

Shale gas as “game changer” for the European energy market? A perspective from exporter’s angle (Economic and Geopolitical Implications for Russia)

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**Keynote speaker’s presentation at the Conference
“Unconventional Gas Market Scenarios: Economics, Supply & Pricing
Strategies for Upstream & Downstream Operators”,
Ramada Hotel Alexanderplatz, Berlin, Germany, 21-22 May 2012**

Questions to be addressed

- US shale gas - a silent revolution with global consequences (its domino effects for Russia as gas exporter)
- Waves of shale gas influence on EU gas market (key Russian gas export market)
- Shale gas as a trigger for adaptation of existing gas suppliers export strategies to Europe
- Gas exports to Europe: Changes of pricing models? Changes of contractual structures?

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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.

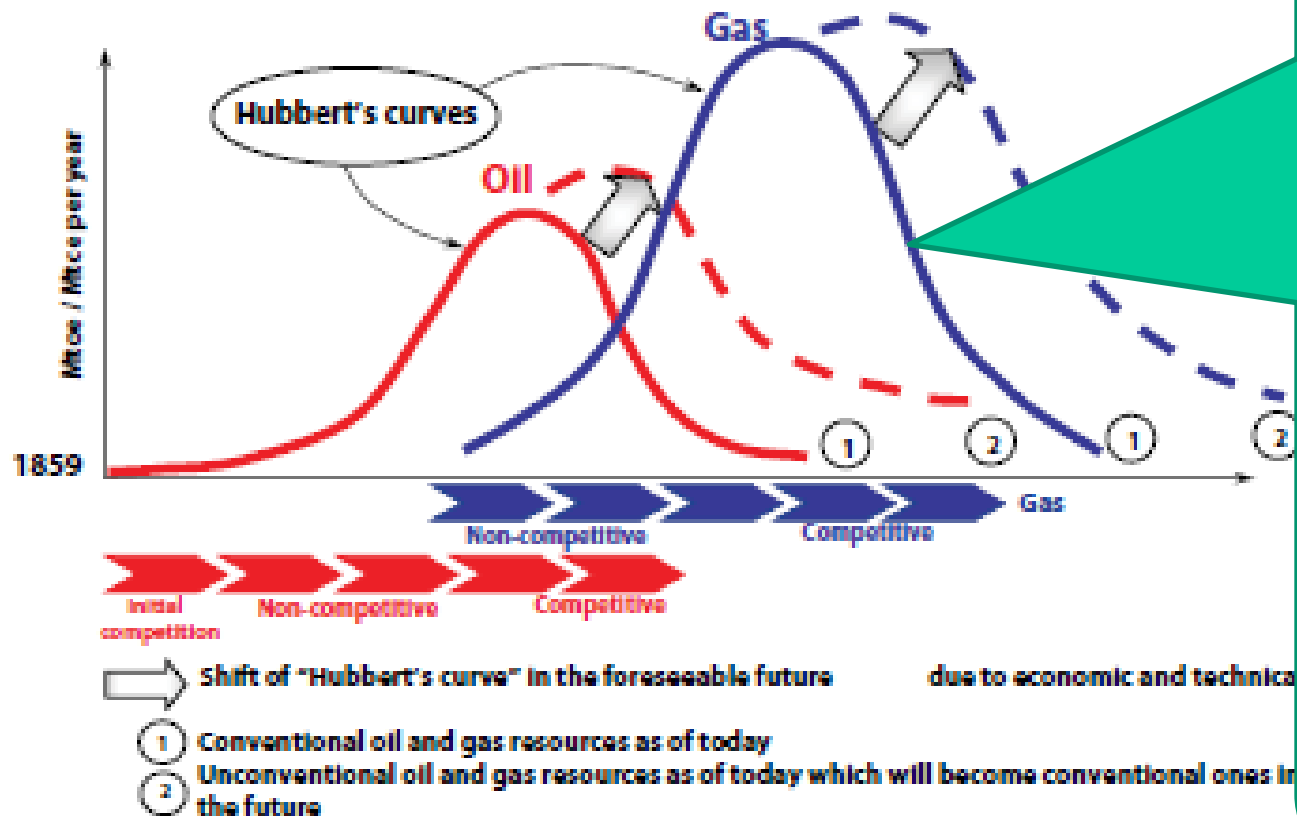
Source: *Maximilian Kuhn/Frank Umbach. STRATEGIC PERSPECTIVES OF UNCONVENTIONAL GAS: A GAME CHANGER WITH IMPLICATIONS FOR THE EU’S ENERGY SECURITY. - A EUCERS STRATEGY PAPER, Volume 01, Number 01, 01 May 2011, p. 48-49*

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“Silent US shale gas revolution” as an argument in “peak-oil/gas” debate ...

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

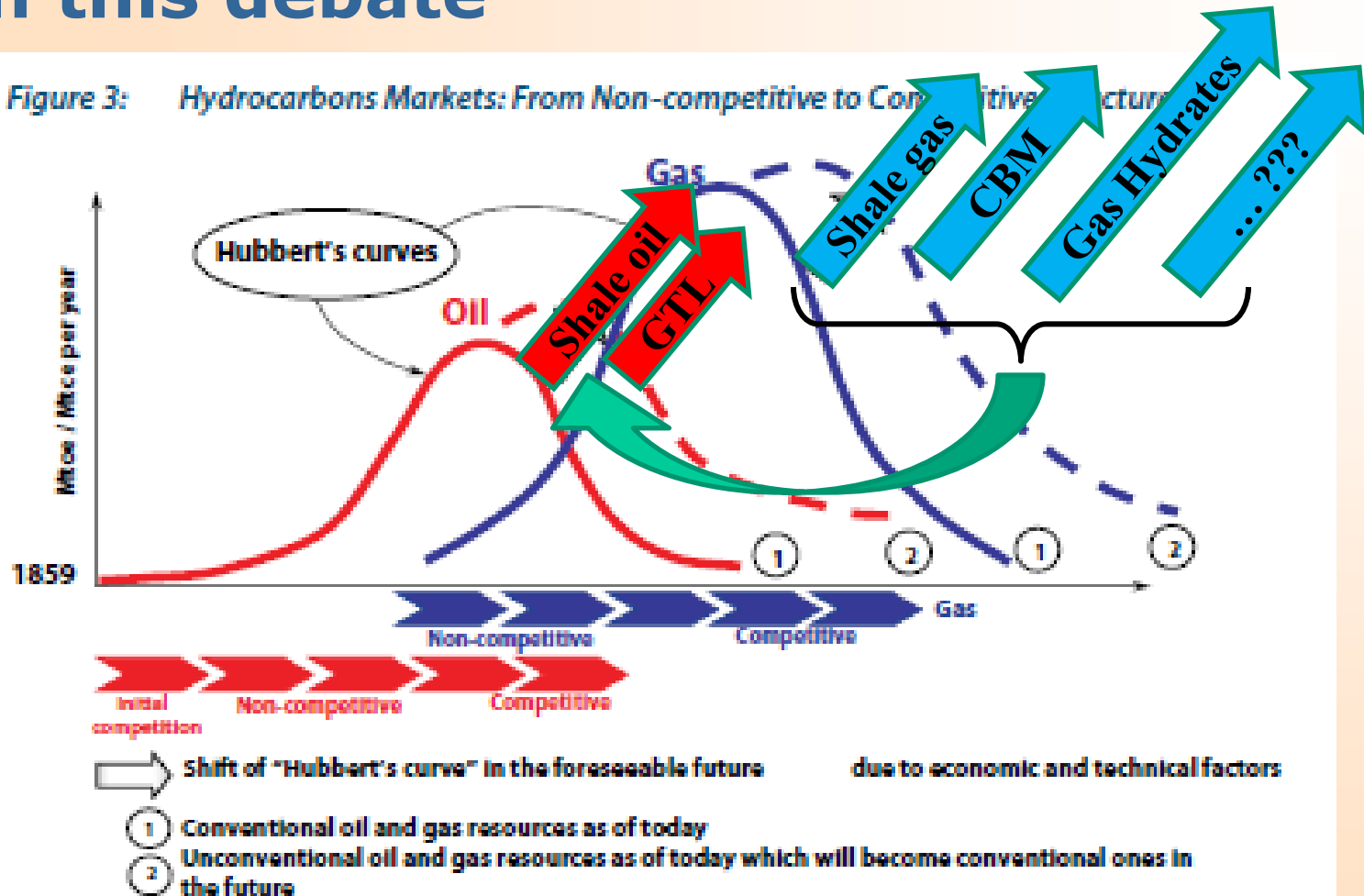


Shale gas development has been further moving Hubbert's peak for gas in upward-right direction - but not only shale gas...

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

... but shale gas is not the only argument in this debate

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

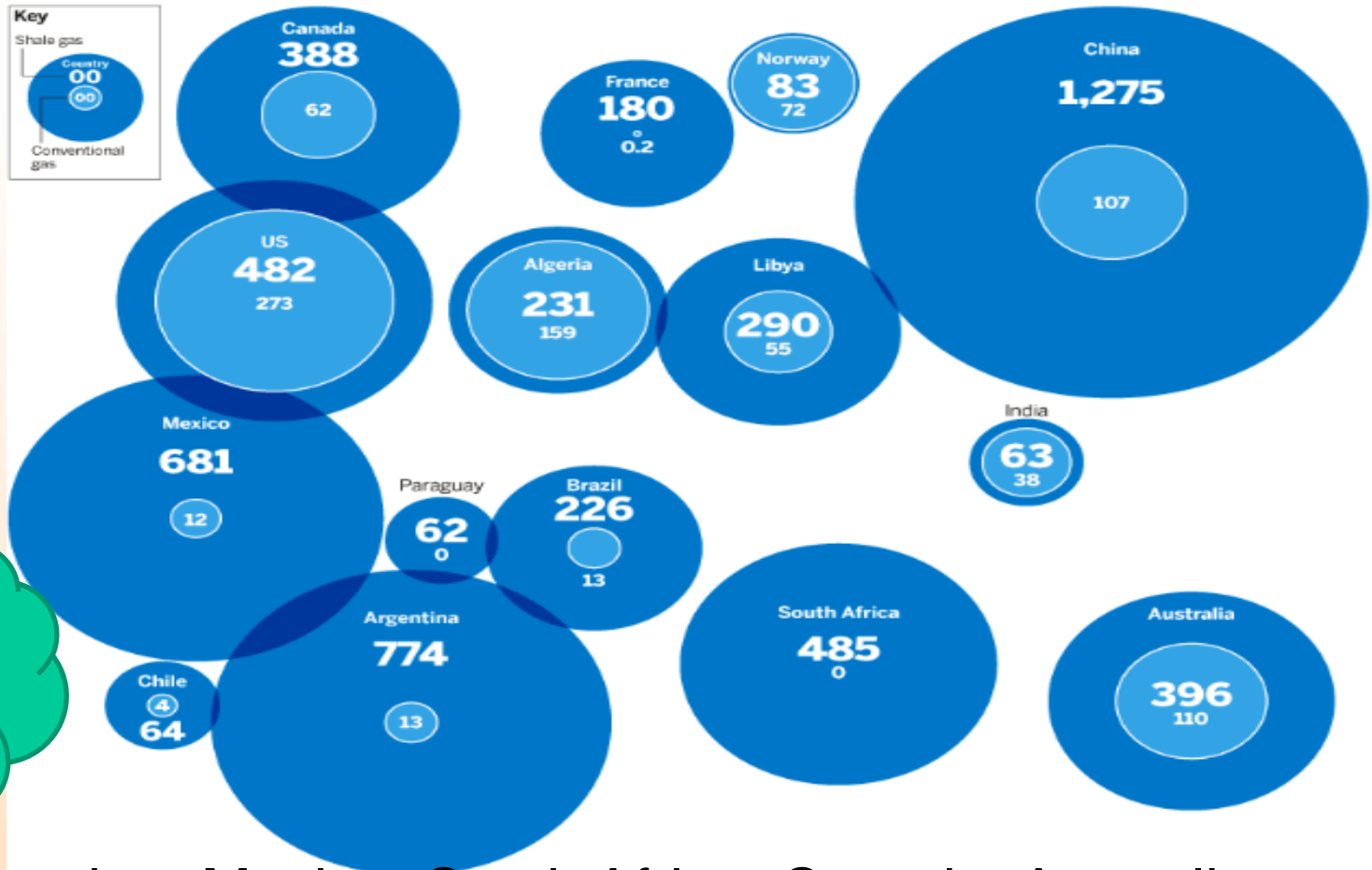
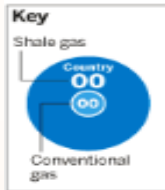


