

WHAT ROLE OF NATURAL GAS IN RUSSIA'S DECARBONIZED FUTURE?

Dr. Olga GARANINA

Dr. Silvana MIMA

The 39th edition of the International Energy Workshop (IEW)
VIRTUAL CONFERENCE 14-17 June, 2021

Research context

Russia is the world's fourth largest GHG emitter and plays important role for global efforts to combat the climate change.

In 2019, Russia ratified the Paris Agreement with the pledge to reduce its GHG emissions to 70-75% from the 1990 level by 2030.

Emissions in 2020 are about 30% less to their 1990 level which makes the national climate target faintly encouraging.

Natural gas provides about half of Russia's primary energy demand and is one of the key macroeconomic drivers.

Energy Strategy 2035 (adopted in 2020) foresees reliance on fossil fuels through the planification period, with emphasis put on the expansion of natural gas exports (mainly LNG).



Research objective:

What are the implications of international climate policies for Russia's domestic natural gas demand and exports prospects?

What role of natural gas in Russia's decarbonized future?

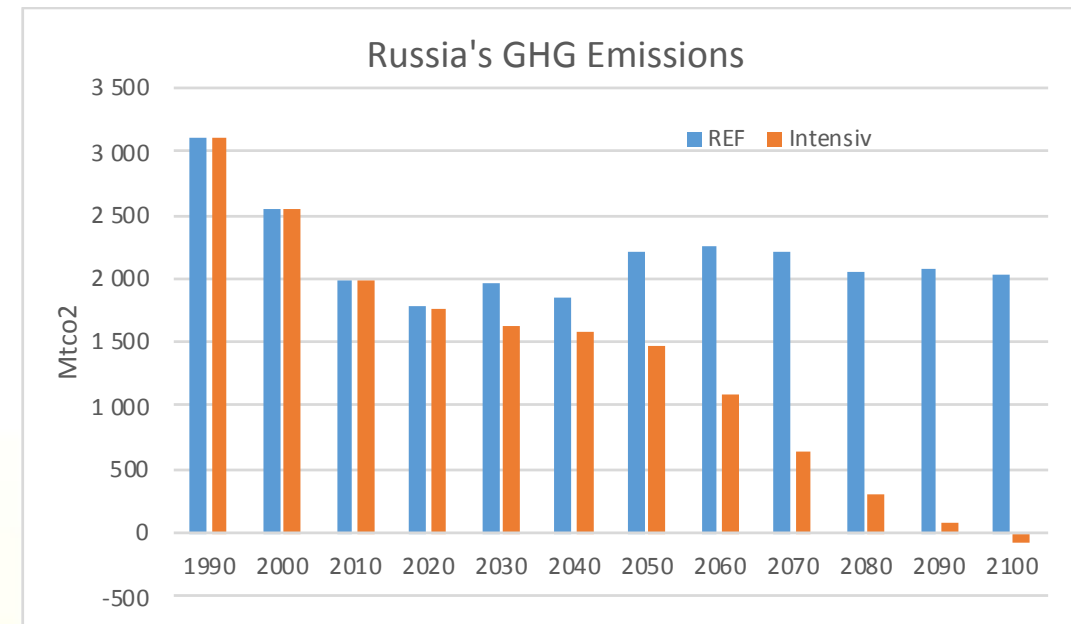
- Methodology
 - Russia's gas demand prospects by sector
 - Power generation
 - Industry
 - Transformation of transportation sector and sustainable mobility
 - Residential, services and agriculture
 - Export outlook
 - Russia's natural gas production outlook
 - Implications & conclusions
- 

Methodology

POLES model (Prospective Outlook on Long-term Energy Systems): a partial equilibrium bottom-up model of the world energy system combining various energy sources, with a variety of technologies and end-uses, under different climate policy assumptions.

Scenarios: *Reference scenario* and *Intensive Scenario* (a 2D type of scenario) till 2100 adjusted for the targets of Russia's Long-term Development Strategy with Low Greenhouse Gas Emissions to 2050 (draft, published by Ministry of Economic Development of RF in March, 2020).

- **Reference:** Implementation of all planned policies for the period 2020-2027. After 2028-2030, supplementary measures are assumed to achieve the reduction of energy intensity to 50% by 2050. The rates of energy efficiency improvements improve due to new measures adopted to stimulate energy & resource savings in all sectors and radical reduction of energy losses. Significant reduction of forest cuts, protection of forests (MED RF, 2020).
- **Intensive:** In addition to Reference, this scenario includes national regulation of GHG emissions (price regulation of emissions), increasing RES-based generation, large-scale electrification and digitalization in transport and industry, introduction of CCS. Ban on forest cuts and increased level of foreign protection. This scenario helps achieving *carbon neutrality by the end of 21 century* (MED RF, 2020).



