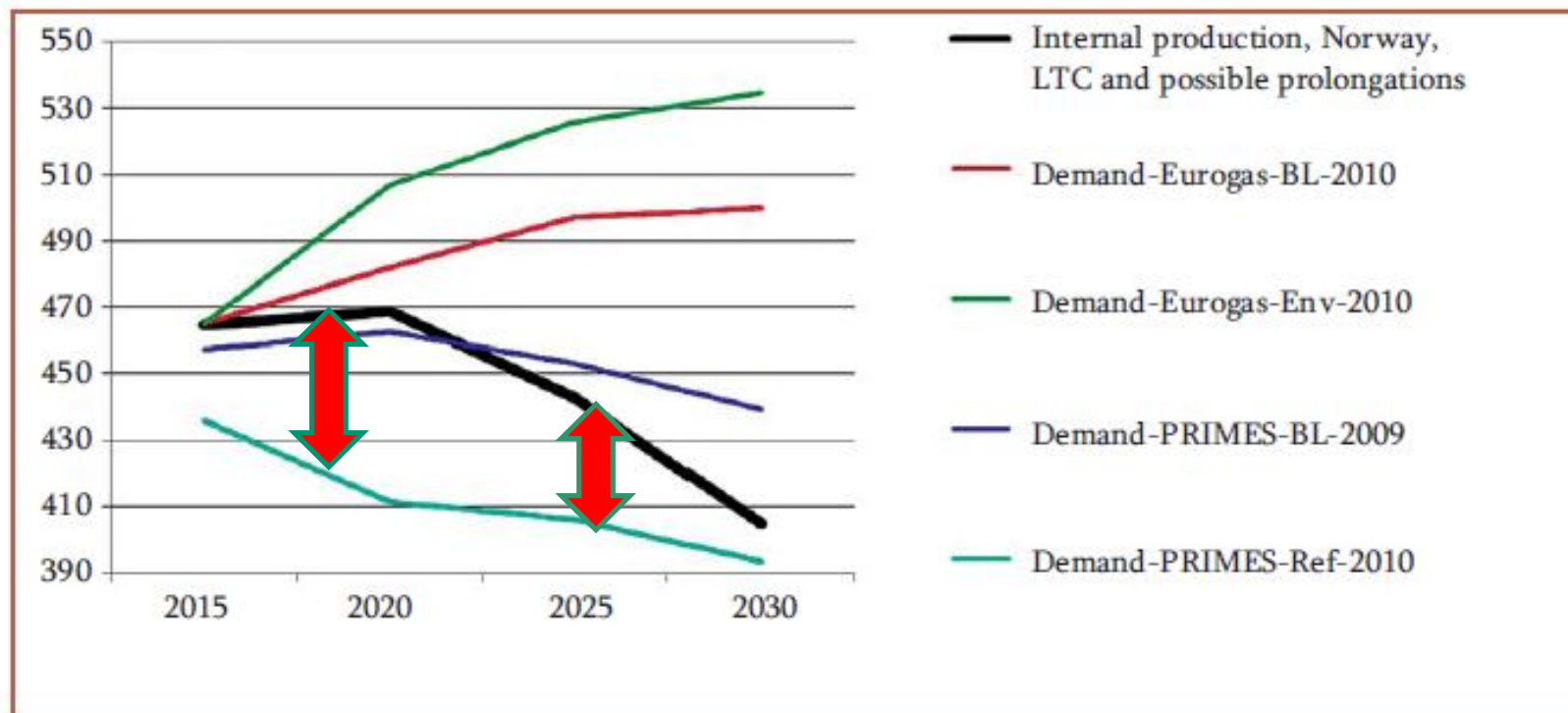
# US shale gas – a trigger of gas oversupply in Europe, 2009-2010

- Decrease of demand:
  - Global economic recession, incl. in Europe
- Increase of supply:
  - New supply projects (mostly LNG) originally destined for Europe & being developed under high oil/gas pricing environment in 2000-ies
  - US shale gas development has *de facto* closed US import market for LNG => LNG supplies originally destined for the US were redirected to Europe
- ***Result:*** Gas Oversupply in Europe

# What consequences for the future of other ingredients under gas glut?

- **Third EU Energy Package (2007=>2009=>2014):**
  - gas glut = increased share of spot trade => key developments of “designed model” under gas glut environment => over-evaluation of the prospects of Anglo-Saxon model within gas target model & designed market => forced movement from LTGEC with gas price indexation to spot trade with futures pricing => is it possible ?
- **Energy forecasts:**
  - downgrading prospects of gas demand levels in official & CEC-sponsored forecasts
- **Russia-Ukraine gas crises (Jan.2006, but mostly Jan.2009):**
  - Negative precedents => “Demethanization (methanophobia)” of EU energy forecasts aimed to escape from Russian gas?

## What messages energy forecasts sponsored by the Commission send to gas business (is it practical to forecast future demand volumes below already contracted volumes?)



**Figure 2. Potential of a new gas supply in EU-27 in 2015-2030 according to forecasts**

Sources: Eurogas, 2010; EET-2030 update 2009

Note: LTC – long-term contracts  Gap between production and demand volumes

Source: Russia-EU Energy Dialogue. Thematic Group on Energy Strategies, Forecasts and Scenarios. Energy Economics Subgroup. "Energy Forecasts and Scenarios, 2009-2010 Research, Final Report", 2011, p.28