Based on: *Putting a Price on ENERGY: International Pricing Mechanisms for Oil and Gas.* – Energy Charter Secretariat, Brussels, 2007, p. 53

Conventional vs shale gas reserves

Big supplement to supply

Estimated shale gas in relation to conventional gas reserves
Technically recoverable shale gas resources, top 15 countries (trillion cubic feet)



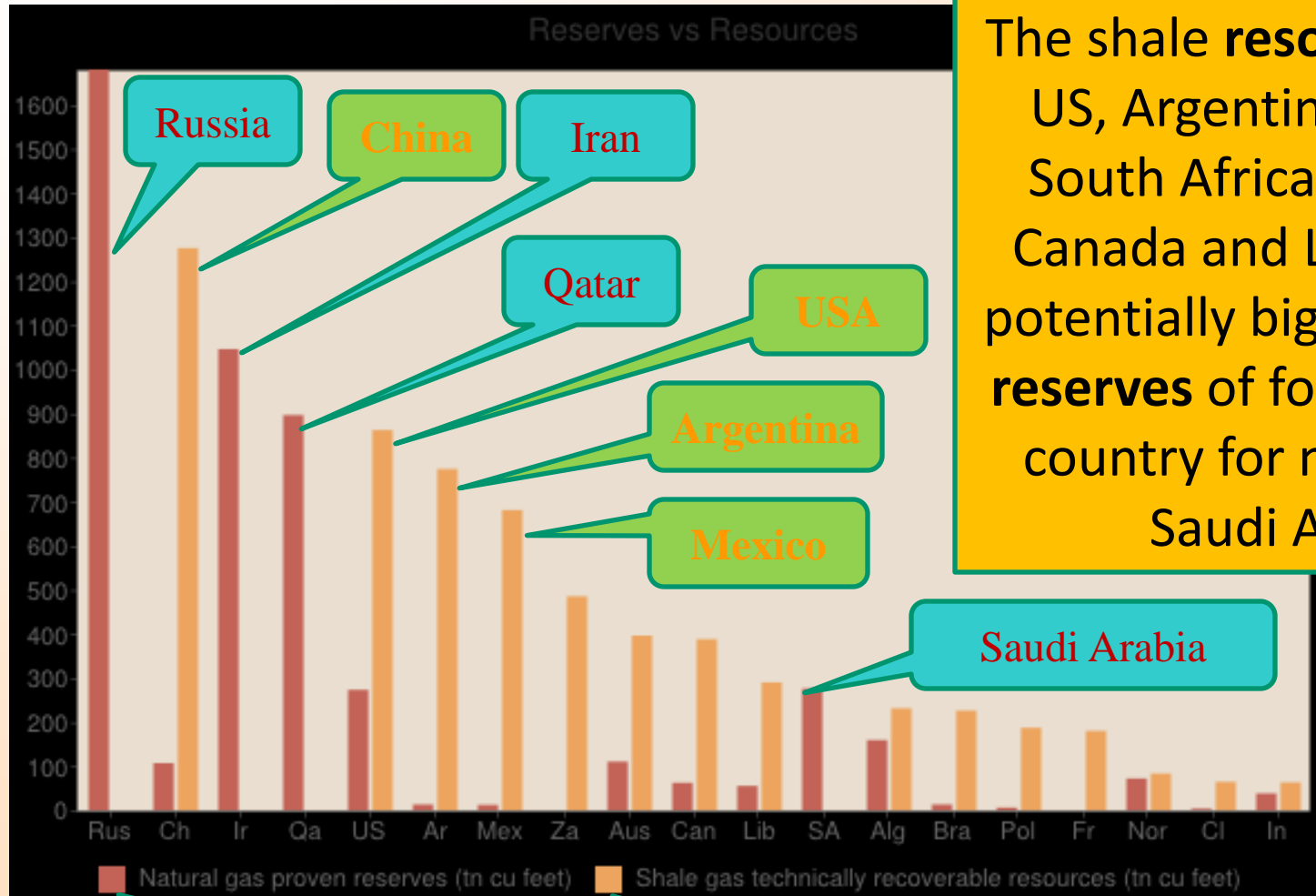
Technically recoverable shale gas resources, top 15 countries, Trillion cu ft

Just to compare the order of the figures...

China, Argentina, Mexico, South Africa, Canada, Australia etc. - New players at the world gas map?

Based on: "Financial Times" shale gas series, 22-25 April 2012

“The scale of the shale resources is, potentially, a game changer. If you can extract it.” (FT)



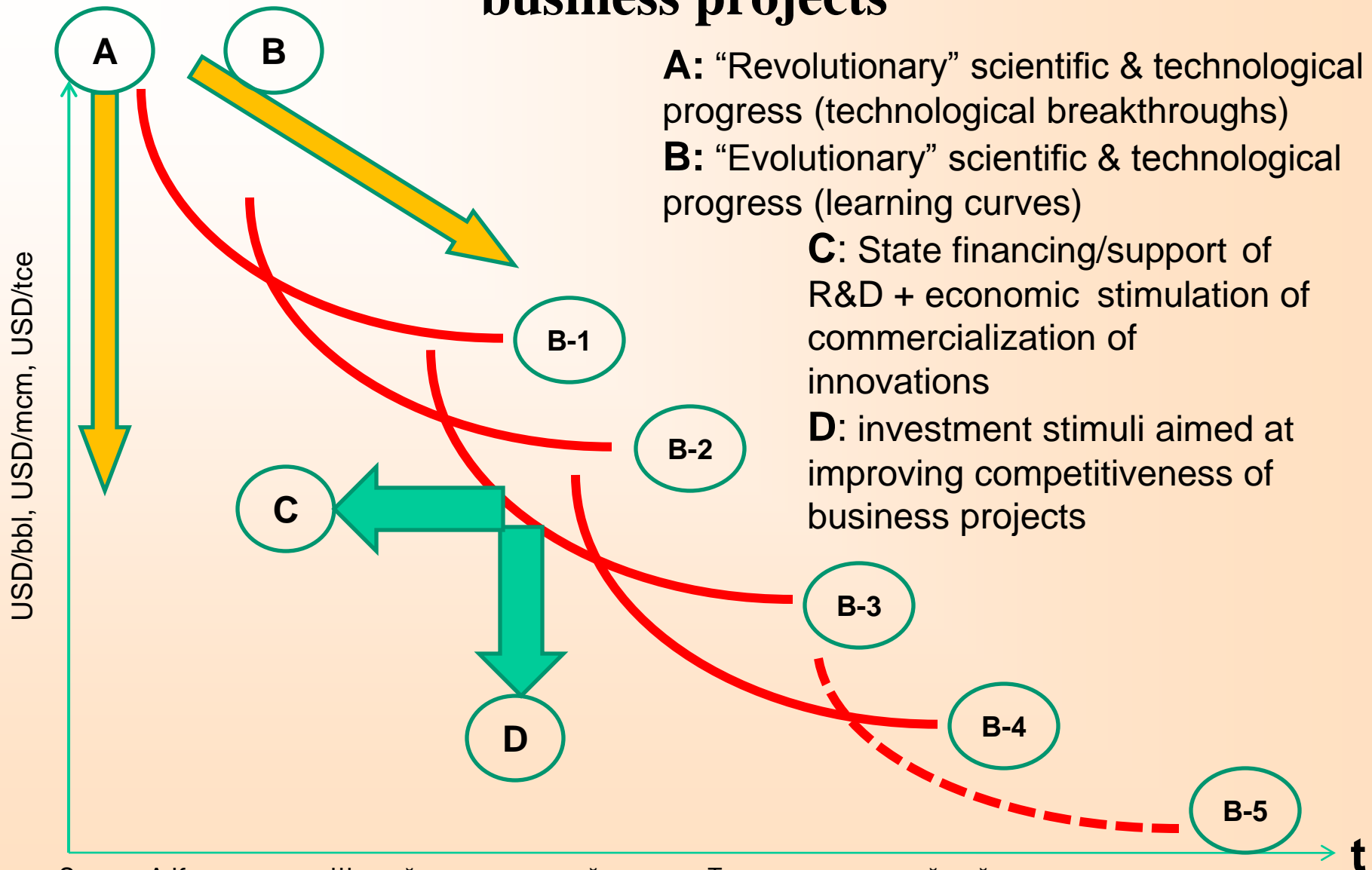
The shale resources of the US, Argentina, Mexico, South Africa, Australia, Canada and Libya are all potentially bigger than the reserves of fourth-biggest country for natural gas, Saudi Arabia

Sources:
EIA, CIA
World
Factbook
(Cited from
“Financial
Times”,
09.12.2011)

Reserves

Resources

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



A: “Revolutionary” scientific & technological progress (technological breakthroughs)

B: “Evolutionary” scientific & technological progress (learning curves)