Source: POLES-GAEL (2021)

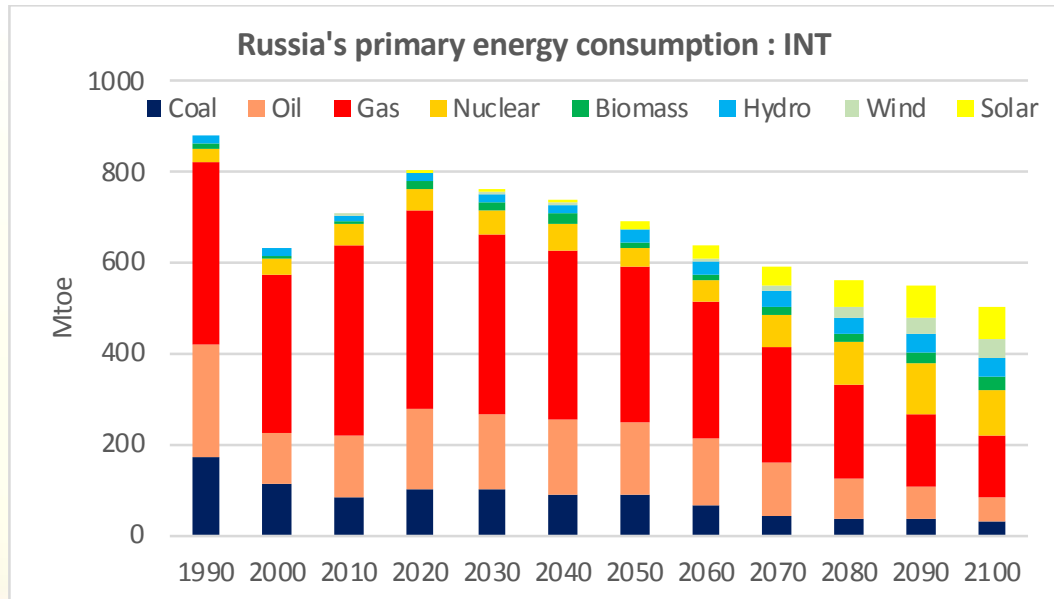
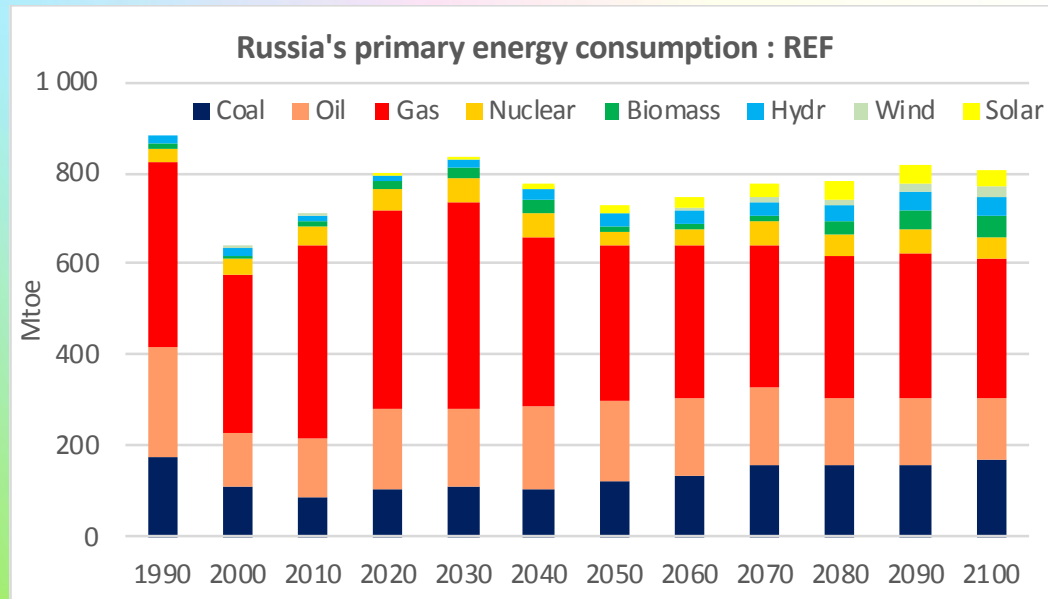
Targets:

