

# **“Domino Effects” of US Shale Gas Revolution: International Consequences in Institutional Sphere**

**Prof. Dr. Andrey A. Konoplyanik,**  
**Adviser to Director General, Gazprom export LLC;**  
**Professor, Chair ‘International Oil & Gas Business’,**  
**Russian Gubkin State Oil & Gas University**  
**(Moscow, Russia)**

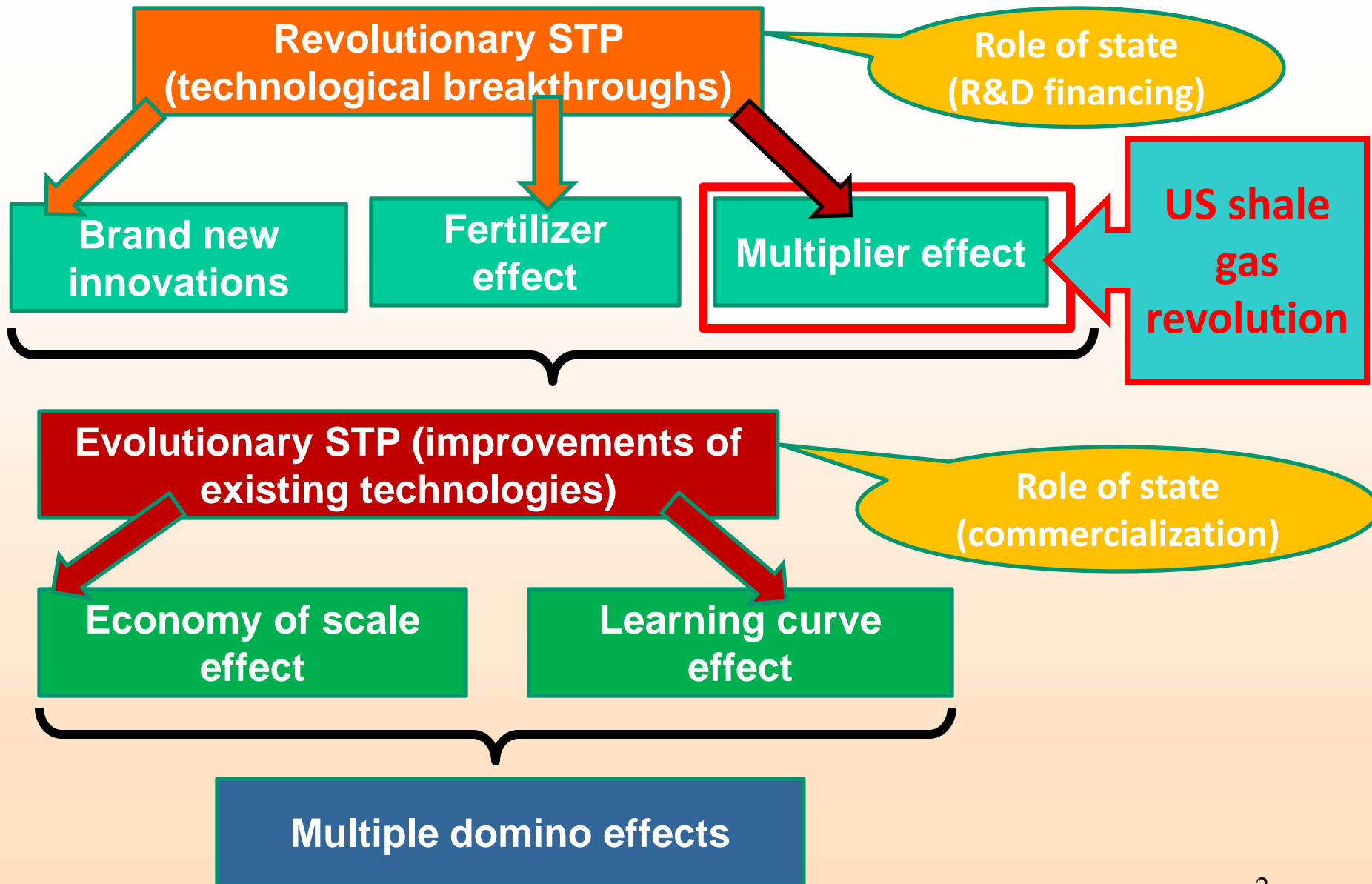
**<a.konoplyanik@gazpromexport.com>**

**<andrey@konoplyanik.ru>**

**<www.konoplyanik.ru>**

**Presentation at Forum 1: “Keynote Forum - Decoding Global and Chinese Trend on Emerging Industries”,**  
**BIT's 1st Frontier Industrial Forum-2013,**  
**Qingdao, China, 24-25 October 2013**

# Two types of STP - & US shale gas revolution



# Innovations in resource extraction industries: individual & multiplier effect – US shale gas case

- Individual innovations in resource industries:
  - **Seismic:** from 2D-seismic to 3D-seismic,
  - **Drilling:** (i) from vertical to combined vertical & horizontal  
+ (ii) from single-well to multiple-wells from one well-pad,
  - **Penetration:** from single to multiple hydraulic fracturing
- **US shale gas:** new combined technologies stipulated rapid innovations cycle based on multiplier effect of innovations + long-time state financing of R&D + fiscal/investment incentives, cheap & available credit... + (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 => US shale gas revolution & its global (!) “domino effects”

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

- 1) Available resource-base
- 2) Stripper wells-based oil & gas industry (historical disadvantage = challenge) predetermined 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 (based on multiplier of innovations: 3D-seismic + horizontal drilling + multiple fracking) + cheap & available credit
- 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 (subsoil rights belong to landlords onshore US)

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.

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

- 6) Gas prices followed oil price upward in 2000-ies while costs decreased (STP)
- 7) Well-developed, diversified, 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 do not deter producers that sold today's production a year ago at much higher and profitable prices (but: the risk of "financial bubble")
- 10) "Privilege of the pioneer" (lack of public knowledge of negative consequences, esp. in ecology)

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

⇒ **Shale gas in other countries worldwide will not be another global "game changer" like in US, but can be a local "game changer" for that countries**