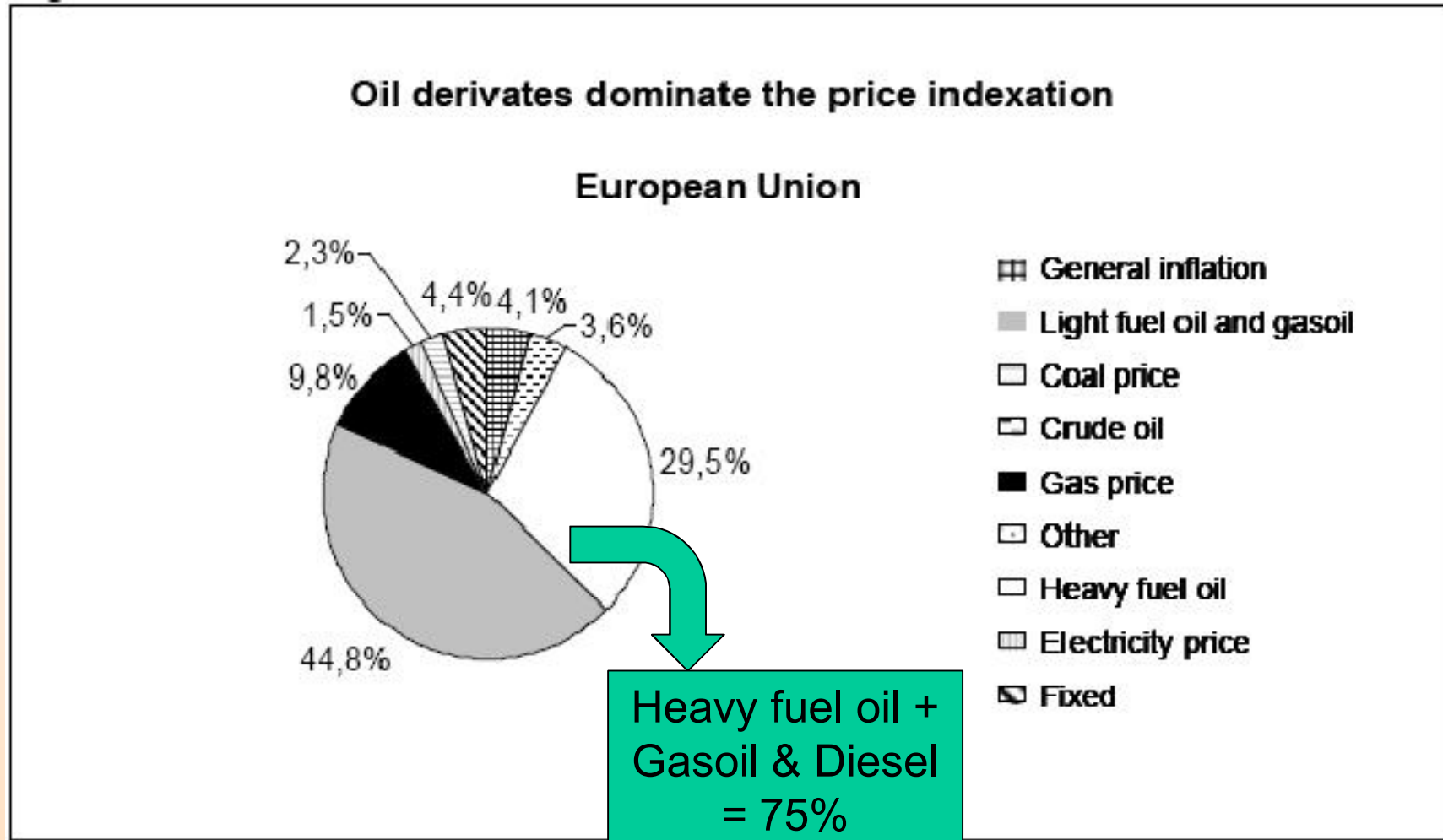
# Evolution of gas pricing in Europe (1)

- **Prior to 1960-ies:** cost-plus
- **1962:** net-back replacement value (to maximize long-term resource rent – Netherlands, “Nota de Pous”)
- **1962-2009/10:** spread-over of Groningen-type LTGEC with mostly oil-indexation through broader energy Europe
- **Why “Oil-Indexation”?:** “*Indexation*” = mechanism of softening price fluctuations; “*oil*” = key replacement fuel
- **Oil-indexation in the 1960-ies:**
  - RFO (electricity generation) & LFO (households) are really key replacement fuels to gas,
  - Oil price is low and stable, so RFO & LFO,
  - Oil-indexation is a mechanism of softening *potential* price volatility of key replacement fuels => fully corresponds to replacement value philosophy at that time => easy to implement & rare adjustments

# Evolution of gas pricing in Europe (2)

- **Oil-indexation nowadays:**
  - RFO & LFO are not the key replacement fuels anymore,
  - Oil price is high & volatile, does not reflect (since mid-2000's) “physical oil” fundamentals
  - Oil-indexation is softening fluctuations of oil prices, but the nature of volatile oil prices (commoditization of oil market) still in place => the gap between “oil-indexation”(contract formula) and “replacement value” (economic philosophy of formula-based gas pricing) is widening, BUT oil-indexation still easy to implement, though regular adjustments
- **Counter processes in gas market development (to increase vs. diminish price risk & volatility):**
  - Commoditization (Anglo-Saxon model, following oil market) increases risks & volatility => this stipulates
  - Development of financial instruments to mitigate these growing risks immanent to chosen EU gas target model (“designed market”) => illogical vicious circle: first to increase risks, then try to diminish them