Reference: GHG emissions reduction to 67% in 2030; 64% in 2050 to 1990 level

Intensive: 64% in 2030; 52% in 2050 to 1990 level

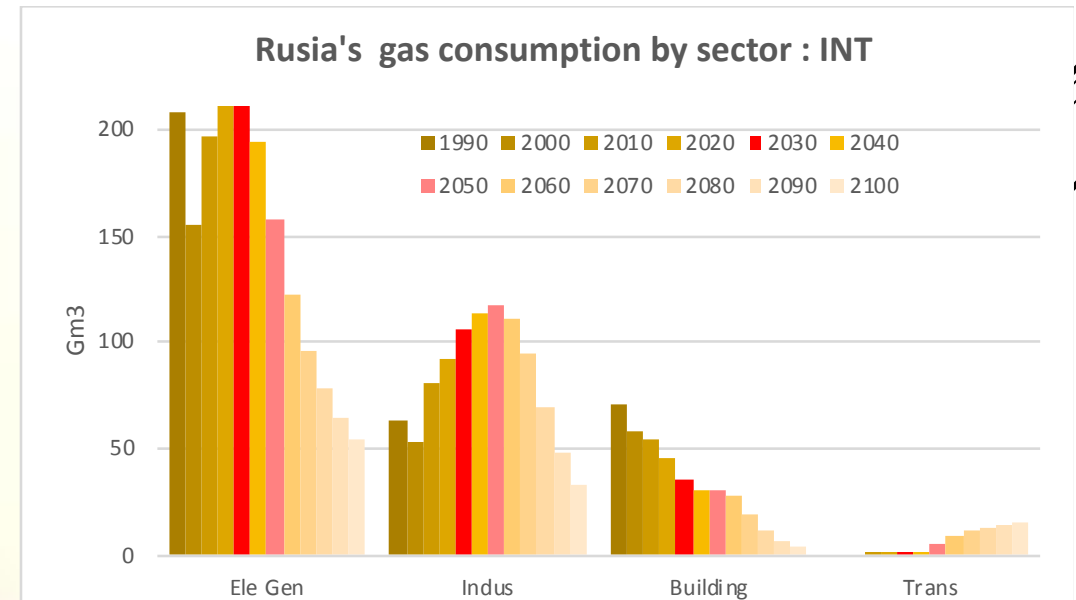
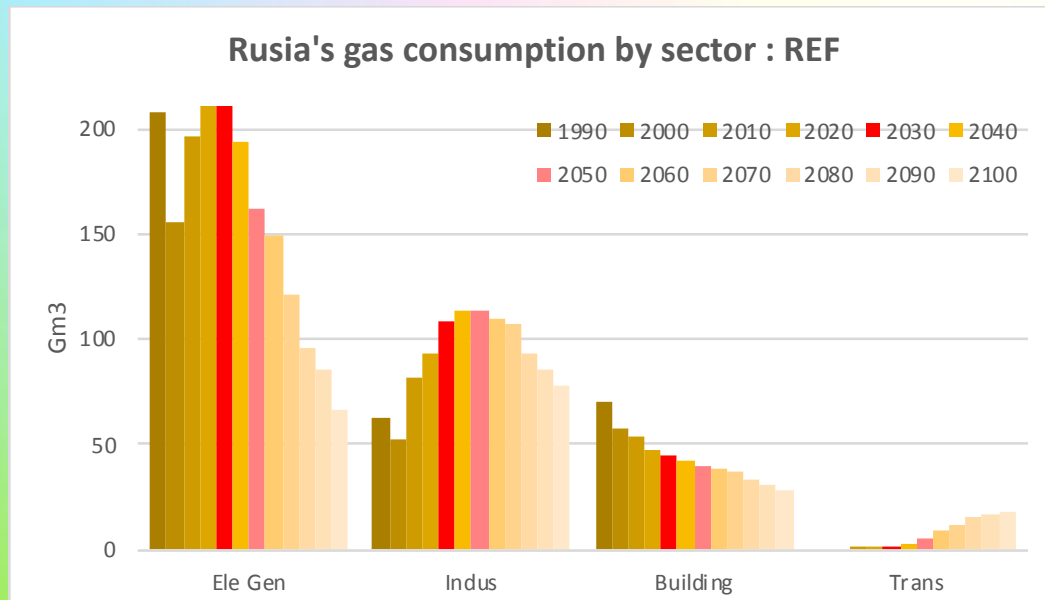
Role of natural gas in Russian primary energy mix

- Russia's primary consumption has not yet attained the 1990 level.
 - Primary consumption should start declining immediately to reach the 2D target.
- Natural gas covers currently more than 50% of Russia's energy needs, although diversification of the energy mix is observed in both scenarios.
- Natural gas is not to become the winner of energy transition in Russia.
 - In the REF case, the gas consumption is expected to continue its growth up to 2030 and starts declining afterwards.
 - In the INT scenario, gas consumption declines steadily till 2100, representing about 1/4 of the current consumption by 2100. In turn, nuclear and renewables gain shares in the primary consumption mix.