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

D: investment stimuli aimed at improving competitiveness of business projects

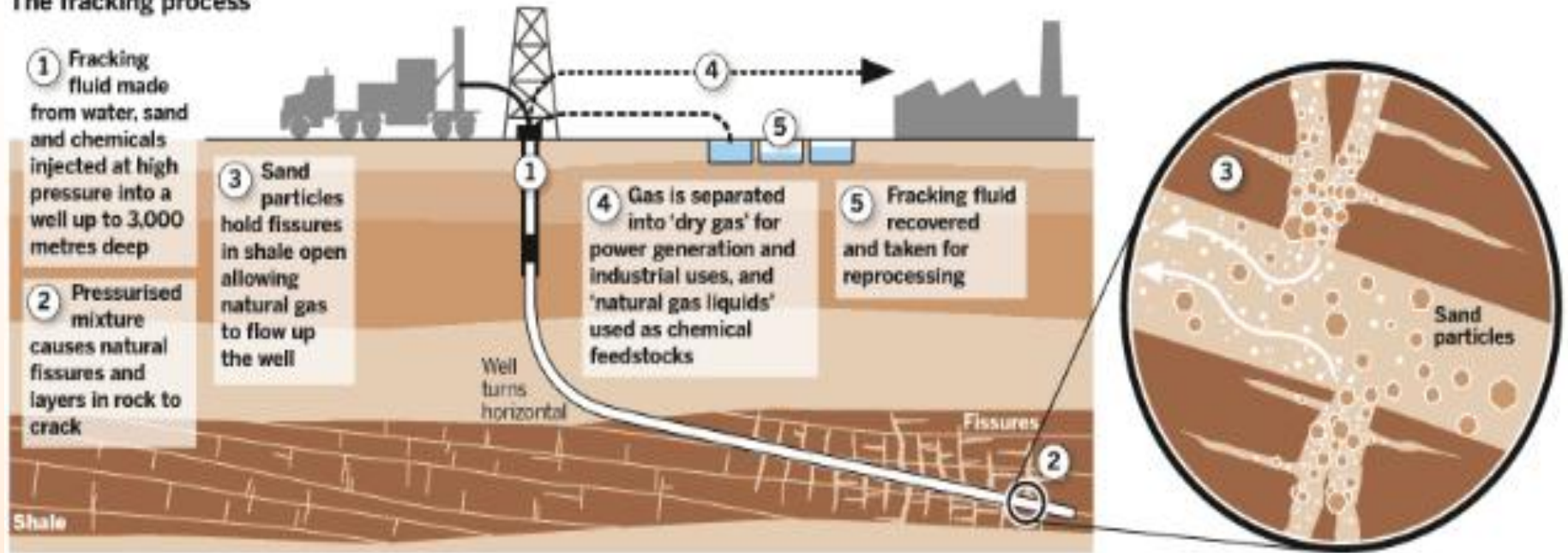
Source: A.Конопляник. «Шестой инновационный кластер. Такую роль в российской экономике могут сыграть нефть и газ». – «Нефть России», 2012, №4, с. 6-11, №5, с. 9-15.

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US Shale gas: multiplier effect of STP, etc.

The fracking process



Shale gas (USA): new combined technologies stipulated rapid innovation's cycle based on "multiplier effect" of innovations (3D-seismic + horizontal drilling + multiple hydraulic fracturing, etc.) + long-time state financing of R&D + fiscal/investment incentives + (key!) growing oil/gas prices in 2000-ies => technical possibility + economic incentives to develop new cluster of energy resources, well known but not commercially developed before => cost-benefit consequences => "silent US shale gas revolution" & its global (!) "domino effects"

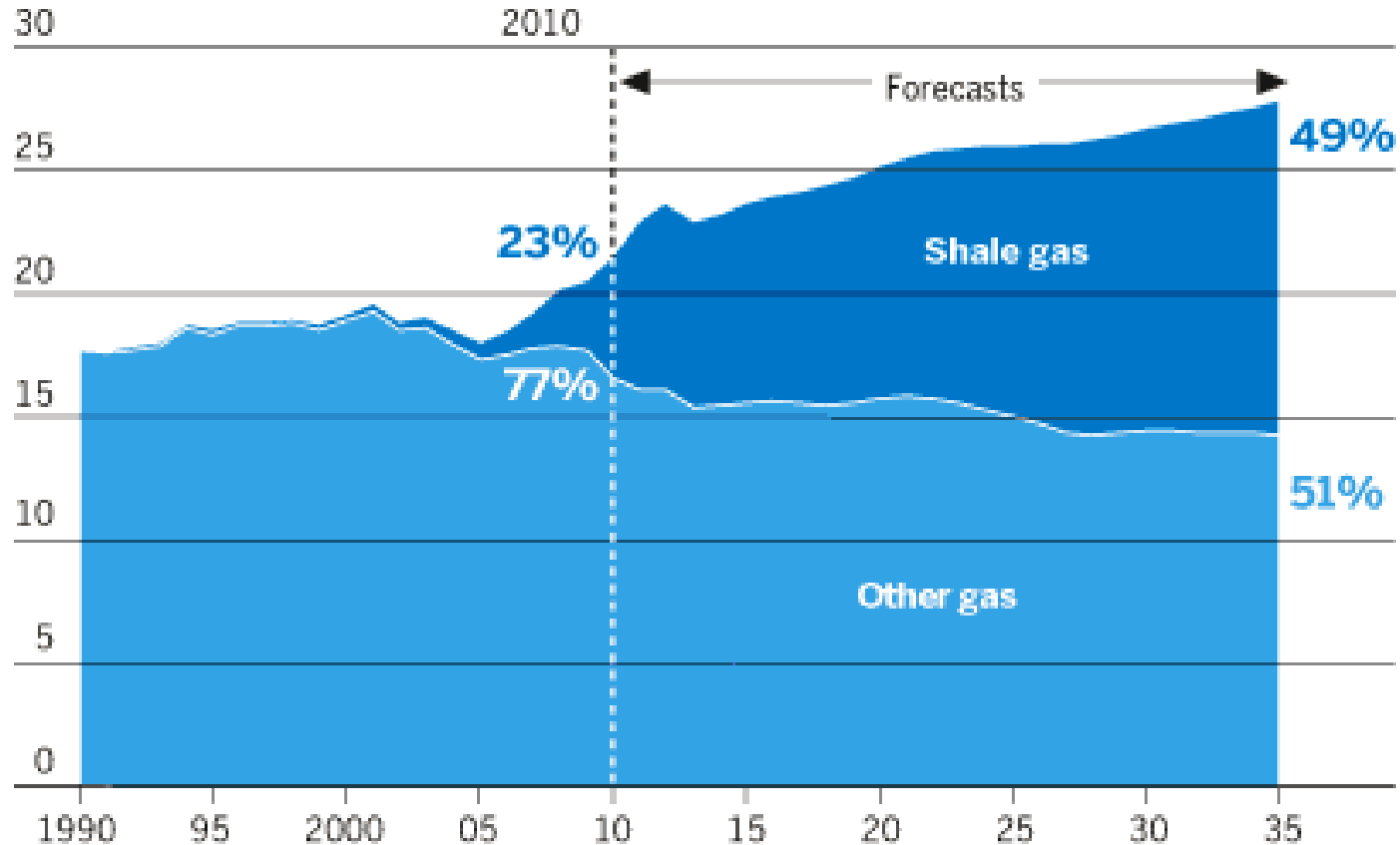
Source of picture: "Financial Times" shale gas series 22-25.04.2012 ¹²

A.Konoplyanik, Berlin, 21-22.05.2012

US shale gas: 1/4 today, 1/2 in 20 years?

US natural gas production

Cubic feet (tn)



Source: "Financial Times" shale gas series 22-25.04.2012

A.Konoplyanik, Berlin, 21-
22.05.2012

US shale gas: happy combination of circumstances (1/2)

- 1) Available raw material resources – good source rock stuffed with gas and oil
- 2) Well-developed, low-cost service & manufacturing industry to drill wells and provide necessary equipment (FT: a 60-80% cost advantage over those operating overseas)
- 3) US economic system which has perfected a means of “manufacturing” natural gas from shale (multiplier of innovations: 3D-seismic + horizontal drilling + multiple fracking)
- 4) State-funding for R&D & tax incentives for their commercialization (US Energy Ass., 24.01.2012: 30 years of R&D budget financing helped develop shale gas technologies)
- 5) Regulation allowed landowners to be offered lucrative compensation in exchange for the use of their subsoil plots

Author's compilation based on, inter alia: S.Pfeifer. Finds that form a bedrock of hope. “Fin.Times”, April 22, 2012; P.K.Verleger Jr. The coming US boom and how shale gas will fuel it. “Fin.Times”, 25 April, 2012, etc. 14

US shale gas: happy combination of circumstances (2/2)

- 6) Gas prices followed oil price upward in 2000-ies while costs (STP) decreased
- 7) Competitive & open pipeline systems permit connection of new fields, prevent any participant from denying these economic benefits to any other producer or consumer
- 8) US in effect thus broke monopolistic control on hydrocarbon supply once enjoyed by the majors (FT: around 4000 gas producers in the US nowadays)
- 9) US financial markets (principally futures markets) enable producers and consumers to lock in profits for years ahead. Low today's gas cash prices now do not deter producers that sold today's production a year ago at much higher and profitable prices
- 10) "Privilege of the pioneer" (lack of public knowledge of negative consequences)

⇒ **This combination does not exist elsewhere (D.Yergin)**

What has fueled “silent shale gas revolution” in the US (acc. to Florence Geny, OIES)

- Capital incentives (tax credits, etc.)
- High oil prices
- Technological nature of the industry
- Regulatory body
- Competitive market structure
- Availability of service industry competition

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. 16-17*

Why US shale gas experience could *not* be repeated elsewhere (*institutional* reasons !)

- Philip K. Verleger, Jr.: “Leaders outside the US recognise the threat shale gas poses to their competitive position. Vladimir Putin has warned that Russia’s national energy company must respond to the challenge. State energy groups, as well as the world’s integrated oil companies, will no doubt try. One can be confident of their failure, though. The development of shale oil and gas involves drilling hundreds of thousands of low-cost wells...
- The big multinationals cannot run projects involving thousands of workers on many small sites... Instead they excel at developing a few very expensive, highly productive projects that yield high-cost supplies. Their executives and shareholders should be thankful that the **unique *institutional* conditions behind the US shale revolution cannot be found anywhere else.**
- **The US and Canada will be, for the foreseeable future, a low-cost energy hegemony. We are the only nations that have promoted small, efficient, low-cost energy producers. Every other country relies on the Exxon type”.**

⇒ **No repetition of US shale gas revolution beyond North America due to *institutional* reasons?**

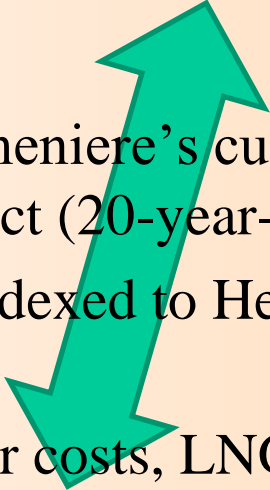
Source: P.K.Verleger Jr. The coming US boom and how shale gas will fuel it. “Fin.Times”, 25 April, 2012.