# Price indexation structure in the EU

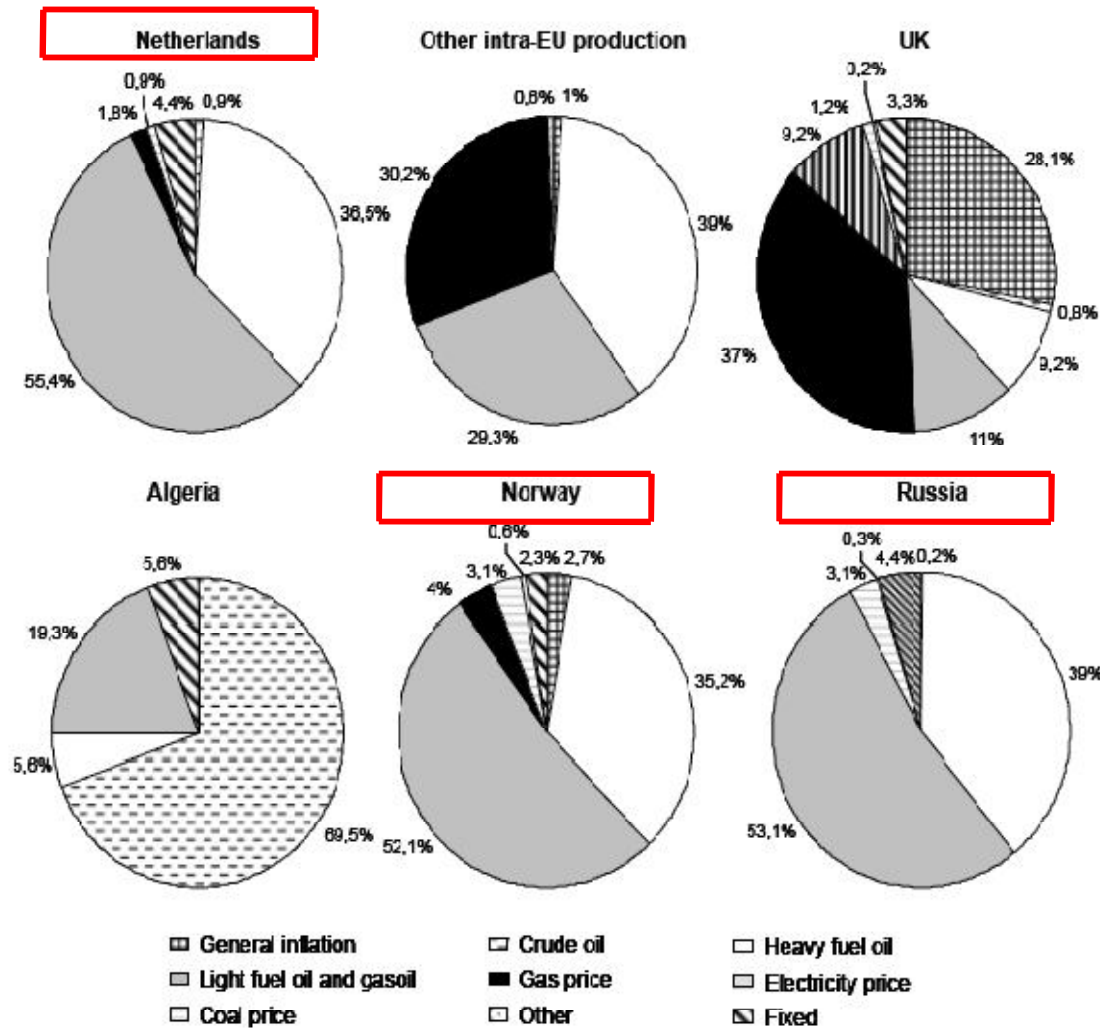


Source: Energy Sector Inquiry 2005/2006



# LTGEC in the EU: Indexation by Producer

Indexation is not similar for all producing regions



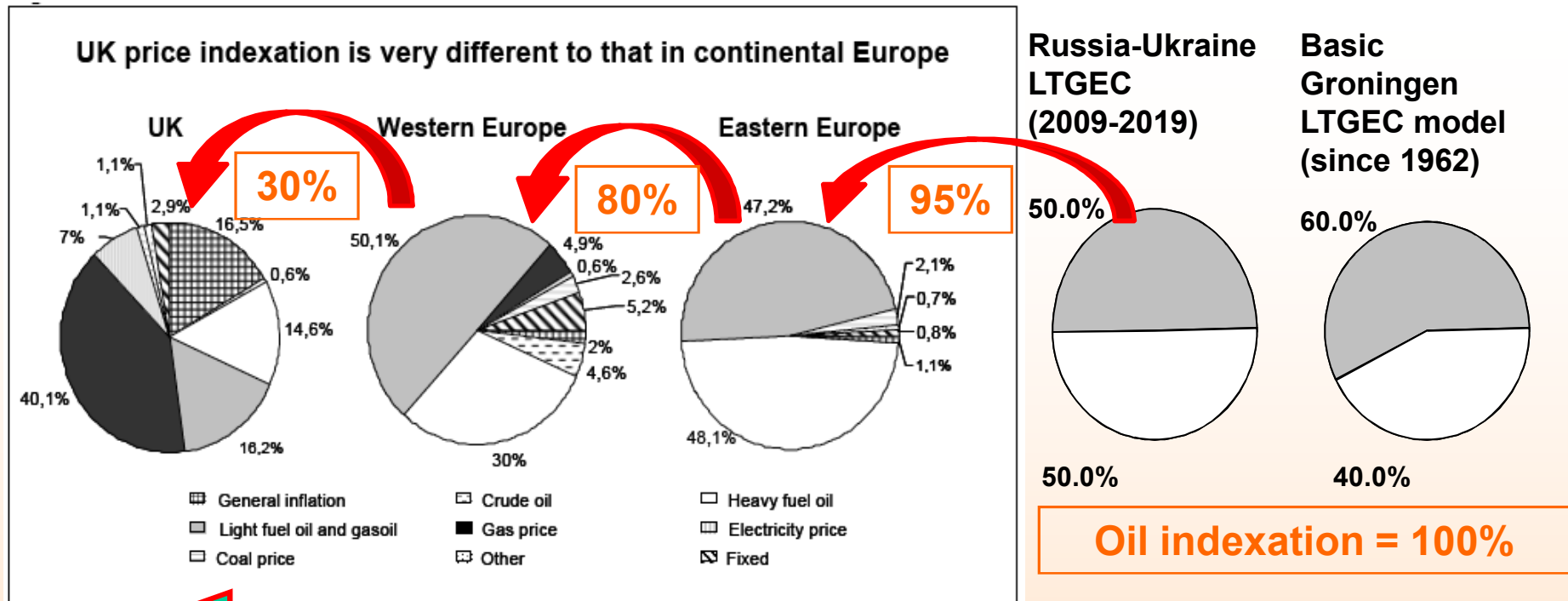
**Netherlands, Norway, Russia:**  
HFO = 35-39%;  
diesel & gasoil = 52-55%;  
Sum-total HFO+ Diesel & Gasoil:  
**Netherlands = 92%,**  
**Norway = 87%,**  
**Russia = 92%**