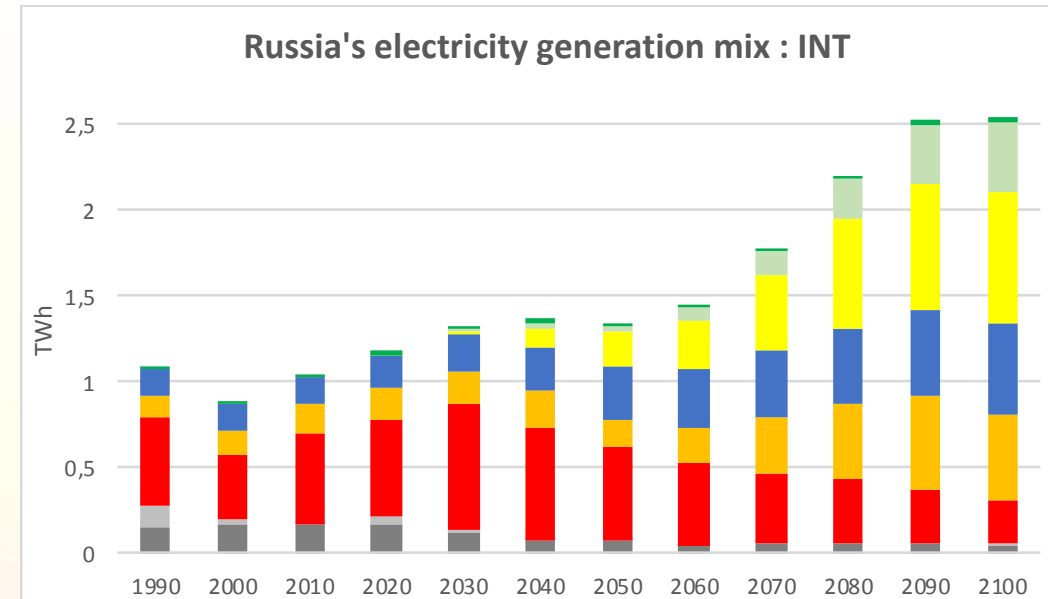
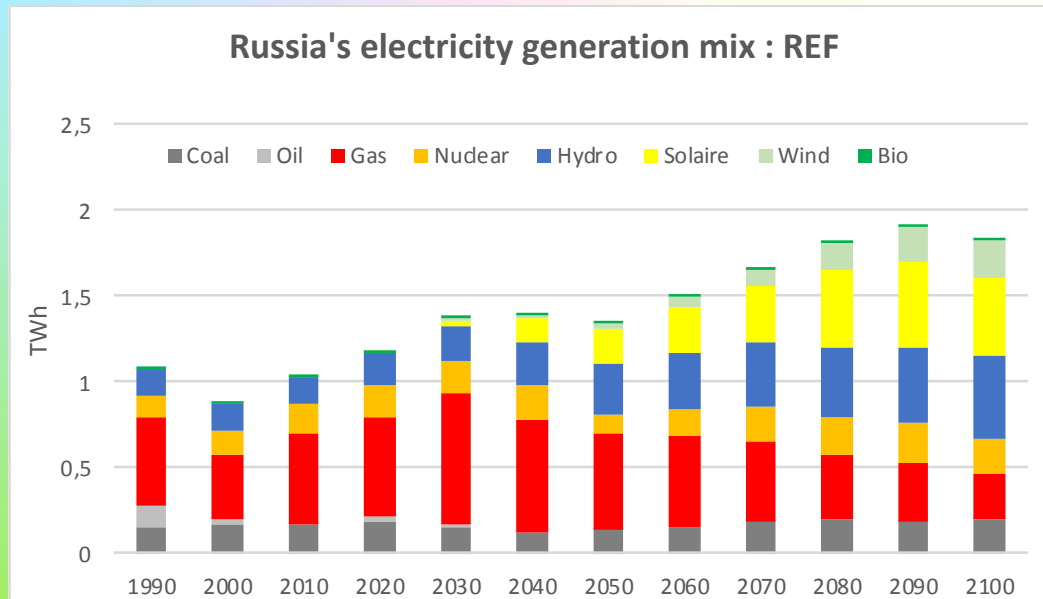
Russia's gas demand by sector

