Between Decarbonizing the Gas Value Chain and Securing Supply: Towards a Positive Agenda On Russia-EU Cooperation

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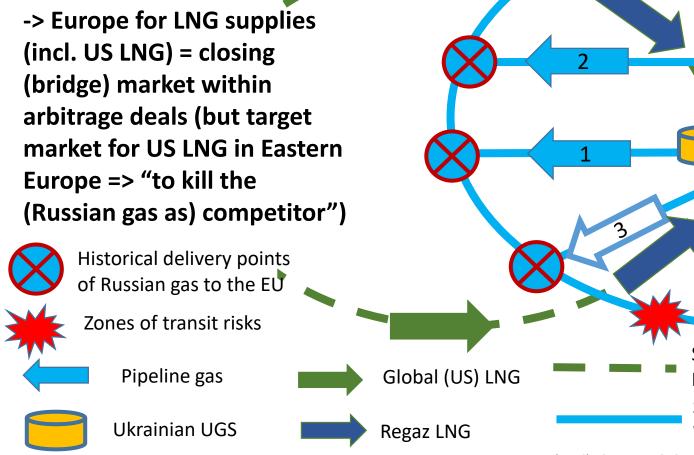
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Transition from historical system of linear corridors to current linear-circular system of Russian gas supplies to the EU within two current rings of competitive gas supplies in formation: (i) "disruptive" ring of global LNG supplies & (ii) "integral" with internal backup ring of Russian pipeline gas supplies within radialcircle gas infrastructure system (generalized scheme)

- -> Europe for Russian pipeline gas supplies = target market
- -> Europe for LNG supplies (incl. US LNG) = closing (bridge) market within arbitrage deals (but target **Europe => "to kill the**



Northern corridor (semi-ring) for major flows:

- (4) Nordstream-1 + OPAL + Gazelle,
- (5) Nordstearm-2 +Eugal

Central transit corridors for balancing flows:

(1) Ukrainian, (2) Polish, (3) B<mark>a</mark>lkan

Source: A.Konoplyanik

Southern corridor (semi-ring) for major flows: (6)Turkish stream + Balkan stream

Supply ring based on LNG (incl. from US): to close loop in the East – to displace Russian gas from Eastern Europe Supply ring based on Russian pipeline gas: to close loop in the West – to increase security of supplies

What is clean energy? Depends on how you calculate/consider it... Wrong perceptions as if renewable H2 is the only clean H2 and, moreover, that it is clean at all

A hydrogen strategy for a climate-neutral Europe (Brussels, 8.7.2020 COM(2020) 301 final):

'Renewable hydrogen' is hydrogen produced through the electrolysis of water (in an electrolyser, powered by electricity), and with the electricity stemming from renewable sources. The full life-cycle greenhouse gas emissions of the production of renewable hydrogen are close to zero <...> 'Clean hydrogen' refers to renewable hydrogen.

Siemens/Gascade/Nowega (Hydrogen infrastructure – the pillar of energy transition..., 2020):

"If the electricity required for electrolysis comes exclusively from renewable, CO2-free sources, the **entire production** process is completely CO2-free."

<u>Carbon track of renewable H2 through the full life-cycle (acc. to EU H2 Strategy) – GHG Scopes 1-2-3</u>

GHG Scope 3

Production equipment for generation RES electricity/H2

GHG Scope 2

Production RES electricity

GHG Scope 1

Renewable H2 production

GHG Scope 3

Utilization of equipment for RES/H2 production after project business life is over

CO2 emissions: **NOT equal to Zero**

EU H2 Strategy: not included

shuttle in mining..."