Major gas exporters to the EU: mostly oil indexation

Source: Energy Sector Inquiry 2005/2006

# LTGEC in Europe: Indexation by Region - Historical Evolution from Less to More "Liberalized" Markets



Source: Energy Economics, 2005/2006

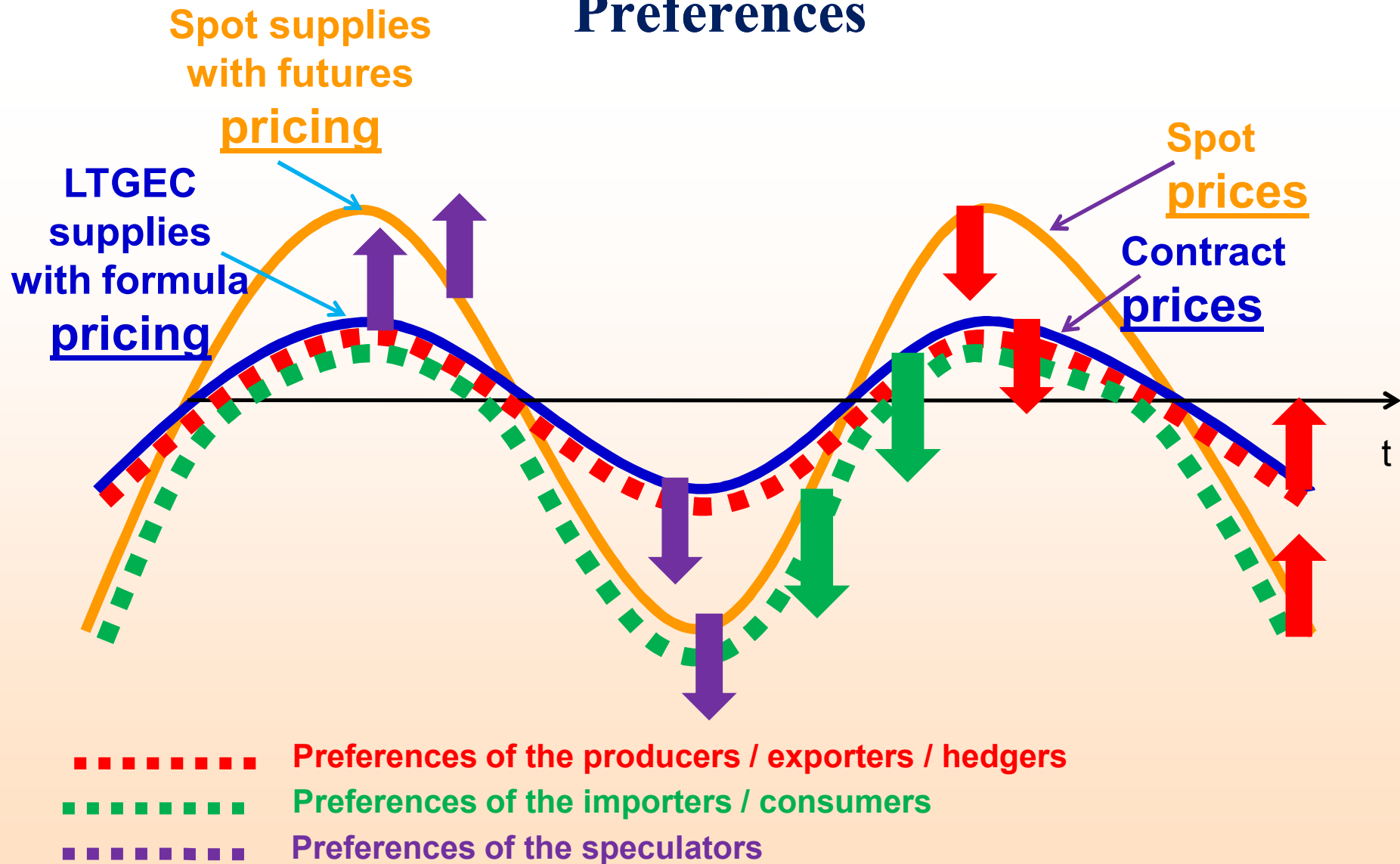
Evolution of LTGEC pricing formula structure: from more simple to more complicated

NB: Russia-Ukraine 2009 LTGEC structure rationale: more practical (understandable & sustainable) to start with less sophisticated pricing formula => similar to basic Groningen formula

