Implications of Russian invasion of Ukraine for Global LNG Market

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The Russian invasion of Ukraine will have a profound effect of global gas markets in the near and long term



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It is far from certain the course the Russian invasion of Ukraine will take, but after the first week the following has become clear:

- Russia's intent is a major invasion from the north, east and south, committing a major portion of its armed forces
- Strong Ukrainian resistance and Russian tactical difficulties are leading to a protracted struggle, as long as both sides have the will to continue
- The developed world is united in opposition to Russia, supporting Ukraine in every way short of providing ground and air support
- Economic sanctions are crippling the Russian economy to an extent far beyond Russian expectations
- While the west has not explicitly banned purchase of Russian oil and gas exports, purchasers are finding alternatives
- The effect of the sanctions and political moves opposing Russia will result in loss of western partners technology and funding leading to delay and possibly cancelling future projects

To understand the impact of the invasion, it is necessary to show the anticipated role of Russian gas in the worlds current and future economy



Russia has 20% of world 's natural gas reserves



Russia is #2 to USA in gas production, withLinden17% of worlds total



Russia is #1 in world in gas exports, with 238 BCM (25.3%) USA is #2 with 138 BCM (14.6%)

- Major supplier to Europe with 178 BCM pipeline gas in 2020
- Russia was world #4 in LNG exports in 2020 with 40.4 BCM
- Only 3.9 BCM pipeline exports to China in 2020, increase to 16.8 BCM in 2021 as Power of Siberia line comes on stream. Flow will reach 38 BCM at full capacity.

Russia, with western partners planned to greatly expand its LNG potential, aiming to be world #1 by 2040

Russia LNG exports (BCM)



2010 2011 2012 2013 2014 2015 ■ 2016 ■ 2017 ■ 2018 ■ 2019 ■ 2020

With additional Sakhalin capacity and opening Yamal LNG, Russia tripled LNG exports in past decade to be #4 world producer Linden

Russian LNG Projects

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Current Russia LNG capacity is 29 mtpa (40 BCM) Planned additions are:

- Sakhalin 2 expansion: 5 mtpa 1.
- 2. Far Eastern LNG: 5+10 mtpa
- Vladivostok LNG: 5+5 mtpa 3.
- Arctic LNG 2: 13+6.5 mtpa 4.
- Pechora LNG: 2.6+7.4 mtpa 5.
- 6. Shtokman: 7.5+7.5 mtpa
- 7. Baltic LNG: 10 mtpa

Planned LNG expansion by 2040 would be 85 mtpa (117 BCM) increase. In addition, second pipeline to China would add 30 BCM export capacity.

Natural gas will play a key role in the energy transition through 2050



Natural gas emits about ½ CO2 per unit of energy compared to coal and ¾ of oil (depending on type)



Source: U.S. Energy Information Administration, International Energy Outlook 2021 (IEO2021) Reference case

World natural gas production (and consumption) is predicted to increase by 30% from current level by 2050



The US, Russia and Middle East would continue to supply the majority of gas, but Russia share would increase the most in pre-invasion projection



The world will be facing a critical gas shortage in the coming decades







⁷ Russia increases its share of world gas exports from current 25% to 40% by 2050 under pre-invasion plan



- Domestic gas production will begin a sharp decline in the major gas importing regions in the coming decade
- There was a worldwide interruption in funding and
 - implementation for new LNG projects in 2020 due to pandemic
- There will be a major LNG supply-demand gap in the coming decades
- The USA and Qatar have ambitious plans to expand, mainly through 2030 to fill up to 40% of the gap
- It was anticipated that Russia would be the major contributor to fill this gap, particularly after 2030
- Planned Russian LNG projects would provide 1/3 of the needed LNG expansion by 2040

Europe re-evaluates Russia pipeline gas, resulting in increasing demand for LNG from new terminals





Europe gas demand has stayed flat since 2010. However, domestic production has dropped by a third with deficit filled by Russian pipeline gas and LNG Europe now has under construction or proposed 68 BCM (50 mtpa) new capacity of LNG terminals that can potentially replace 40% of Russia pipeline gas



One of major disasters to Russia from invasion is exit by Western Energy majors

BP, ExxonMobil, Shell and Equinor have announced they will leave Russia, selling their shares in all projects. Total has not done so yet, but has indicated they will not provide technical support and financing to new projects.



Only projects not dependent on support from western partners, advanced technology and necessary financing (Baltic and Vladivostok) likely to go forward on delayed timetable



- Of 260 mtpa LNG supply-demand gas, Russia was expected to supply 1/3, but may now supply less than 10%
- If Europe replaces a significant portion of Russian pipeline gas, the gap could be as high as 300 mtpa
- Key question: how can the 50 mtpa (65 BCM) gap due to loss of Russian projects be filled?



The US is well placed to fill the gap, from two areas



Alaskan gas for LNG is more cost effective than Russian Arctic. 50 TCF of stranded gas in North Slope.



Qilak project, utilizing gas from Pt. Thompson is first proposed and most economic project, with export capacity of 16 mtpa by 2030. Additional projects could add 20 mtpa by 2040



USCA, from IEA, 2022

East Coast Atlantic LNG: The US produces close to 40% of its natural gas from the Marcellus and Utica shales. Production could further increase with expanded demand. Cove Pt. LNG utilizes 2.5% of gas (0.82 bcf/d) for LNG export. Numerous proposals for additional LNG export facilities in US and Canada have not received approval. If 10% of production (3.5 bcf/d) were designated for export at two additional terminals, this could result in 26 mtpa export. East Coast has significant distance advantage for Europe market reducing shipping costs.

Largest offshore gas discoveries of this century are offshore Africa. They need to provide LNG to fill the gap

Mauritania/Senegal

Discovery of approximately 80 tcf in Yakaar-Terenga, Tortue and Bir Allah hubs have led to plans for LNG projects with 10 mtpa production by 2030. that amount can be doubled by 2040. Location is highly favorable for the Europe market.



LNG capacity new areas offshore Africa



Mozambique/Tanzania

The largest gas discoveries of the century are the 200 tcf discovered offshore Mozambique (75%) and Tanzania (25%). The Coral, Rovuma and Mozambique LNG projects plan 31.5 mtpa production by 2030, adding an additional; 28.1 mtpa by 2035. The Tanzania LNG Project could produce and estimated 15 mtpa in the following decade. Location of this LNG is highly favorable for the Asian market

The same major companies (BP, ExxonMobil, Total and Equinor) losing LNG projects in Russia will regain the production offshore Africa under more favorable fiscal terms and in a less environmentally sensitive region

Summary and Conclusions

- The Russian invasions of Ukraine is bringing to an end 30 years of collaboration between western energy majors and Russian counterparts
- The loss of technology, project management skills and financing means a dramatic reduction of 50 mtpa in the planned LNG expansion in Russia in the next 20 years
- The projected gap between planned LNG capacity and demand of 260 mtpa by 2040 may be increased to 300 mtpa with Europe replacing Russian pipeline gas with expanded LNG capacity
- The planned LNG expansion in Qatar and US Gulf Coast will fill 40% of overall supply demand gap
- Development of LNG in US Arctic from stranded gas and North America East Coast LNG from 10% of shale production can replace planned Russian LNG
- Development of Africa LNG from the new offshore discoveries will be vitally important in preventing LNG shortage through 2040





■ Qatar ■ US Gulf ■ US Arctic ■ NA East Coast ■ Maur/Senegal ■ Mozam/Tanzan