US as shale gas-based LNG exporter – global consequences

- **US:** 8 projects proposed with total export capacity **120 mln t/y**
- **Canada:** 2 planned LNG terminals (licences granted) with combined capacity **12 mln t/y**
- For comparison: **Qatar** (current world LNG leader) has production capacity **77 mln t/y**
- Pioneer US export LNG plant - **Cheniere Sabine Pass:**
 - 17 April 2012 won FERC approval to build the plant;
 - 4 trains with LNG export **18 mln t/y**
 - 89% contracted long-term (**UK/BG, Spain/Gas Natural Fenosa, India/Gail, South Korea/KGC**)
 - CAPEX USD 10 bln, 60% is raised already
 - Construction to start in (July 2012?)

Based on: “Financial Times” shale gas series 22-25.04.2012, etc.

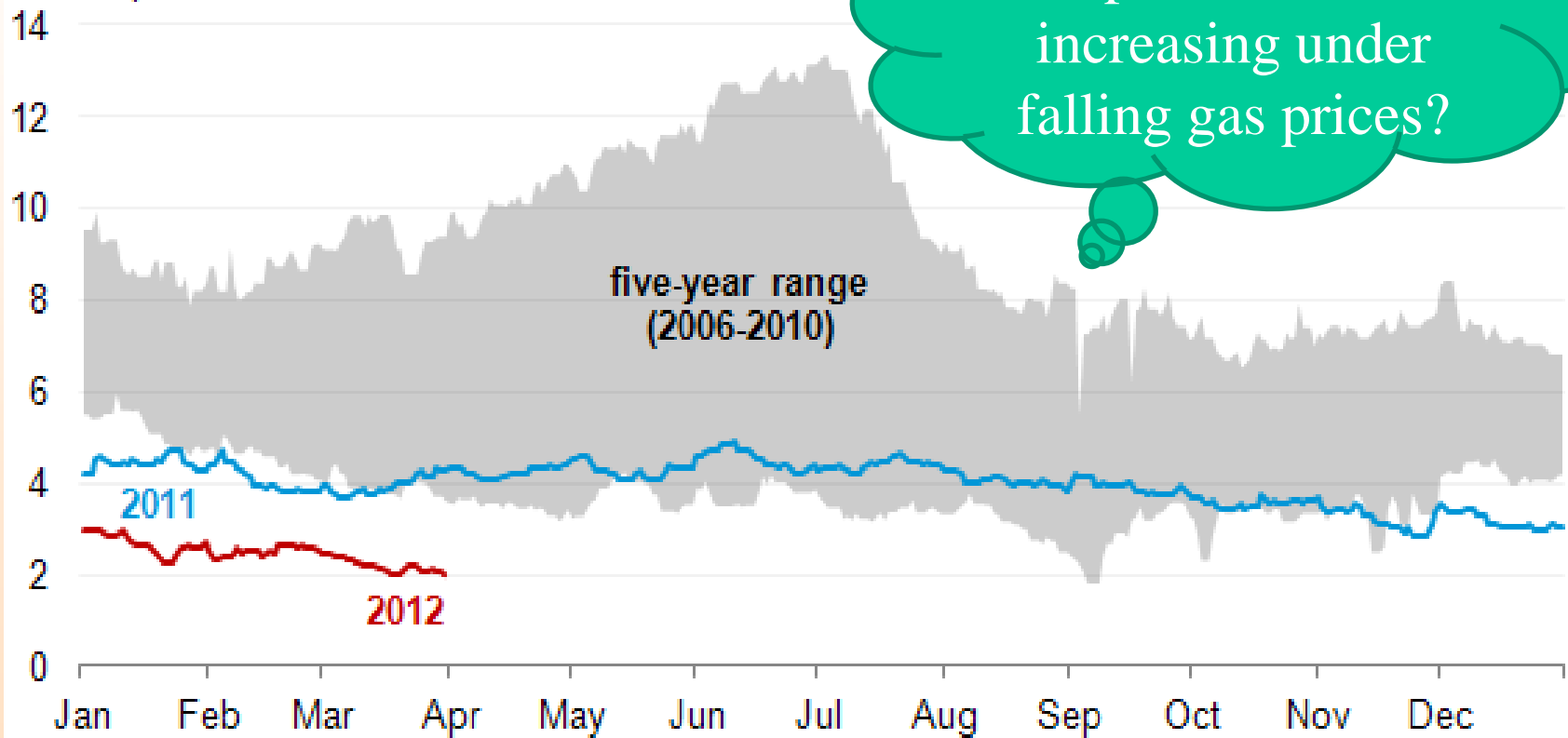
US Cheniere Sabine Pass LNG pricing model

- Traditional LTGEC Asian model:
 - TOP & JCC-based price indexation (currently 17 USD/mBtu)
 - Cheniere Sabine Pass model:
 - Off-taking: Departure from TOP - Cheniere's customers can take less LNG than specified in the contract (20-year-long with BG)
 - Pricing: Gas will be sold at a price indexed to Henry Hub (currently less than **2 USD/mBtu**)
 - After liquefaction, transport and other costs, LNG could be imported into Asia for less than 9 USD/mBtu
 - Selling & buying gas at the same basis
- => A whole new arbitrage opportunity for buyers: from arbitrage in Atlantic & in Asia-Pacific – to global arbitrage
=> to global gas market based on US shale gas & LNG?**
- 

Based on: "Financial Times" shale gas series 22-25.04.2012, etc.

US HH price is now much lower than previous 6-years bottom line

Spot Henry Hub natural gas price
dollars per million British thermal units



Why US shale gas production increasing under falling gas prices?

Source: based on N.Ivanov (FIEF) from EIA data

Shale gas: dry gas down, only liquids are supportive ?

- “The increasing supply and decreasing price of shale gas had led to a reduction in shale gas drilling. Those conditions are now leading to an actual closure of production and the early termination of some shale gas exploration and production projects.
- **This is happening especially for the 'dry gas' projects where low or no liquid production is expected.** Such closures have been announced by some leading shale gas operators such as Chesapeake and Anadarko”.

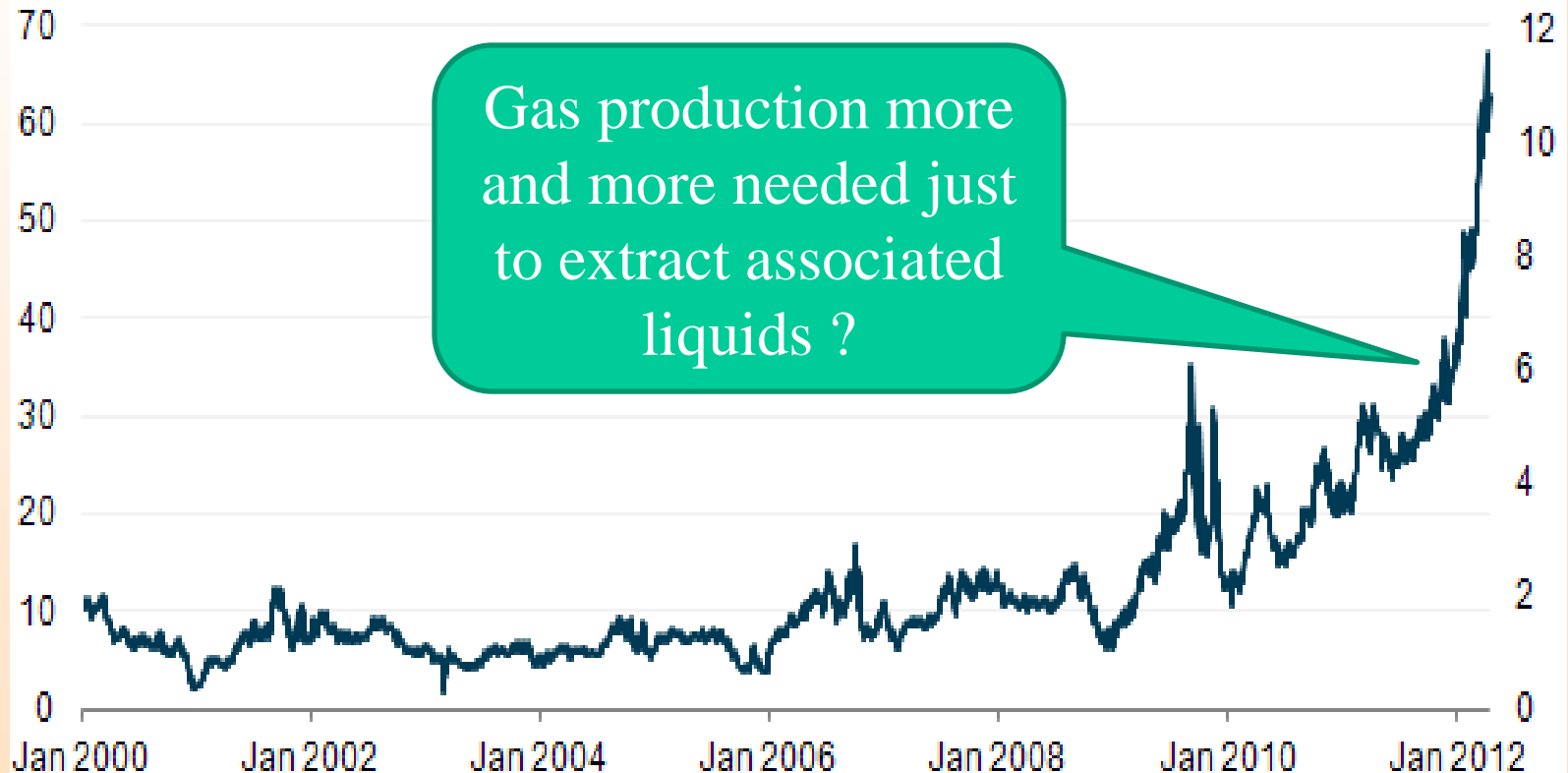
Source: M.TAKIN. Has shale gas become a victim of its own success? – “Quarterly Oil Supply”, CGES, May 2012

Crude (Brent) vs gas (US HH) price ratio

Crude oil-to-natural gas spot price ratio, January 3, 2000 - April 11, 2012

ratio of Brent crude oil (\$/bbl) divided
by Henry Hub natural gas (\$/MMBtu)

ratio of Brent crude oil (\$/MMBtu) divided
by Henry Hub natural gas (\$/MMBtu)



Source: based on N.Ivanov (FIEF) from EIA data

Shale gas & “integration effect”

- US shale gas today: a well-known economic phenomenon when producer of multiple products within one technological process with different marketing niches, prices & price cycles is more protected from market fluctuations compared to producer of a single good (“integration effect” – both in marketing goods/services & in institutional structures):
 - **USA**: shale gas (low price) vs shale gas liquids (high price)
 - **Qatari LNG**: gas vs liquids => expansion of market niche in the EU under oversupply & gas to gas competition (dumping)
 - **UKNS**: UK Gov’t decision on ass.gas => oversupply (even negative gas prices) => creation of liquid UK gas market
 - **Vertical integration**: VICs vs non-integrated companies
 - **Oil refining**: pricing on PP basket within VIOCs
 - **BUT: Gazprom**: dry Senoman gas (lack of flexibility)

Shale gas – some other facets

- Most recent shale gas business strategy: a de facto side product for gas liquids which provide key marketing effect?
- Based on UKNS (high gas/oil ratio => ban on gas flaring), Qatari (LNG vs liquids), etc. “integration effect” experiences?
- Shale gas as transition stage to shale oil?
- Shale gas as transition stage to other unconventional energies (less concentrated, more technological) => commercialization of business strategies based on combination of appropriate STP breakthroughs?
- Unconventional energies will be developed firstly where of conventional energies are less available (by nature or policy)
=> **Russia, Iran, Qatar, etc.** thus to be the last in the queue to develop shale gas & other unconventional gases (energies)?