- ▶ Natural gas plays a key role in power generation, and is widely used in industry and residential sector, with smaller involvement in building and transportation sectors.
- ▶ Being a “clean” fossil fuel, natural gas faces versatile impacts of the energy transition.
 - ▶ Switching from coal and oil to gas is helpful for reducing GHG emissions, but in long run, it is not compatible with the carbon neutrality targets.



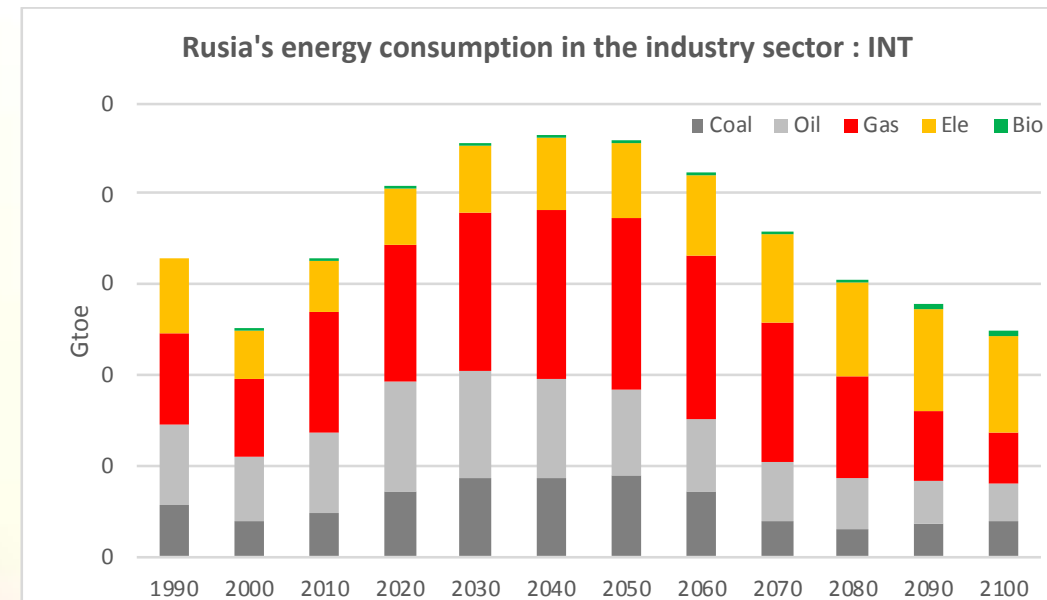
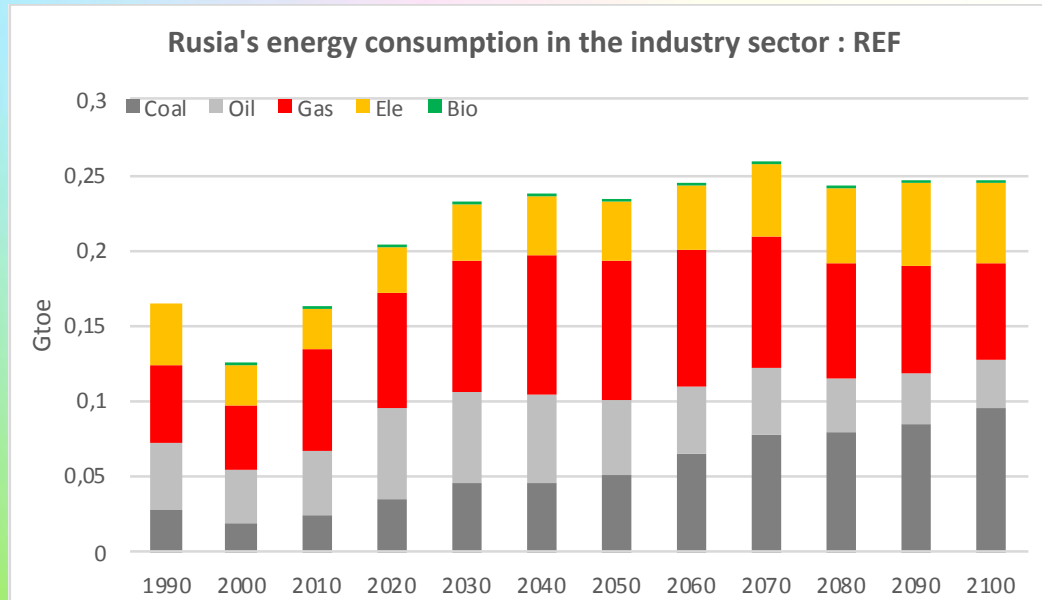
What role for gas in decarbonization of the power generation mix?