Geographical location: beyond EU

CO2 emissions: equal to Zero

EU H2 Strategy: included

Geographical location: within EU

CO2 emissions: **NOT equal to Zero**

EU H2 Strategy: not included

Geographical location: beyond EU

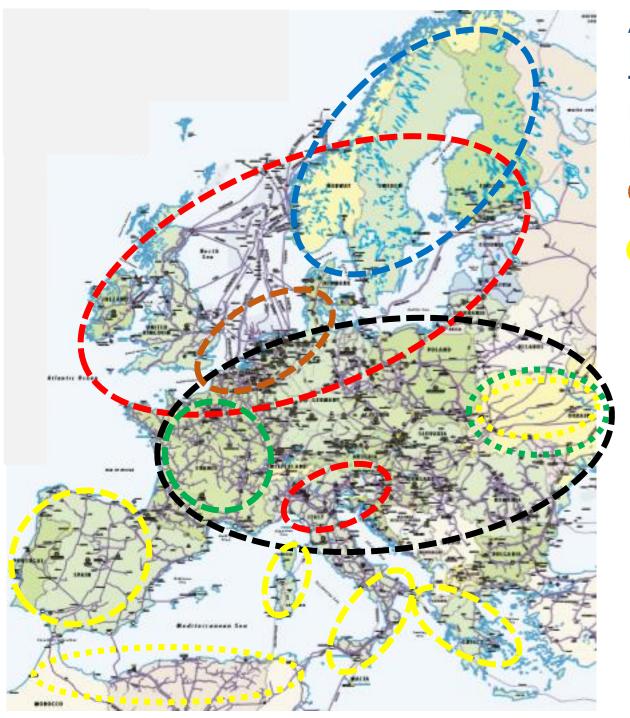
Daniel Yergin, Pulitzer Prize winner for "The Prize" book at presentation of his new book "The New Map":

"NEW SUPPLY CHAINS FOR NET-ZERO CARBON REQUIRES CARBON!!! ... They require diesel to operate

(Source: A conversation with Pulitzer Prize winner and energy expert Daniel Yergin,

Atlantic Council, 25.09.2020; https://www.youtube.com/watch?v=hWMOU8IjRhI)

Alternative concept for export-oriented segment of Russian hydrogen energy economy based on clean H2 (w/o CO2 emission in production) from natural gas (Konoplyanik's vision) Methane CO2 To Asia-Regaz LNG «Cold Energy» To EU Novatek, pyrolysis liquifaction Pacific terminal (i.e. Gazprom CO2 Gate -**Pipelines** Rosatom Ships Rotterdam) **MSR+CCS** 100% LNG Marketing Floating nuclear clean H2 Acting + small power station black export **RES** electricity depleted North 90% carbon Sea oilfields (offshore wind) clean O H2-Russia H2 **Local H2 markets** MHM Black of island (coastal) Methane export to EU H2 valley-3 carbon economies Asiapyrolysis 100% the EU in (coastal **Pacific** clean H2 gaseous-Pipeline Europe) liquid 2 (b) gas export form **Local H2 markets** EU H2 valley-1 TO EU **EU H2 valley-2** 100% Gazprom of continental Asia-(continental (continental clean EU economies Asia **Europe**) **Pacific** Europe) Pacific CS at GTS (to be fueled by MHM produced at same CS by Gazprom-100% patented AMC technology) for transportation work clean H2 pyrolysis plant (energy supply to be fueled by MHM locally 100% produced at nearest CS); methane from GTS – feedstock for H2 clean A.Konoplyanik, SWP4WEC, production w/o CO2 emissions; black carbon – by-product to be 21.09.2021 marketed



Approximate potential areas of preferential use of key H2 production technologies in Europe under state regulation based on "technological neutrality" principles

P2G wind P2G hydro
P2G solar P2G nuclear

Electrolysis
based on
different
primary
electricity
sources

MSR/ATR plus CC(U)S



Methane pyrolysis, plasma-chemical method et al w/o CO2 emissions Gas-based using different gas decarbonisation technological paths

Source: dashed lines - A.Konoplyanik, based on conversations with Ralf Dickel; dotted lines - Ukraine & North Africa are added based on "The 2x40GW Green Hydrogen Initiative Paper" Hydrogen Europe study for illustration purposes with the observation of this author's skepticism in regard to long-distance transportation of H2 produced in these geographical areas; source of map — ENTSOG

Thank you for your attention!

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