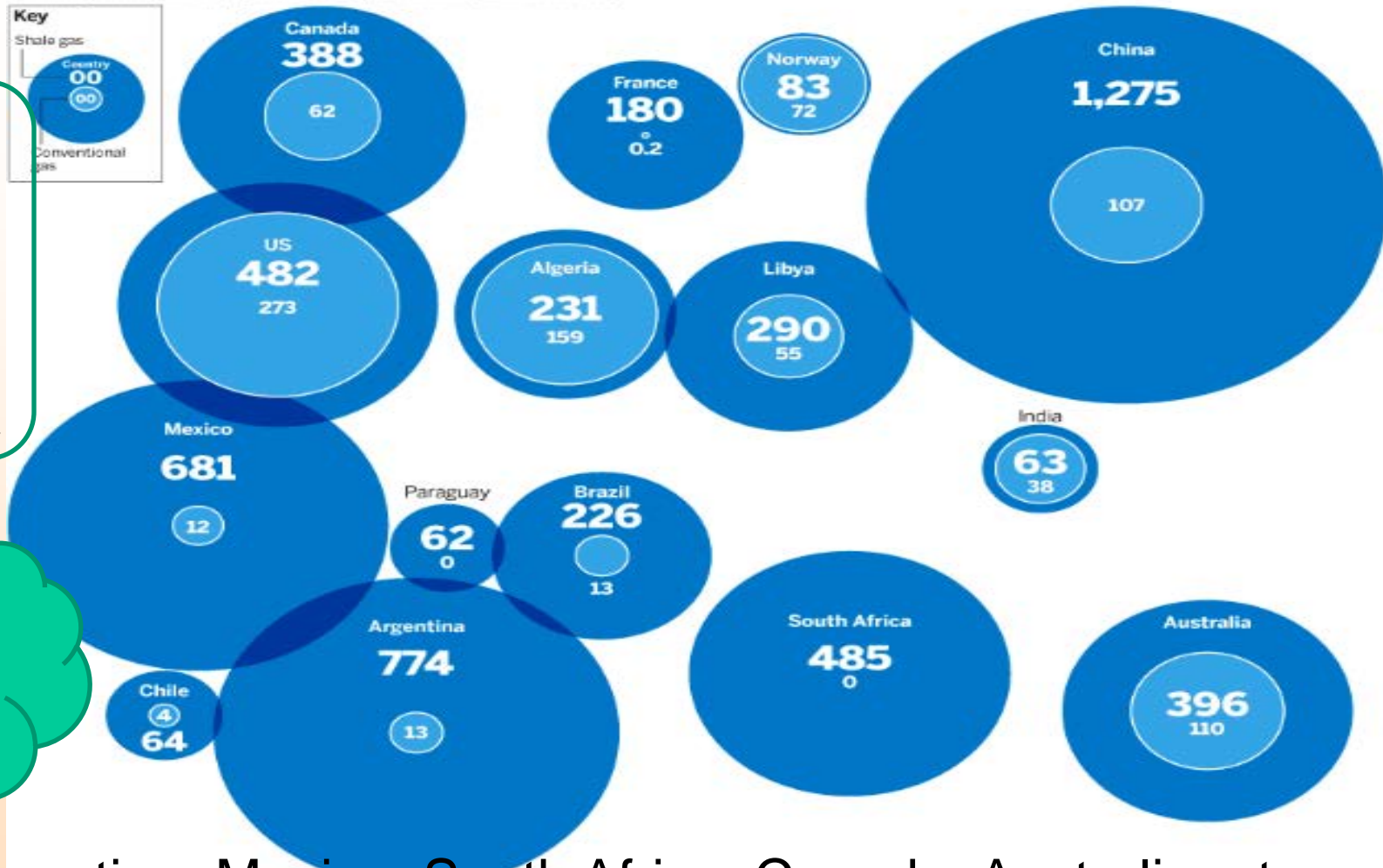
Author's compilation based on, inter alia: S.Pfeifer. Finds that form a bedrock of hope. "Fin.Times", April 22, 2012; P.K.Verleger Jr. The coming US boom and how shale gas will fuel it. "Fin.Times", 25 April, 2012, etc.