- At current stage, “decarbonization” is not explicitly mentioned among the objectives of Russia’s power sector development. Russia disposes of several options for cleaner energy transition besides the coal-to gas shift: modernization of the existing thermal power plants, renewable energy development and breakthrough project for nuclear development.
- Gas contribution is expected to decline steadily after 2030s in both REF and INT scenarios.
- The gas phase-out takes place mostly during 2030-2060s, due to the rising competition from solar and wind generation which achieve the grid parity even without strong policy support, relying on technical advancements in energy generation and grid management.



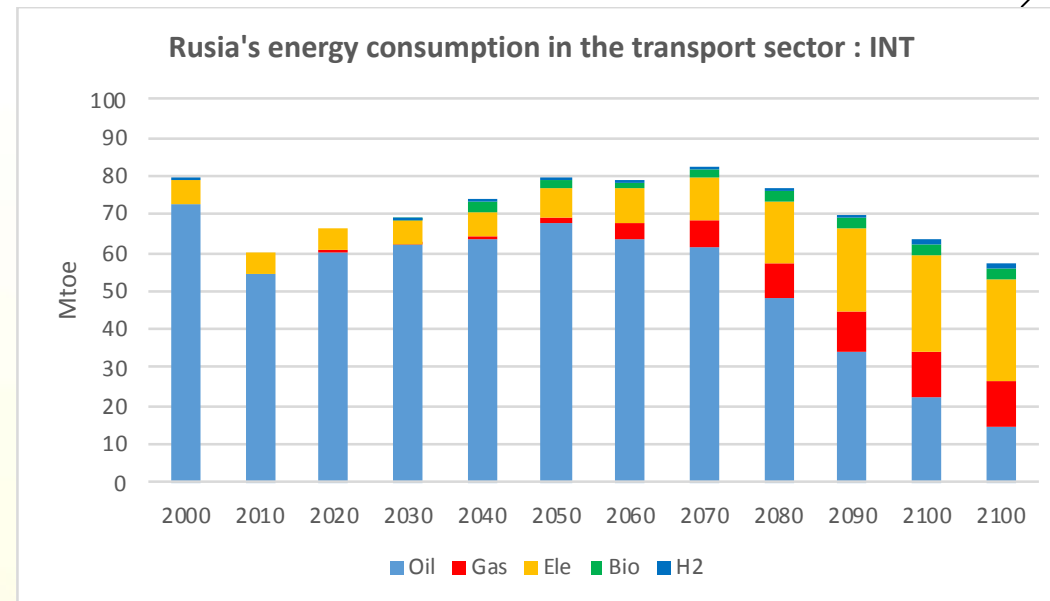
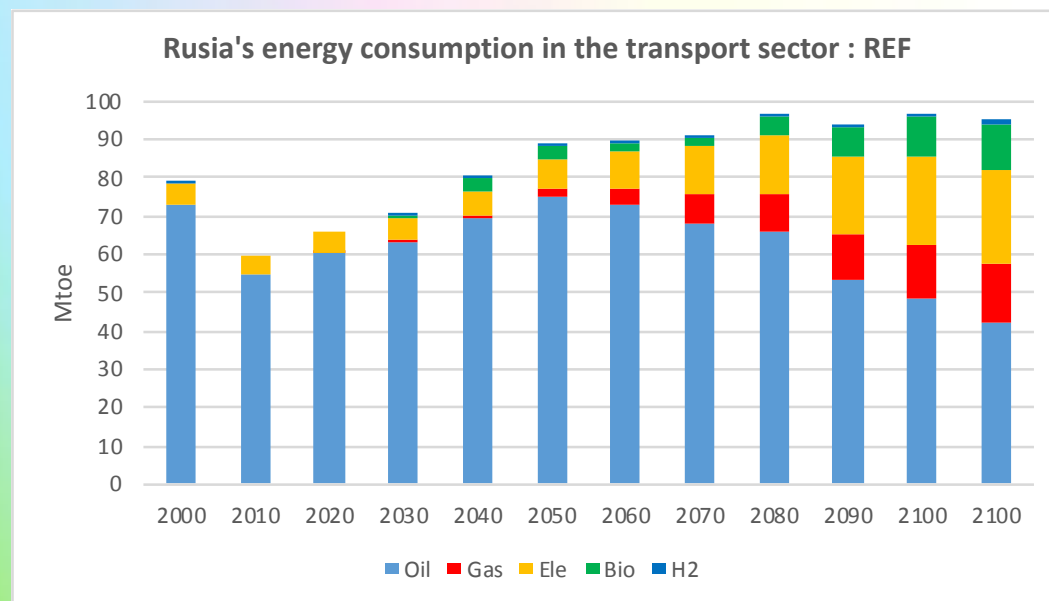
Russia's gas demand prospects in industry