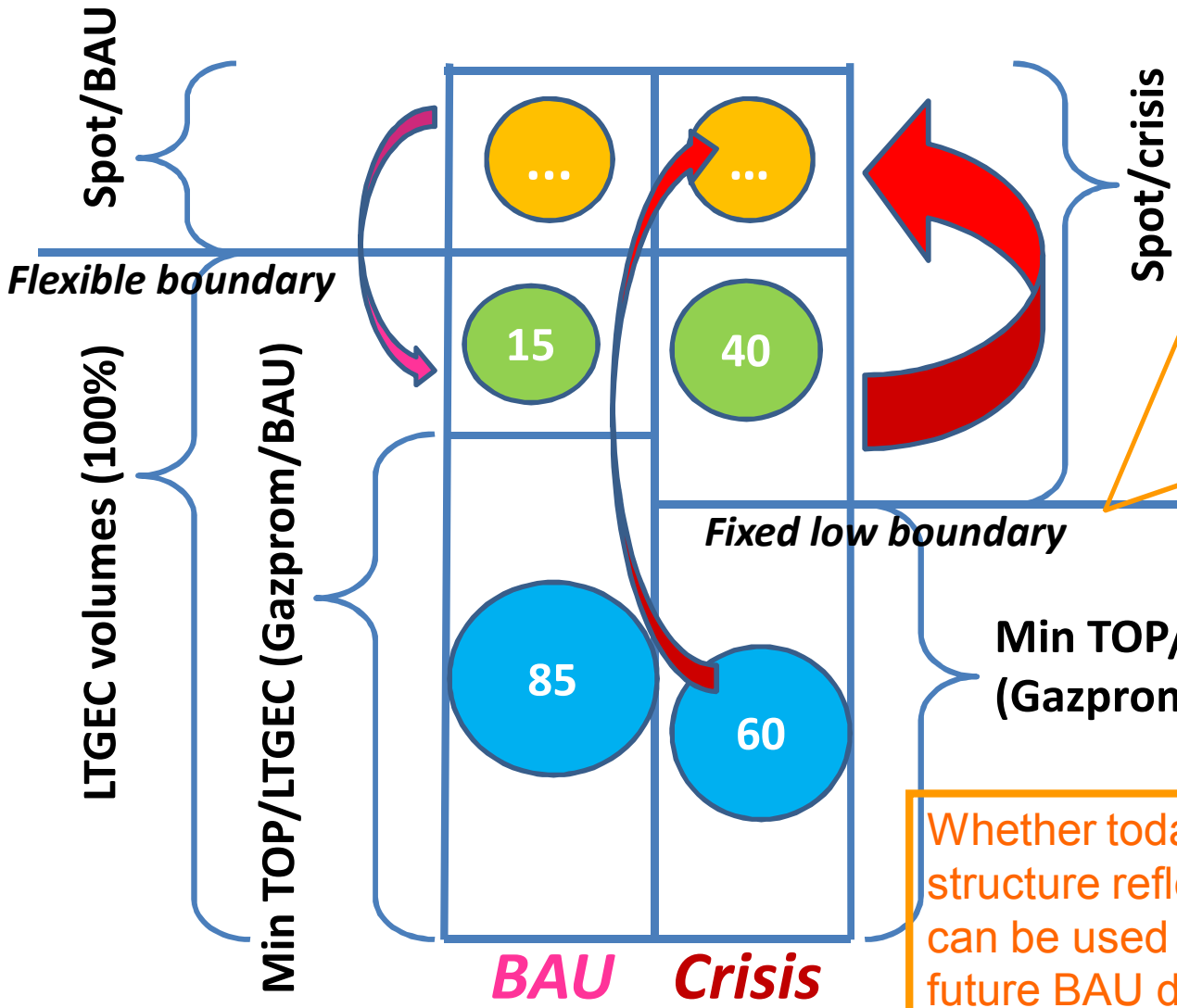
Further development (most likely): towards EE-type => WE-type => UK-type price

indexation => **away from oil parity?**

# Producers, Consumers & Speculators Price/Pricing Preferences



# Evolution of spot/LTC gas trade under BAU/crises



%-age of spot increases to extreme high during crises due to: (1) decrease of 'Min TOP' in LTGECs & buyers' switch from LTGEC to spot purchases + (2) spot compensates delays in contracted supplies (postponed start-ups) from new projects; spot back decreases from extreme high during BAU dev'ts

Whether today's contractual gas market structure reflecting crisis environment can be used as a basis for modeling future BAU developments ?

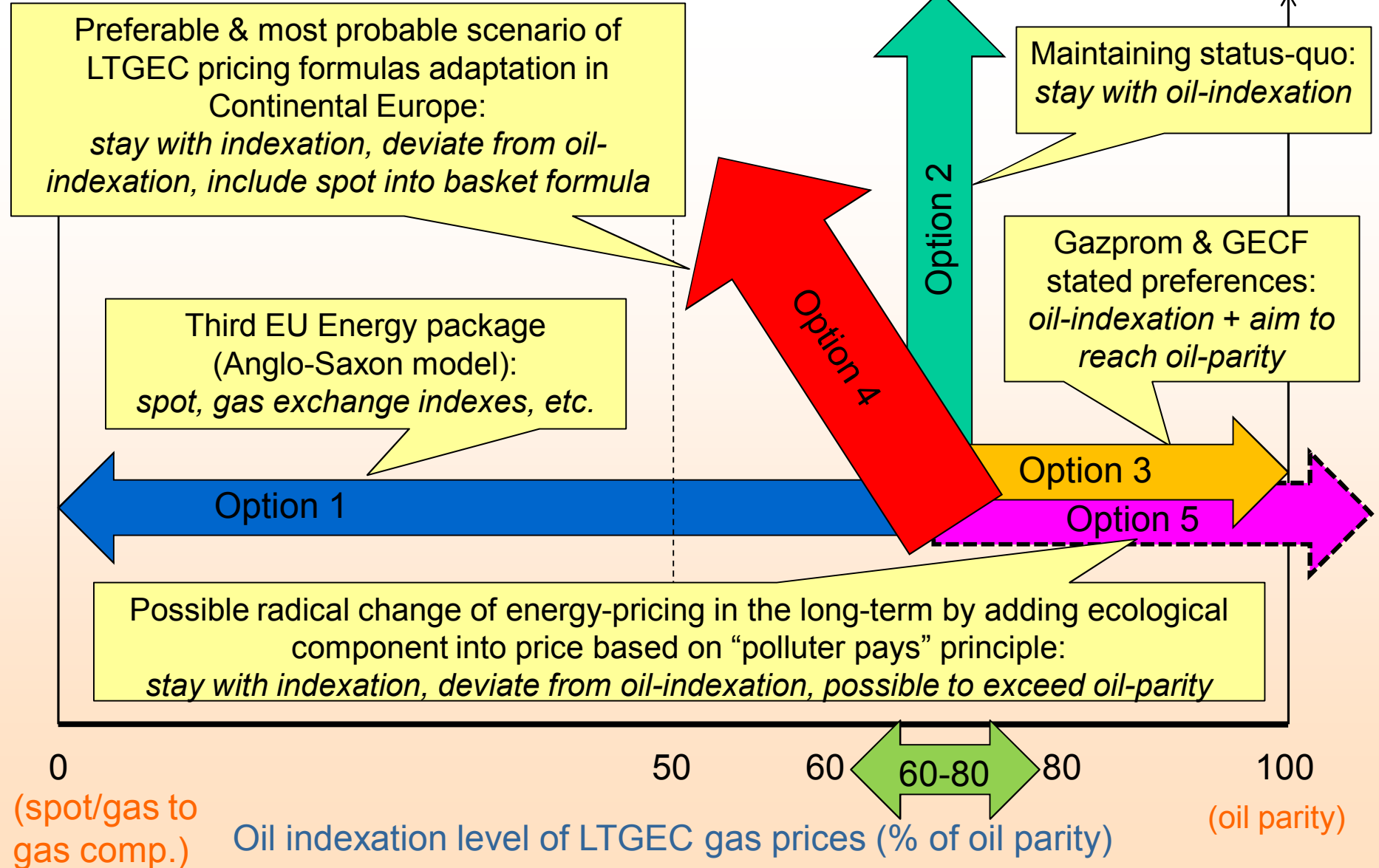
# Gazprom: Evolution of contract provisions and pricing mechanisms in Europe (1)