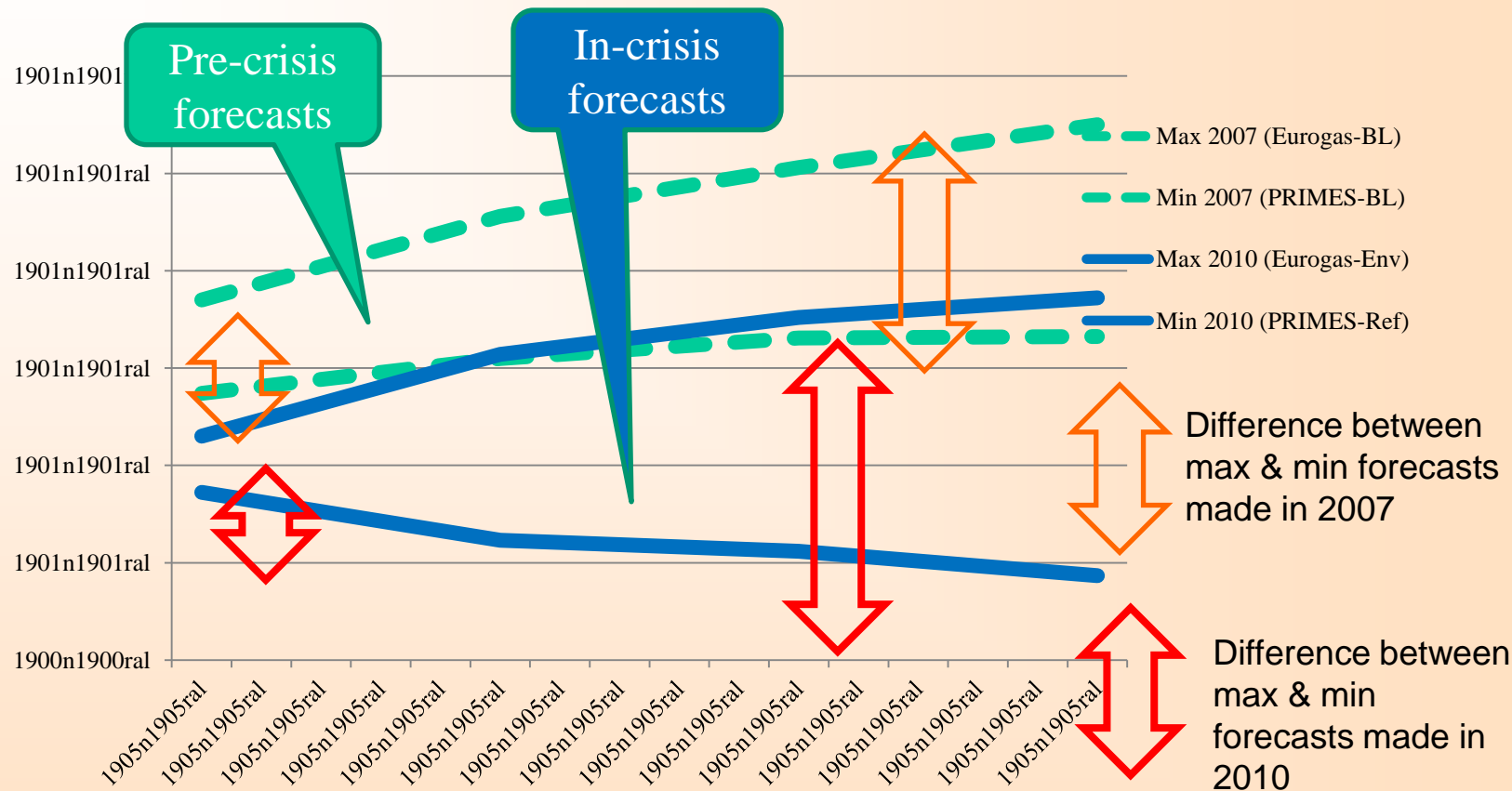
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US shale gas – a trigger of gas oversupply in Europe, 2009-2010

- Decrease of gas demand:
 - Global economic recession, incl. in Europe
 - Decarbonisation of EU energy prospects/scenarios
- Increase of competitive gas 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

EU future gas demand forecasts: corridor of uncertainties has been increasing, general trend has been lowering, bottom line became negative...



Source: compiled by V.Protasov on the basis of the database of the study “Energy Forecasts and Scenarios, 2009-2010 Research, Final Report”, Russia-EU Energy Dialogue, Thematic Group on Energy Strategies, Forecasts and Scenarios, Energy Economics Subgroup, 2011 I (available at: www.fief.ru).

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

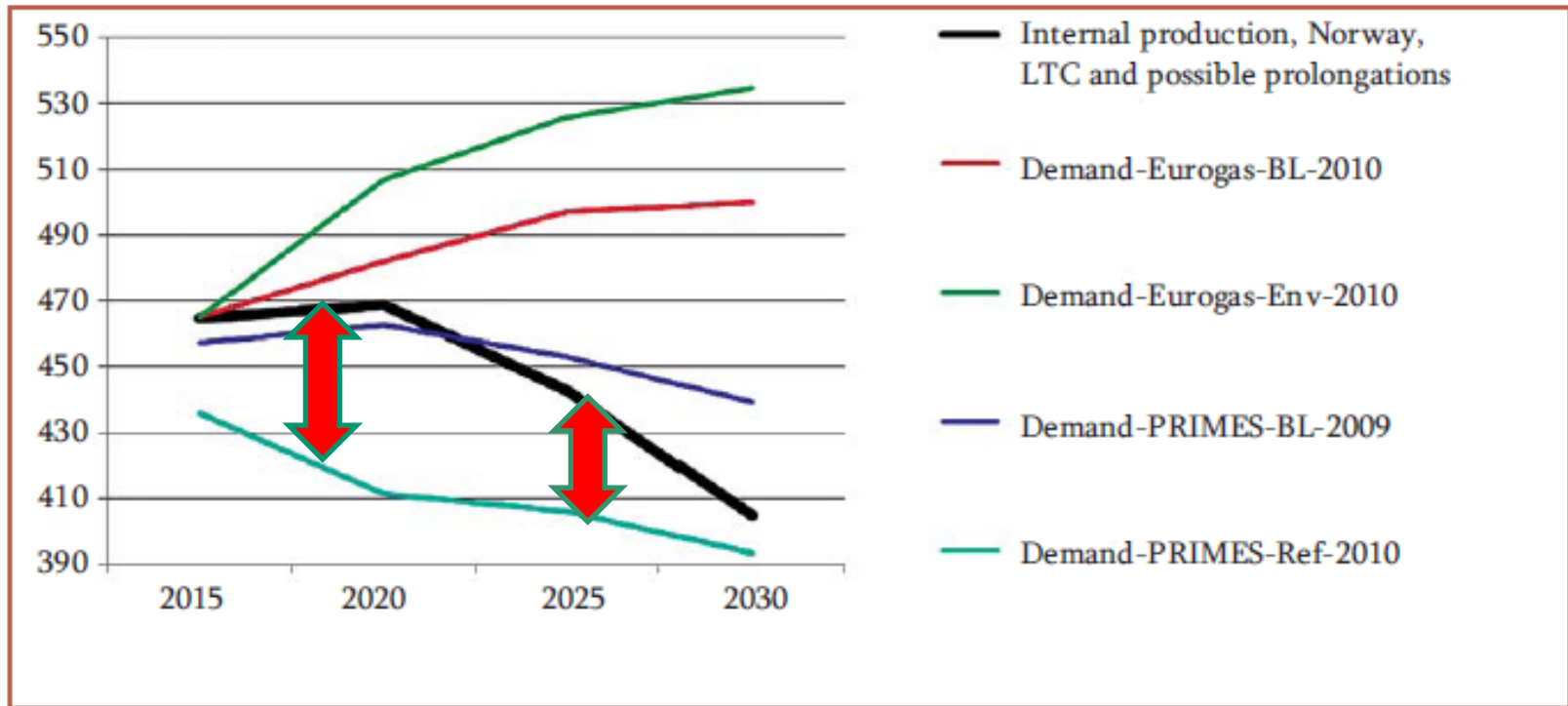


Figure 2. Potential of a new gas supply in EU-27 in 2015-2030 according to forecasts