- Industry represents 40% of Russian emissions from final energy consumption, with steel sector representing about 2/3 of the total industry emissions.
- Russian energy policies are mainly oriented at energy efficiency improvements and optimization of energy costs, while the industrial lobby objects the implementation of any stringent climate policy instruments (RUIE, 2020).
- We expect a positive change of the gas demand volumes for the next decades. However, structural shifts in the energy consumption structure are constrained by the lack of cost-effective technological alternatives to fossil fuels in medium run and the overall weak climate policy targets.
 - After 1970s, decarbonization visibly erodes the industry gas demand in the INT scenario.
 - INT scenario activates strong efficiency gains, which are likely to halve the energy consumption by 2100 relative to its peak level of 2040.



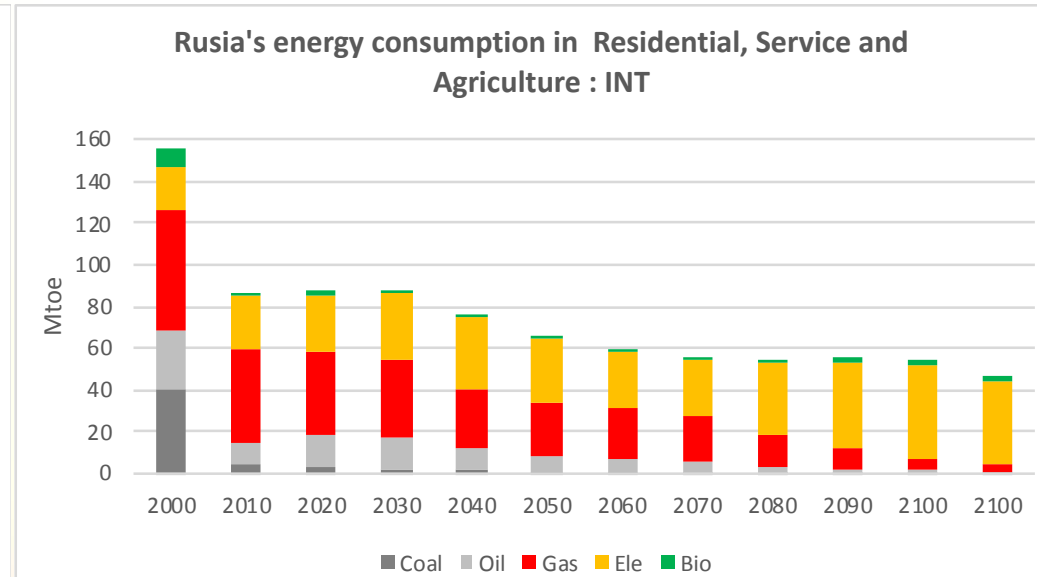
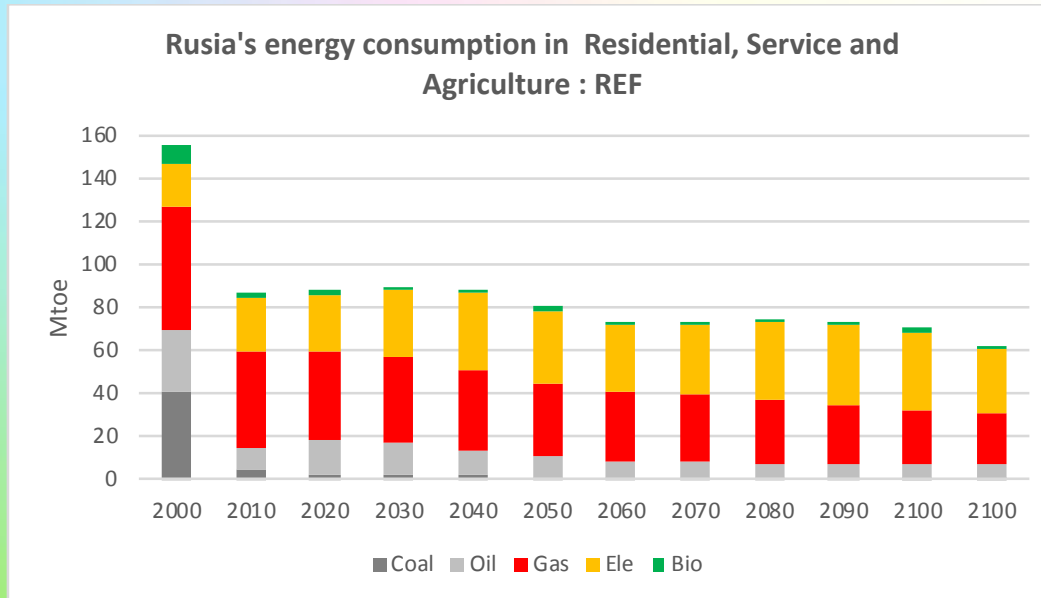
Russia's gas demand prospects in transport