# Conventional gas reserves vs shale gas resources

## 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

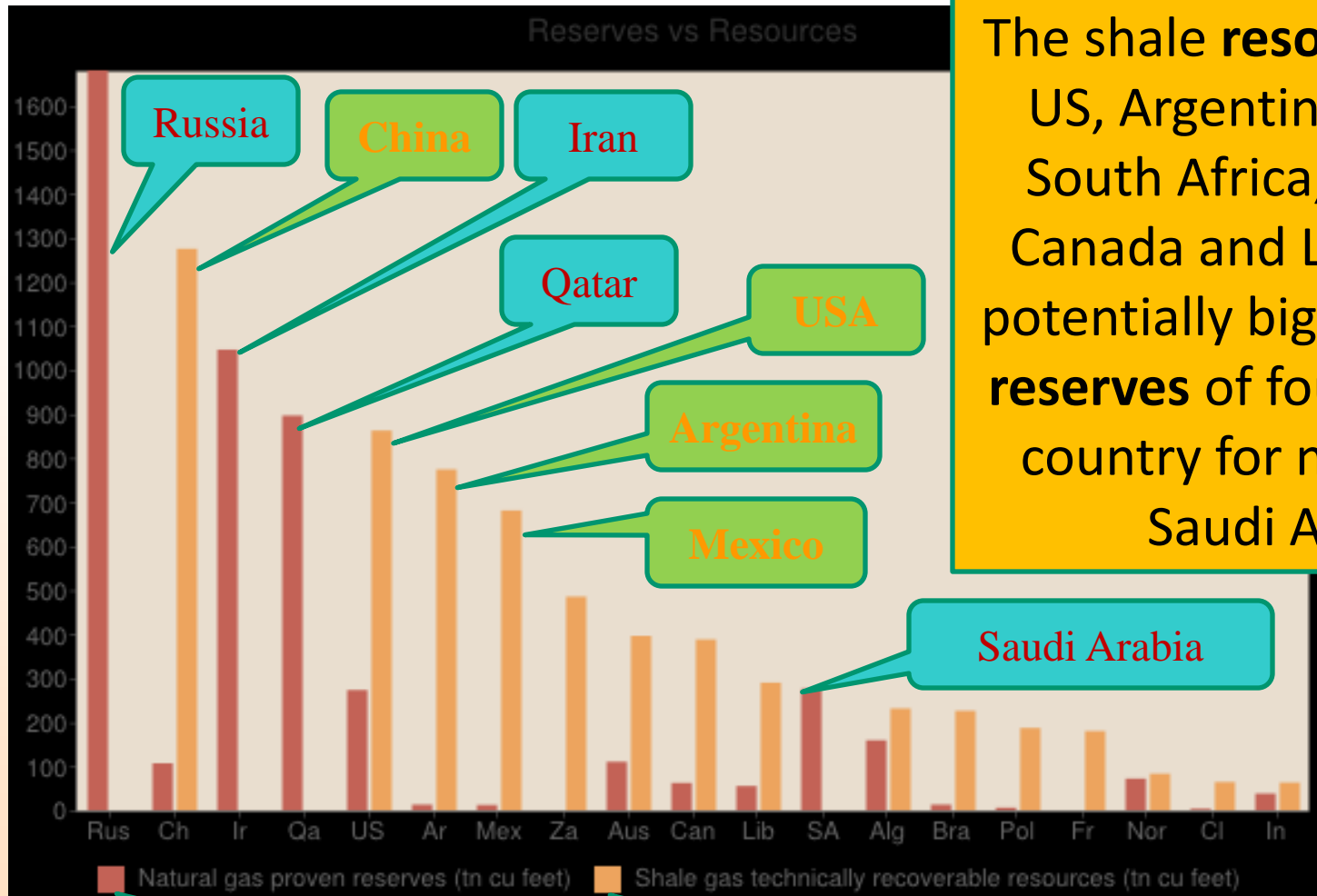
Just to compare the order of the figures...

China, Argentina, Mexico, South Africa, Canada, Australia, etc. => New players at the world gas map? When & at what cost?

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

A.Konoplyanik, Qingdao, China, 24.10.2013

“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



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

- Philip K. Verleger, Jr.: "...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 N.America due to institutional reasons => which “domino effects” then?**

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



# “Yes” & “No” of “Domino effects” of US shale gas revolution

- **“NO” effect:** US shale gas revolution will NOT be repeated in other states worldwide in the quantities/volumes & on the model of US
- **“YES” effect:** US shale gas revolution has already started up a chain of irreversible processes/consequences in other – than shale gas development – industries & areas of activities worldwide

# Direct & indirect/domino effects of US shale gas revolution

- **Direct effects:**

- 1) Growth US domestic gas production => decreasing US gas prices => decrease / termination of LNG imports => US as LNG exporter since 2016 => emerging global gas market
- 2) Prolongation of “fossil fuels era” (Hubbert’s O&G peaks)