Sources: Eurogas, 2010; EET-2030 update 2009

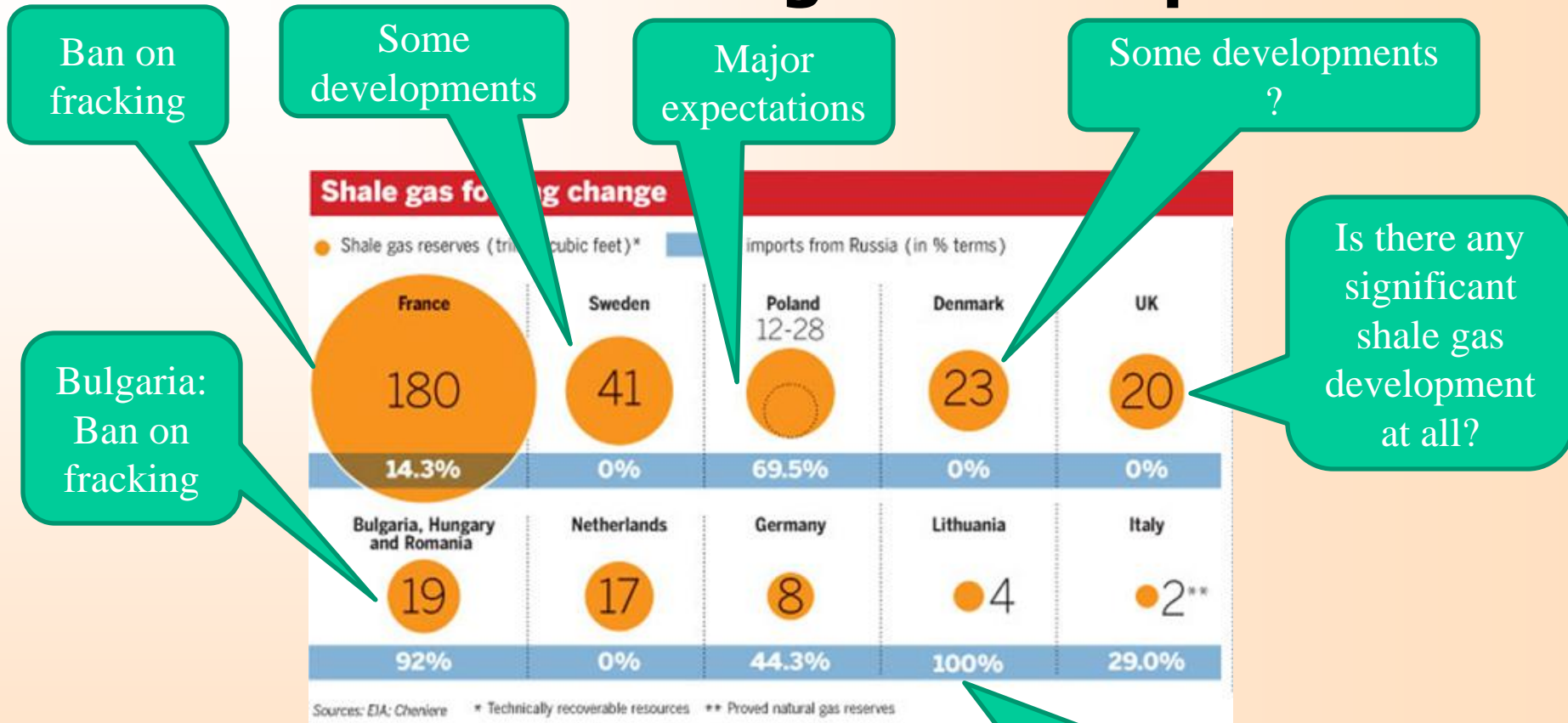
Note: LTC – long-term contracts



PRIMES: 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

EU MS dependence on Russian gas & their stimuli for shale gas development



Based on: Guy Chazan. Shale gas seen as unlikely bet for Russia, "Financial Times", April 24, 2012

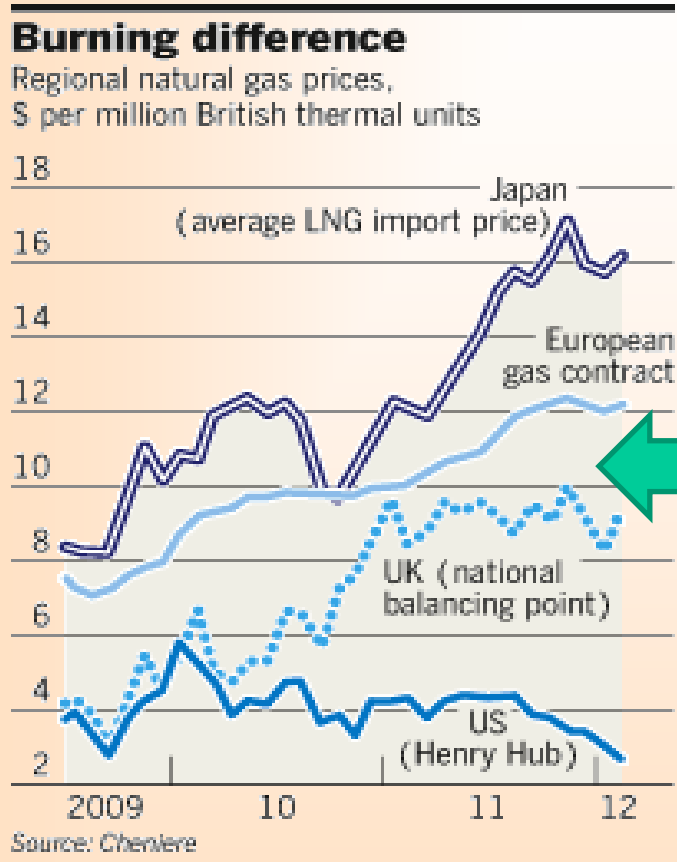
NB: Who is responsible for 100% dependence on Gazprom? Who insisted on closing Ignalina NPS?

Shale gas in Europe: European views

- Niall Rowantree, analyst, Wood Mackenzie: “You know there is gas there, **its just about how many wells you can actually drill**. Countries like Poland have gas and favorable tax policies, both of which could attract investments over a longer period. However, **there are a range of factors which cannot be duplicated in Europe**, due to environmental concerns, land rights and planning requirements.”
- Katinka Barysch, Deputy Director, CER: “**European experience with shale gas could not be compared to the U.S.** due to long-term contracts between Gazprom and several EU member states. We can’t sell it because Poland is locked into long-term contacts with Gazprom...”
- Peter Cameron, Director, CEPMLP: “New increases in shale would merely create more market uncertainty and doubts about long-term investments. **The hype about shale gas potential has had a negative impact on future investment in natural gas as the long term price is very unclear.**”
- **NB:** Industry estimates suggest drilling a well for shale gas in **Poland**, for example, is **3 times more expensive** than in the **US**, given the absence of a competitive service industry.
- Gunter Oettinger: “**Shale gas in the US totally changed the market. In Europe it can’t... It is an additional element, maybe 5-10 per cent.**”

Source: <http://www.cges.co.uk/media/articles/2010/11/29/shale-gas-popularity-rising-but-experts-remain-divided>; S.Pfeifer. Finds that form a bedrock of hope. “Fin.Times”, April 22, 2012; 30

Competing zone for shale gas in Europe



Source: Guy Chazan. Shale gas: Terminal decline no longer. (Shale Gas Review, Financial Times, April 23, 2012)

- Relatively **high contractual** prices for Russian gas in Europe as competitive advantage for shale gas in Europe

- Relatively **low spot** gas prices in Europe as competitive disadvantage for shale gas in Europe

⇒ Russian gas export pricing policy is supportive for shale gas development as competitor for Russian gas export (?)

⇒ in case of successful shale gas developments in Europe Russian contractual gas supplies would be the first under competitive pressure and can face second wave of price review pressures within current LTGEC (first wave was stipulated by low spot prices)

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Shale gas in China - & some import pipelines

Turkmenistan-Uzbekistan-Kazakhstan-China gas pipeline (exists)

Russia-China "Altai" gas pipeline (proposed)

China accounts for a fifth of global shale resources and has the world's largest technically recoverable shale gas resources (US EIA)



● China has **25tn cubic metres** of potentially recoverable shale gas resources - enough to supply the country's gas needs for nearly 200 years at current levels

● Beijing's goal is to produce **6.5bn cubic metres** of shale gas annually by 2015 and **60bn cubic metres** annually by 2020, a huge leap from no commercial production today (Or even 100 BCM) by 2020

● Shale gas fits into China's energy strategy as it could reduce dependence on imported gas as well as helping cut carbon emissions

● Premier Wen Jiabao vowed recently that China must 'tackle key problems more quickly' in shale gas development, a tacit acknowledgement of the challenges the sector is facing

Source: L.Hook. China tries to copy US success in shale. "Financial Times", 25.04.2012

A.Konoplyanik, Berlin, 21-22.05.2012

China shale gas – physical difficulties

- Many early exploratory projects are in the quake-prone Sichuan basin
- The country lacks the extensive pipeline infrastructure needed to bring the gas to market
- Availability of water, where China faces growing shortages
- ...

Shale gas in China & Russian gas

- A disagreement on price has been delaying Russia and China signing a big gas supply deal.
- Reasons for the delay:
 - Gazprom's policy for equal netback (on-border? well-head?) price for all supply destinations (incl. exports to the West and to the East) made it difficult to prove that based on replacement value pricing principle of LTGEC gas price for China (replacement fuel = local coal) should provide same netback as for the EU (replacement fuel in EU-destined LTGEC = LFO & FRO linked to crude oil import price)
 - China's growing awareness of its own shale gas resources, which could reduce its need for imports => **shale gas as a negotiating tool for lower import Russian price**

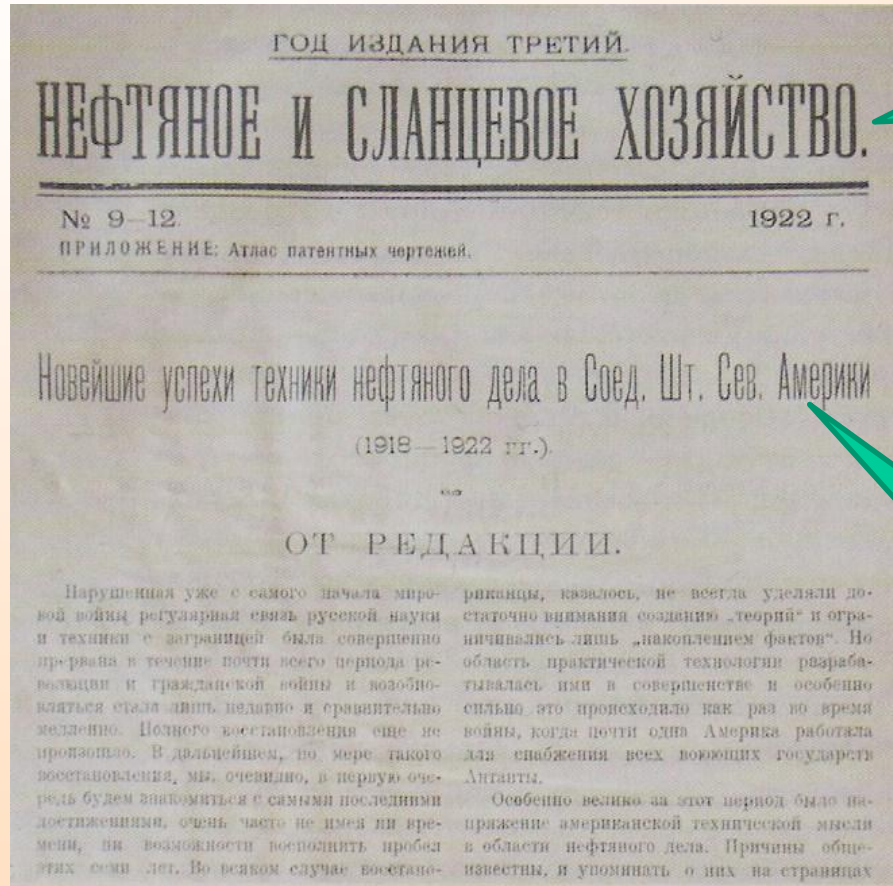
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Shale gas, V.Putin & Russian historical tradition