Actions	Companies
Buyers' demands for price reviews and contract adjustments following "significant market changes"	E.On, Wingas, RWE, Botas, Eni, GdF Suez, EconGas, Gasum
Downgrading minimum TOP obligations from Gazprom's average 85%	E.ON, Botas: 90% to 75%; ENI: 85% to 60% for 3 years) => Gazprom total 15 BCM for 3 years = 5/140-145 BCM (2010) = 3.5% RF gas export volume
No penalties for violation of minimum TOP obligations	Naftogaz Ukraine, Botas; Eni, E.ON pending
Gas sales above minimum TOP obligations at current spot prices	E.ON, GdF, Eni
Adding gas-to-gas competition component into pricing formulae thus decreasing/softening oil-indexation formulae link	E.ON, GdF, Eni–Gazprom = 15% based on a basket of European gas hubs, E.ON-Statoil = 25%; Statoil average up to 30%, requests to Gazprom up to 40%

# Gazprom: Evolution of contract provisions and pricing mechanisms in Europe (2)

Actions	Companies
Increasing flexibility of contractual provisions	Gazprom's "promotional package"
Recalculating base formulae price	Wingas
Direct price concessions	Naftogas Ukraine, Botas (tbc)
Manoeuvre by contract volumes within contractual time-frame + requests to cancel obligation to off-take contracted volumes within 5-year period	E.ON, Eni
Stimulating measures ("packages") for purchases in excess of (downgraded) minimum TOP	
Shorter contract durations	Sonatrach
Shortening of recalculation period/interval	possible
Shortening of reference period	possible
Some buyers files lawsuits against Gazprom over long-term prices (within price review/DS clauses)	Edison S.p.A. (AC SCC), etc.

# Evolution/adaptation of gas pricing mechanisms in Europe: major options (1)



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# Technological effects in oil & gas cost reduction – and their implication in shale gas development (1)

## Technological effects in oil & gas cost reduction

Fertilizer effect: implementation in oil & gas of technological achievements from the other – mostly military – industries

Effect of concentration (economy of scale): decrease in unit costs with increase of unit volumes

Effect of learning curve: cost decrease due to accumulation of experience in the course of multiple repetition of technological operations & due to streamlining (simplifying) route of achieving business aim (*evolutionary technological progress*)

Effect of technological breakthroughs: radical change in technologies (*revolutionary technological progress*)

Multiplication effect: cumulative effect (giving effect of multiplication) of all or of the part of above-mentioned effects