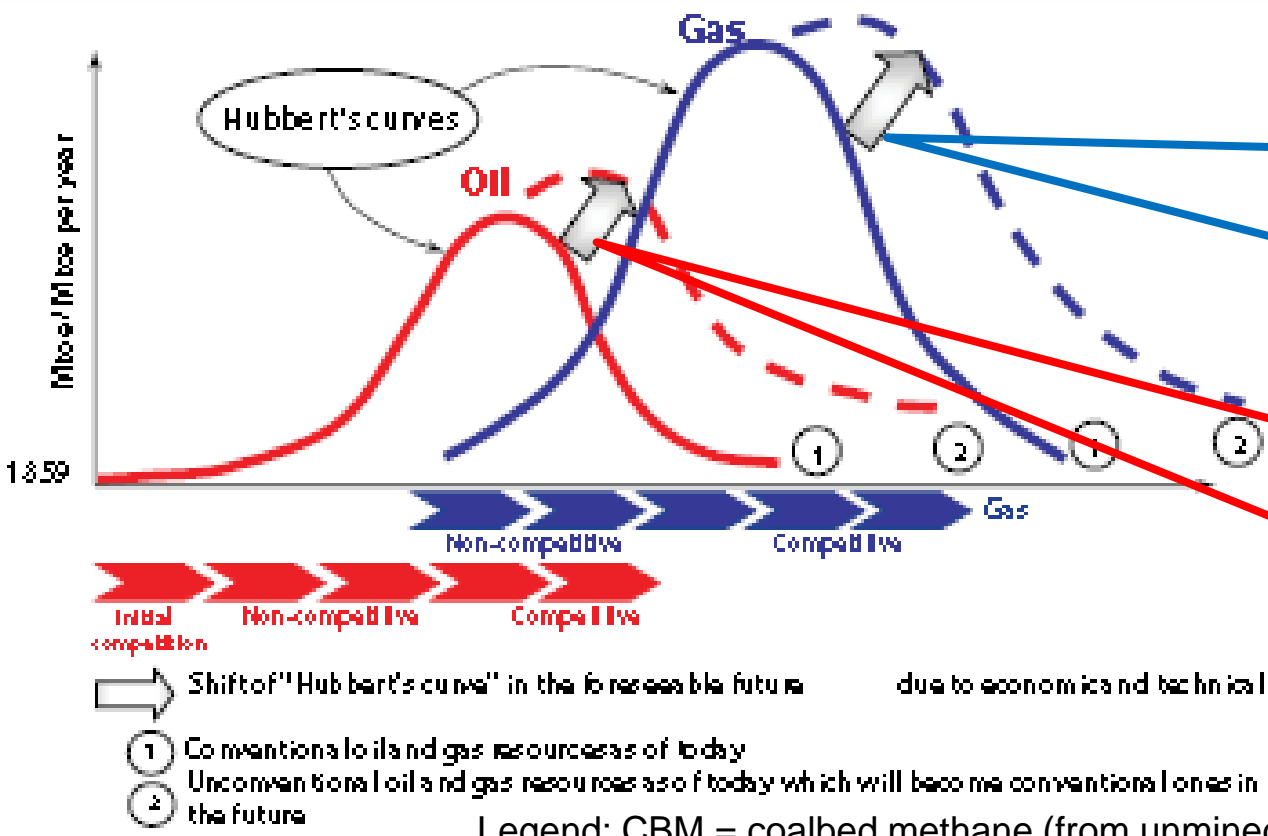
- **Indirect/domino effects:**

- 1) EU gas market
- 2) Coal
- 3) Ecology
- 4) Shale oil
- 5) Global oil market
- 6) Macroeconomics (global FDI flows), ...

# Direct effects of US shale gas revolution: trigger for emerging global gas market

- Since 2016 US as LNG exporter to Asia Pacific (2015: end of Panama Channel reconstruction) at Henry Hub-based gas pricing => start of competition between two pricing models in Asia Pacific (?): JCC-based (today: higher price) & HH-based (today: lower price) => whether LNG oversupply possible in Asia Pacific which might stipulate import LNG price to go down? (whether repetition of EU post-2009 situation possible?) => further weakening of oil-indexation?
- US to become one of few global swinging exporters of LNG? => Qatar (today), US (tomorrow ?), Eastern Africa (after tomorrow ?) as global arbitrage LNG players => global gas market will factually come into existence then ...