- Historical Russian tradition: wait until clear signals from the very top? (O&G as 6th cluster for innovations?)
- Speaking recently to lawmakers, Russia's then president-elect Vladimir Putin says shale can “seriously transform the structure of the hydrocarbon market... Russian companies must address this now”.
- But Russia is not unfamiliar with shale:
 - Russian famous magazine “Oil Economy” («Нефтяное хозяйство») when established in 1920 was first entitled “Oil and shale economy” («Нефтяное и сланцевое хозяйство») + regular study of Western experience
 - City Сланцы (“Shale”) in Estonia – former USSR center of shale development

Russia New Economic Policy in the 1920-ies: “Oil & shale economy” magazine and US experience



“Oil and shale economy”, 1922, № 9-12 (third year of edition)

“Most recent achievements in the petroleum industry in the USA (1918-1922)”

Russia is not unfamiliar with shale, but it has huge conventional gas resources/reserves => results

- => stimuli to develop mega-fields (“economy of scale”) based on “evolutionary STP” (“learning curves” => improvement of existing technologies) => less stimuli to develop alternatives & for flexibility & adaptability which is characteristic for development of small fields & different unconventional energies (flexibility & adaptability as a function of lacking smth.)
- Late E.Gaidar: “Reforms are implemented not when there is enough time & money for them, but when there is no other choice, when it is impossible not to undertake them”
- Huge gas reserves = fundament for stability, but also risk for stagnation: precondition for LTGEC (resulted in 40+ years of stable & secure supplies to the EU), but LTGEC has comparatively low flexibility & adaptability => stability vs flexibility dilemma
- + Difficult to be simultaneously big (like Gazprom) & flexible (high inertia of big institutions)

Waves of shale gas influence on Russia

- Cyclical waves: shale development is capital-intensive => CAPEX waves + accumulation of domino effect of each wave
- 1st wave (2009-2010+): US shale gas development has closed US domestic market for imported LNG => redirection of US-oriented Qatari, etc. LNG to the EU + Atlantic basin arbitrage HH-NBP
- 2nd wave (2013+): US as a global exporter of LNG from shale gas (both in Atlantic basin & Asia-Pacific) ?
- 3rd wave (?): domestic EU shale gas development ?
- 4th wave (?): China shale gas development => partial closure of prospective China export market for Russian gas ?
- 5th wave: closure of prospective US market for prospective Russian LNG
- Cumulative effect for Russia: **after each wave EU gas market (key export market for Russian gas) became more competitive**

=> **Whether Russia is/would be “tied-up” to Europe?**

Shale gas influence on Russian exports markets

- Tomorrow (US): Closure of US gas market for future Russian LNG (in 2009, Gazprom predicted it would be supplying up to 10% of North American LNG market by 2020) (*physical*)
- Tomorrow (China): Closure (partial?) of domestic market for Russian pipeline gas & LNG? (*physical + pricing*)
- Today (EU): Redirection to the EU of LNG flows originally destined for the US => Oversupply at EU market => spot prices went below Gazprom's LTGEC prices => Pressure on Gazprom's (*physical + pricing*):
 - contractual structures re volumes (Min TOP, no penalties for under-off-taking)
 - pricing mechanisms (from oil-products-indexation to spot quotations?)

Gazprom's concessions to its customers in Europe

- Amid falling demand, customers who sought to reduce their imports of Russian gas were prevented by Gazprom's "take-or-pay" contracts, which oblige buyers to offtake minimum contracted volumes and fines them if they do not.
- After a consumer backlash, Gazprom was forced to make concessions.
- **In 2010** it struck a three-year deal with some of its biggest customers, including Eon Ruhrgas, agreeing to **link up to 15 per cent of its sales to spot prices**.
- Gazprom announced in **January 2012** that in its negotiations with a clutch of customers – including GDF Suez, Wingas and OMV – it had **agreed to a net price reduction of 10 per cent**.
- It also said it would let consumers **take less gas than required** under the original take-or-pay contracts.
- Others are still not satisfied. Eon, RWE and PGNiG have launched **international arbitration proceedings** against Gazprom to lower the prices in its gas contracts.

Gazprom: Adaptation of contract provisions and pricing mechanisms in Europe since 2009 (1/2)

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%

Source: A.Konoplyanik. "Russian gas in Europe: Why adaptation is inevitable". - *"Energy Strategy Reviews"*, March 2012, Volume 1, Issue 1, p. 42-56 (<http://www.sciencedirect.com/science/article/pii/S2211467X12000119>).

Gazprom: Adaptation of contract provisions and pricing mechanisms in Europe since 2009 (2/2)

Actions	Companies
Increasing flexibility of contractual provisions	Gazprom's "promotional package"
Recalculating base formulae price	Wingas
Direct price concessions	Naftogas Ukraine, Botas (tbc)
Maneuvre 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/Dispute Settlement LTGEC clauses)	Edison S.p.A. (AC SCC), EON-Ruhrgas, RWE, PGNiG, etc.

Source: A.Konoplyanik. "Russian gas in Europe: Why adaptation is inevitable". - *"Energy Strategy Reviews"*, March 2012, Volume 1, Issue 1, p. 42-56 (<http://www.sciencedirect.com/science/article/pii/S2211467X12000119>).

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Evolution of gas pricing in Europe (1)

- **Prior to 1960-ies:** cost-plus to pay-back CAPEX
- **1962:** net-back replacement value to maximize long-term resource rent: Netherlands, “Nota de Pous”, Groningen LTGEC
- **1962-2009/10:** spread-over of Groningen-type LTGEC with mostly oil(PP)-indexation through broader energy Europe
- **Why “Oil(PP)-Indexation”?:** “*Indexation*” = mechanism of softening price fluctuations; “*oil(PP)*” = key replacement fuel(s)
- **Oil(PP)-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(PP)-indexation softens fluctuations of gas prices, but the nature of volatile oil prices (financialisation of oil market) still in place => the gap between “oil(PP)-indexation”(contract gas price formula) and “replacement value” (economic philosophy of formula-based gas pricing) is widening, BUT oil(PP)-indexation still easy to implement, though regular adjustments needed
- **Counter processes in gas market development (to increase vs. diminish price risk & volatility):**
 - Commoditization + financialisation (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

LTGEC petroleum-products-based price-indexation debate: arguments “in favour” and “against”

“In favour”

1. It has been worked out in practice for 50 years, thus convenient for users
2. It narrows corridor of price fluctuations, increases price predictability, minimizes investment risks
3. Convenient tool for financial institutions (hedging) providing debt financing
4. Transparent and understandable pricing mechanism (at least for professionals)
5. Professional, stable and narrow circle of market participants
6. Proposed alternatives (spot/futures) are not better: low liquidity, high possibility for manipulations

“Against”

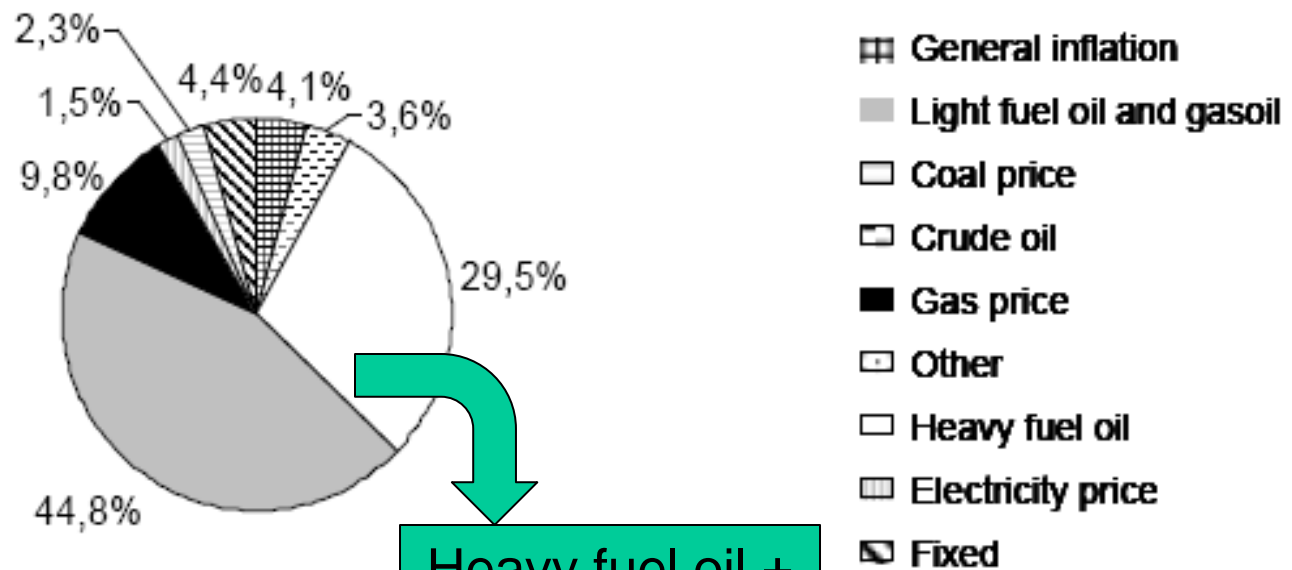
1. Its conservation without changes do not correspond to evolution of “replacement value” mechanism within LTGEC
2. Liquid fuel is displaced form competitive with gas areas of consumption (industry, electricity generation); it ceased to be a replacement fuel for gas, but just a reserve one
3. It withhold gas price below oil parity (price of oil in energy equivalent)
4. it links gas price to highly liquid, but manipulated and unpredictable futures oil (oil derivatives) market
5. Confidentiality, thus closed and non-transparent for the public
6. Currently: higher contractual prices compared to spot transactions

Source: A.Konoplyanik. «How to manage gas price risk?» - *“Echanges”* (Bulletin of French Society of Chief Financial Officers), № 298, May 2012, p.42-46 .