# Technological effects in oil & gas cost reduction – and their implication in shale gas development (2)

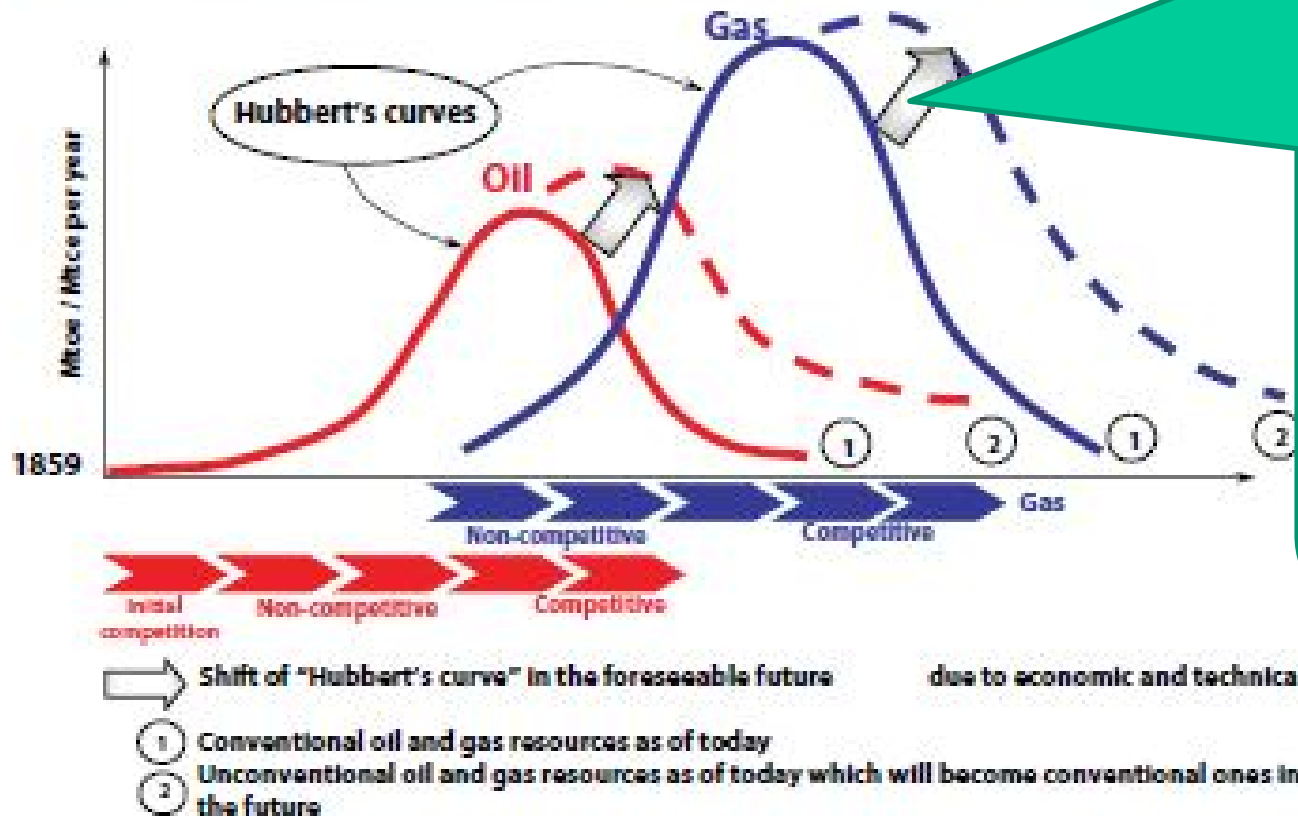
Technological effects in oil & gas cost reduction	Effect in shale gas development (compared to traditional O&G)
<u>Fertilizer effect</u> : implementation in oil & gas of technological achievements from the other – mostly military – industries	NO (?)
<u>Effect of concentration (economy of scale)</u> : decrease in unit costs with increase of unit volumes	YES
<u>Effect of learning curve</u> : cost decrease due to accumulation of experience in the course of multiple repetition of technological operations & due to streamlining (simplifying) route of achieving business aim ( <i>evolutionary technological progress</i> )	YES
<u>Effect of technological breakthroughs</u> : radical change in technologies ( <i>revolutionary technological progress</i> )	NO (?)
<u>Multiplication effect</u> : cumulative effect (giving effect of multiplication) of all or of the part of above-mentioned effects	YES

# Innovations in resource industries: individual cases & multiplication effect

- Individual cases of innovations:
  - Seismic: from two-dimensional (2D) to three-dimensional (3D)
  - Drilling: from vertical to combination of vertical & horizontal drilling
  - Drilling: from single-well to multiple-wells from one well-pad
  - Penetration: from single to multiple hydraulic fracturing
- Shale gas (USA): new combined technologies stipulated rapid innovations cycle based on multiplication effect of innovations:
  - Combination of horizontal drilling with multiple hydraulic fracturing, etc. + (key!) under **growing oil/gas prices in 2000-ies & fiscal/investment incentives** => technical possibility + economic incentives to develop new class of energy resources, well known but not commercially developed before => cost-benefit consequences => “silent shale gas revolution” & its consequent effects

# “Silent gas revolution” = argument in “peak-oil/gas” debate

Figure 3: Hydrocarbons Markets: From Non-competitive to Competitive Structures



Shale gas development has further moved Hubbert's peak for gas in upward-right direction

Source: *Putting a Price on ENERGY: International Pricing Mechanisms for Oil and Gas*. – Energy Charter Secretariat, Brussels, 2007, p. 53

## What has fueled “silent shale gas revolution” in the US (acc. to Florence Geny, OIES) – and Russia case for marginal O&G

	USA	Russia
Capital incentives (tax credits, etc.)	<b>YES</b>	<b>NO</b>
High oil prices	<b>YES</b>	<b>YES</b>
Technological nature of the industry	<b>YES</b>	<b>YES</b>
Regulatory body	<b>YES</b>	<b>NO</b>
Competitive market structure	<b>YES</b>	<b>NO</b>
Availability of service industry competition	<b>YES</b>	<b>NO</b>

Source (USA): Maximilian Kuhn/Frank Umbach. STRATEGIC PERSPECTIVES OF UNCONVENTIONAL GAS: A GAME CHANGER WITH IMPLICATIONS FOR THE EU'S ENERGY SECURITY. - A EUCERS STRATEGY PAPER, Volume 01, Number 01, 01 May 2011, p. 16-17

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# Russia & innovations: away from O&G - or within the O&G as well (1)

- Dominant position within state leadership & society:  
*with innovations to pass away from O&G dependency*
  - Contra-distinction of O&G (resource industries) to innovations => to overcome “resource curse” => innovative clusters outside “resource industries” (Medvedev’s five priority innovative clusters)