# Oil & Gas Hubbert's curves: US shale gas revolution prolongs fossil fuels era



Deep horizons, deep offshore, Arctic, shale gas, CBM, CSM, CMM, tight gas, gas hydrates, etc...

Deep horizons, deep offshore, Arctic, heavy oil, shale oil, tar sands, GTL, CTL, XTL, etc...

Legend: CBM = coalbed methane (from unmined rock), CSM = coal seam methane (from active coal mines), CMM = coalmine methane (from abandoned coal mines), GTL = gas-to-liquids, CTL = coal-to-liquids, XTL = biomass to liquids

Source: based on Andrei Konoplyanik

US shale gas & oil developments has expanded zones of competitive supplies of (former unconventional) hydrocarbons => this prolongs "fossil fuel era" & further moves Hubbert's peaks in upward-right direction

# Indirect/domino effects of US shale gas revolution => (1) EU gas market

- De facto closure of US gas market for imported LNG => redirection of (mostly Qatari) LNG flows, originally destined for US, within Atlantic basin from US to EU => oversupply at EU gas market (strengthened by decrease of EU gas demand due to economic crisis) => intensive development of spot transactions at EU market, esp. in NWE, with hub-based pricing (backed by introduction of Third Energy Package) => forced (& now irreversible) adaptation of contractual structures and pricing mechanisms of major non-EU gas suppliers to EU (firstly, of pipeline gas suppliers from Algeria, Norway, Russia)...

# Indirect/domino effects of US shale gas revolution => (2) Coal

- Decreasing US gas prices => shale gas substitutes coal in US => US started to export coal to EU which began to compete there with imported gas => cheap US coal (dark-spread positive) replaces in EU expensive oil-indexed contractual pipeline gas (spark-spread negative) => “Third Coal Renaissance” in Europe => further pressure on oil-indexation => But: what consequences for EU environmental policy (one of cornerstones of its economic/development policy)?...

# Indirect/domino effects of US shale gas revolution => (3) Ecology/environment

- **Yesterday** (before US shale gas revolution):
  - USA as one of two major pollutants (has not signed Kyoto Protocol) contrary to EU (one of initiators of Kyoto, strong environmental policy, 20:20:20 programme...)
- **Today** (after US shale gas revolution):
  - US increased gas consumption, diminished coal consumption, net balance in favour of environmental protection
  - EU increased coal consumption, diminished gas consumption, net balance – increased pollution (CO<sub>2</sub> emissions) though statistically it is neglected through the quota trading system (IEA)



# Indirect/domino effects of US shale gas revolution => (4) Shale oil

- From US shale gas revolution to US shale oil revolution: US domestic gas price went down => drilling (same technological concepts) was reoriented from dry gas to wet gas and gas liquids (to monetize production – world oil price is high) => steady increase in shale oil production (gas production in US more and more needed just to extract associated liquids?) => USA became N1 producer in liquid fuels

# Indirect/domino effects of US shale gas revolution => (5) Global oil market

- Today:
  - Two dominant players in global oil market: Saudi Arabia (physical oil market) & USA (paper oil market)
- Tomorrow:
  - Increasing role of US at global physical oil market, maintaining dominant US role at global paper oil market
- Whether we are moving to unipolar global oil market/world?

# Indirect/domino effects of US shale gas revolution => (6) Macroeconomics

- **Yesterday:**

- FDI flows from “developed” towards “developing” economies:

- first wave - export of “dirty” energy-intensive industries in search for cheap (no) cost of environmental protection,

- second wave – export of labour-intensive industries in search for cheap labour costs

- **Today:**

- Increased reverse FDI flow: return of energy-intensive industries back to US from “developing” economies (where labour costs are not as cheap as earlier anymore) in search for cheap energy costs

# Thank you for your attention

**<a.konoplyanik@gazpromexport.com>**  
**<andrey@konoplyanik.ru>**  
**<www.konoplyanik.ru>**