Price indexation structure in the EU

Oil derivatives dominate the price indexation

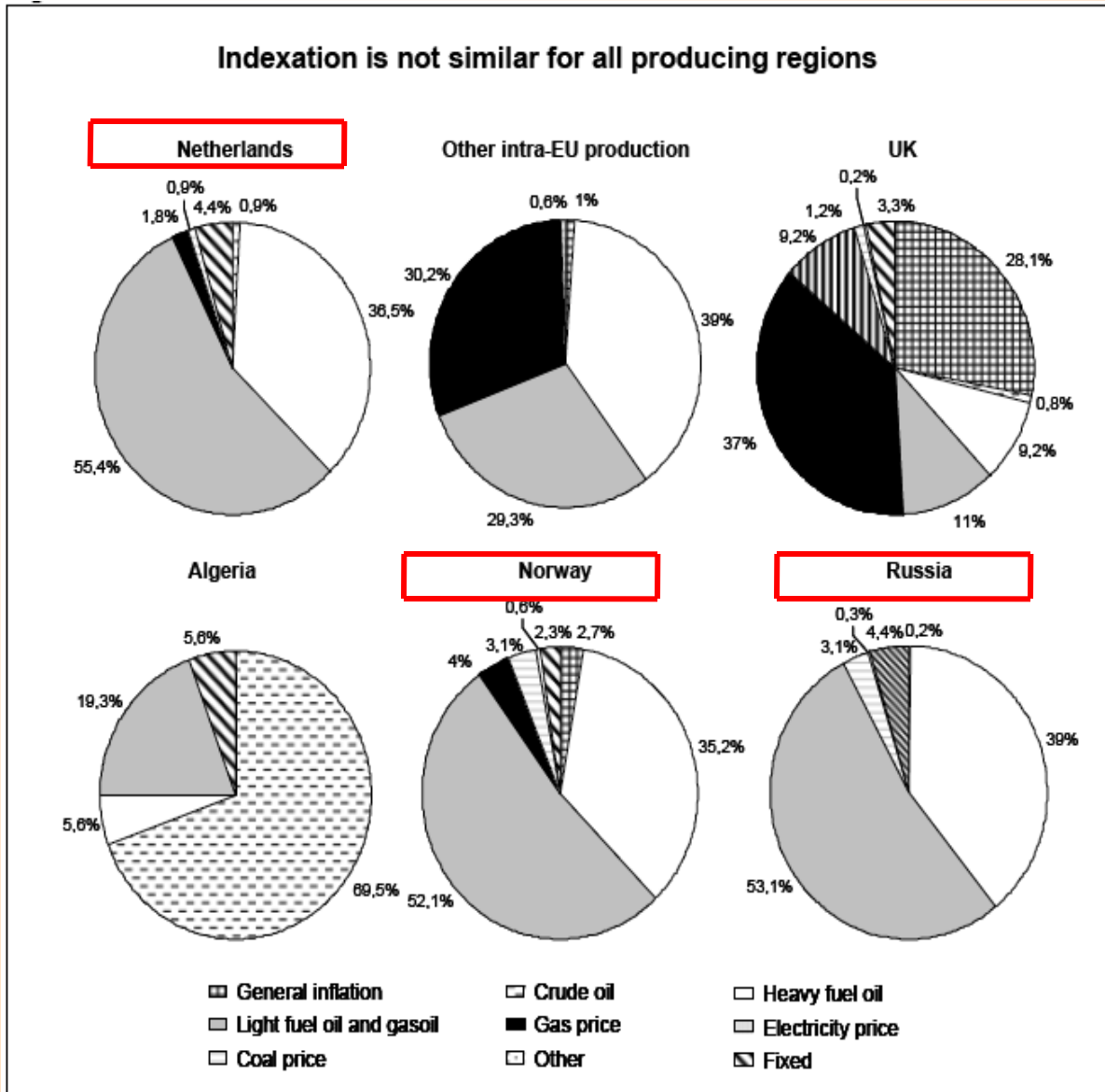
European Union



Heavy fuel oil +
Gasoil & Diesel
= 75%

Source: Energy Sector Inquiry 2005/2006

LTGEC in the EU: Indexation by Producer



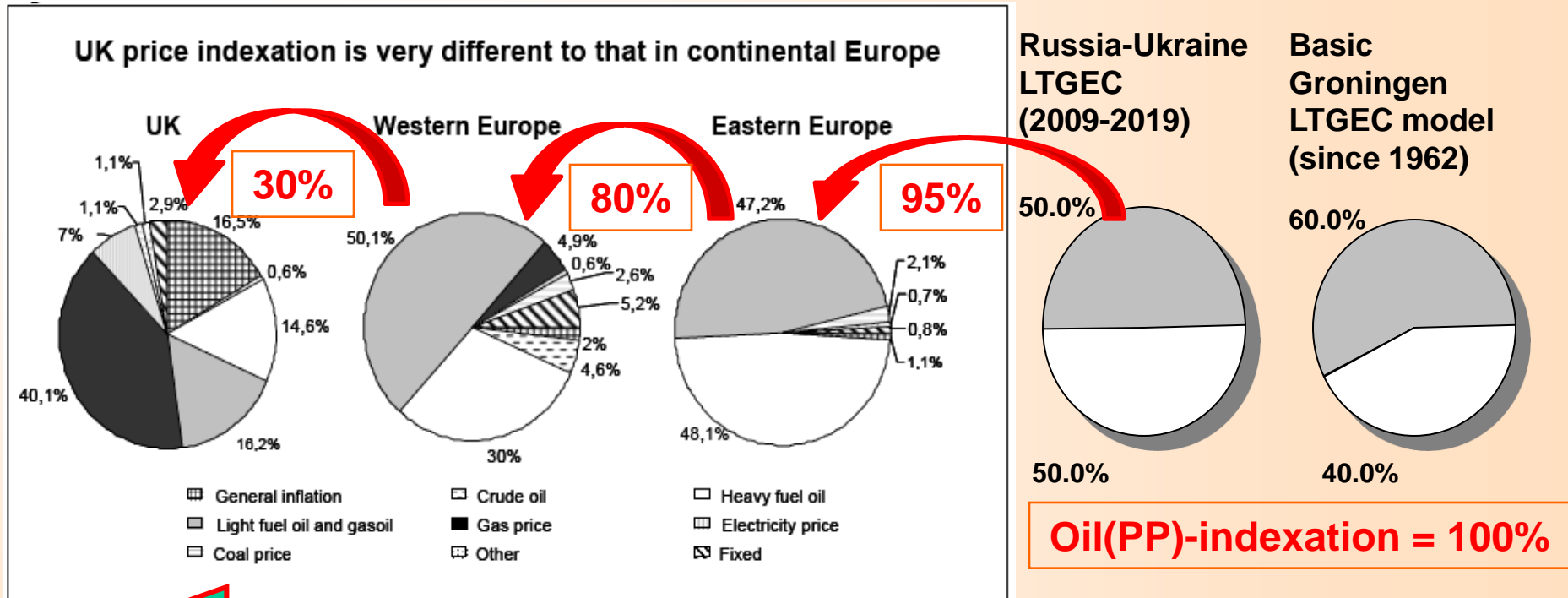
Netherlands,
Norway, Russia:
HFO = 35-39%;
diesel & gasoil =
52-55%;
Sum-total HFO+
Diesel & Gasoil:
Netherlands =
92%,
Norway = 87%,
Russia = 92%



Major gas exporters
to the EU: mostly
oil(PP)-indexation

Source: Energy Sector Inquiry 2005/2006

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

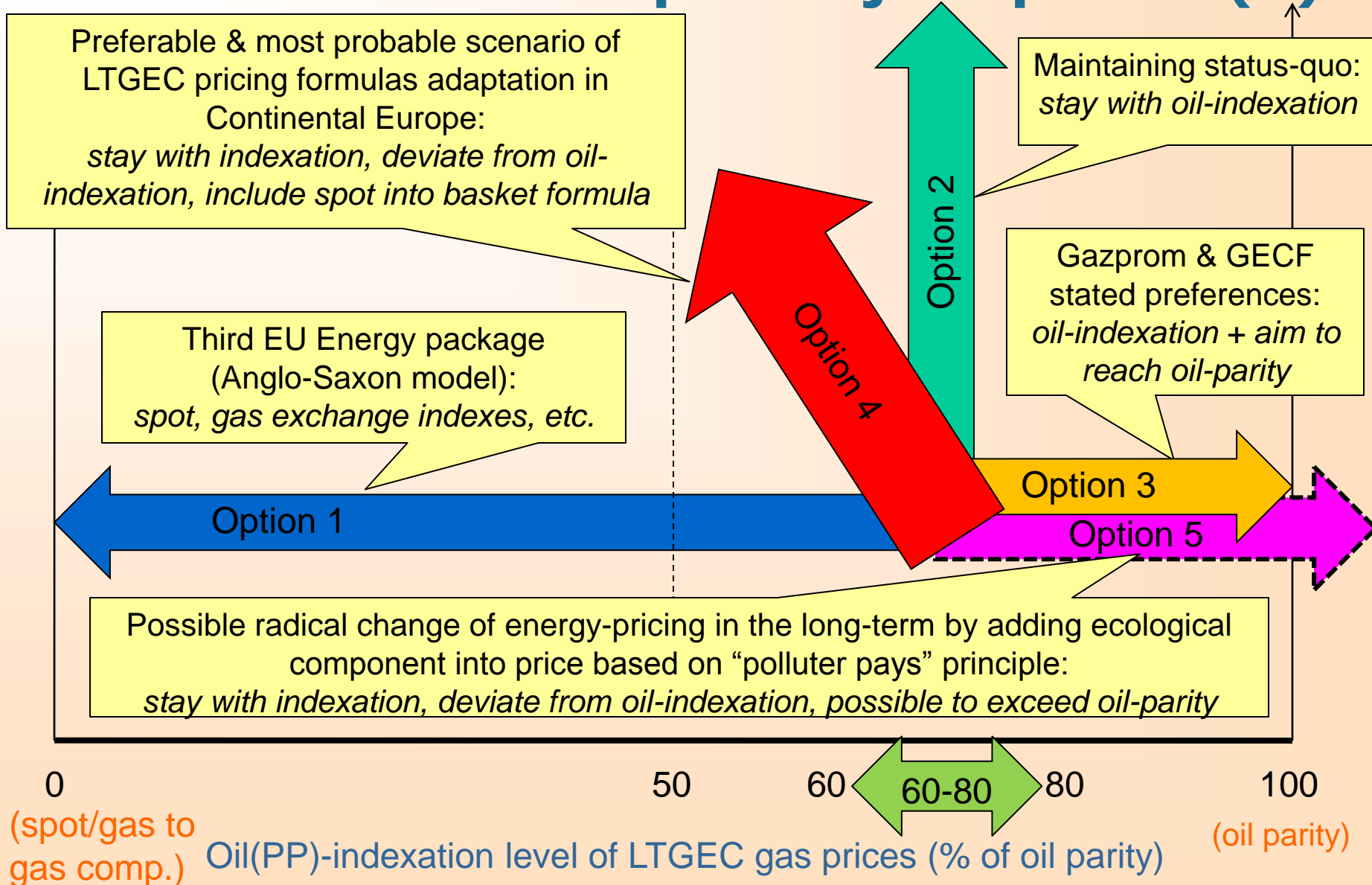


Evolution of LTGEC pricing formula structure: from more simple to more complicated

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?**

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



**Thank you for your
attention**

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