# Russia & innovations: away from O&G - or within the O&G as well (2)

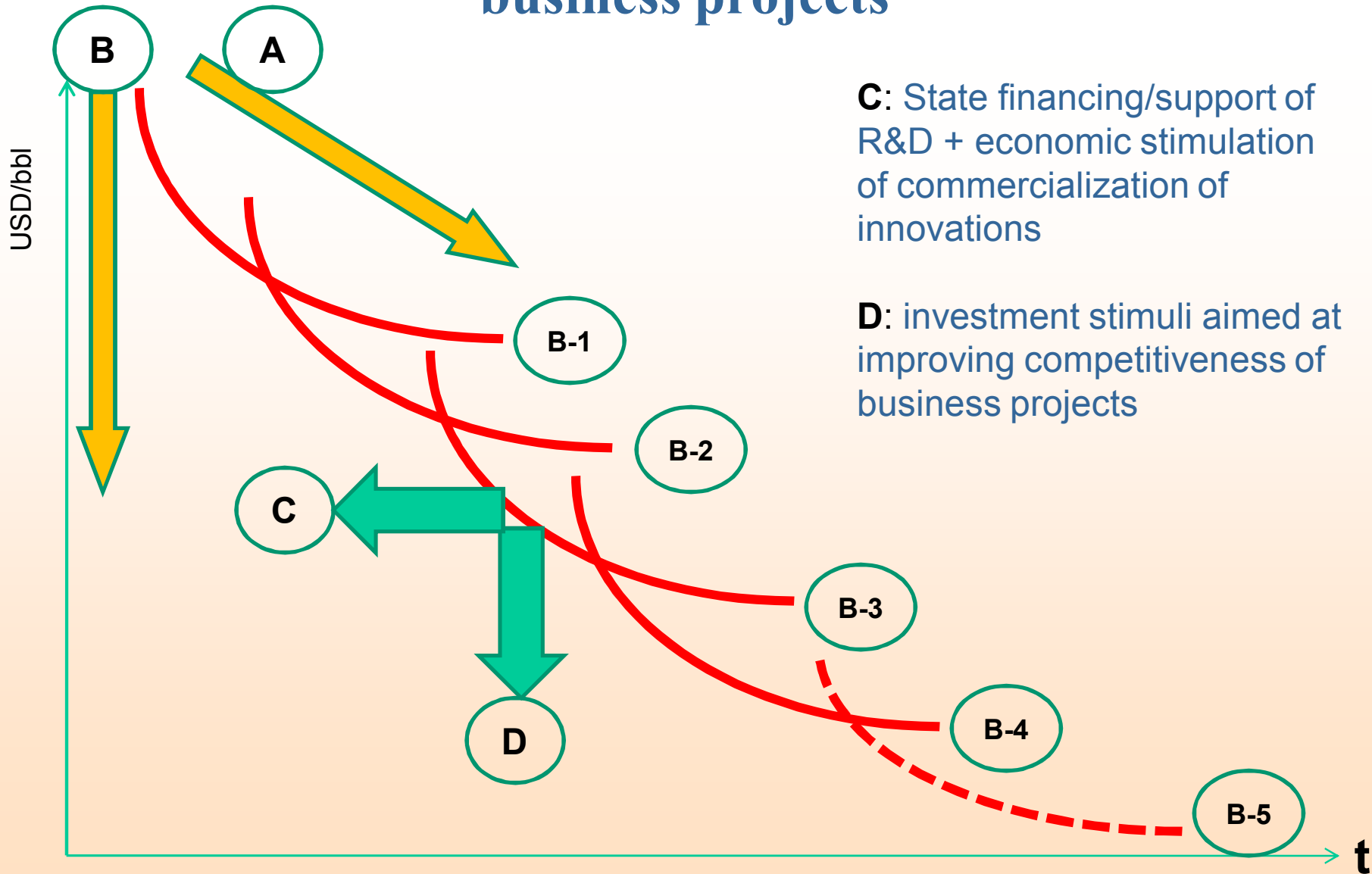
- Alternative position: *application of innovations within O&G industries as well*,
  - Availability of O&G resources is not a curse, but a natural value - if effectively managed => problem is not in resources availability, but in capability to effectively develop them and utilize their extraction revenues => formation & utilization of “resource rent”,
  - Under prudent investment policy resource industries (O&G) provide creditworthy demand for innovations & create multiple macroeconomic effects for the state; investment projects in resource industries as regional development projects
  - Degradation of natural conditions of natural resource development => resource industries should become another innovative cluster to overcome negative effects of “natural factor” & to increase competitiveness of resource industries in resource & capital markets
- US shale gas as a case study for innovation cycle

## Russia: resource industries as prospective (sixth) innovative cluster

- Priority areas for innovations in Russian O&G:
  - offshore O&G development, incl. Russian Arctic deep offshore development
  - Eastern Siberia gas processing industry, incl. helium
- Historical analogies (USA/USSR) of high-tech: development of nuclear bomb, outer space exploration (Arctic deep offshore development is not easier than outer space exploration)
- *Earlier* (under military confrontation of two systems): offshore developments on the basis of dual-use military technologies (aircraft engines = gas turbines on offshore platforms) => resource industries as **consumer** of dual-use technologies
- *Nowadays*: offshore development as generator for innovative decisions => resource industries as supplier of high-tech technologies to other civil industries



# «Learning curves»: role of the state in cost decrease of business projects



**C:** State financing/support of R&D + economic stimulation of commercialization of innovations

**D:** investment stimuli aimed at improving competitiveness of business projects

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**P.S.**

# **EUCERS: Russians can not be objective on shale gas developments ?**

- “Confronted with decreasing natural gas prices and Russia’s threats to Europe’s supply security, Moscow’s policies have become unintentionally the major enabler for unconventional gas developments in Europe. ... **it is hardly surprising that representatives of the Russian government and Gazprom try to downplay the importance of a shale gas in Europe and to portray very negative implications of unconventional gas production in Europe for its environment and the EU’s climate mitigation efforts.(105)”**

(105) ‘Alexander Medvedev Answers Your Questions – Part One’, Financial Times, 18 February 2011; ‘Gazprom Chief Steps Up Attacks on Shale Gas’, *ibid.*, 18 February 2011, ‘Gazprom Chief Calls Shale Gas a ‘Bubble’, Financial Times.Com, 18 February 2011, and Andrey Konoplyanik, ‘The Economic Implications for Europe of the Shale Gas Revolution’, *Europe’s World*, 13 January 2011.

Source: *Maximilian Kuhn/Frank Umbach*. STRATEGIC PERSPECTIVES OF UNCONVENTIONAL GAS: A GAME CHANGER WITH IMPLICATIONS FOR THE EU’S ENERGY SECURITY. - A EUCERS STRATEGY PAPER, *Volume 01, Number 01, 01 May 2011, p. 48-49*

# Thank you for your attention

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