- Transport is the sector with the lowest use of natural gas, but in the longer run, the role of gas increases in both scenarios. This trend is in line with the orientations of Russia's Transport Strategy to 2030 (Government of the Russian Federation, 2014), which includes measures to promote the shift to natural gas as a transportation fuel.
- A stronger policy support may be expected in Russia for natural gas vehicles rather than for electric vehicles, relying on huge fuel production capacities, as well by the possibility to adapt the fleet produced by national car manufacturers (Kolbikova and Timonin, 2018).
- However, as shown by POLES, in the long run gas struggles to compete with electricity, especially in the Intensive scenario, where carbon prices incentivize stronger fuel savings and decarbonization of the vehicle fleet.



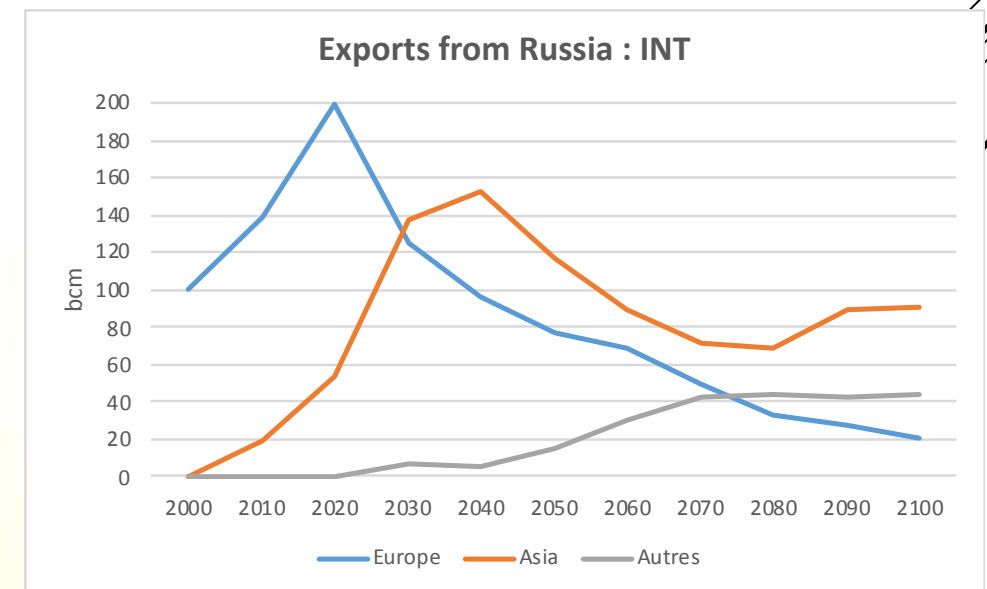
Russia's gas demand prospects in buildings

- Energy use in buildings is constrained by efficiency improvements in result of implementation of heat metering systems, improved efficiency of construction materials and energy consuming equipment, as well as application of better insulation techniques.
- Natural gas consumption is conditioned by the grid access. The extension of the gas network coverage (currently approx. 70%) does not make a significant contribution to the gas demand, as new users are generally located in remote areas with small population (Bylkin, Posypanko and Lvova, 2018).
- Electricity already plays an important role in the energy mix in residential sector, services and agriculture, and its share will expand in longer run.
 - Under the INT scenario, electrification of the energy demand in the sector leads to a quasi-complete phase out of natural gas by the end of the period.



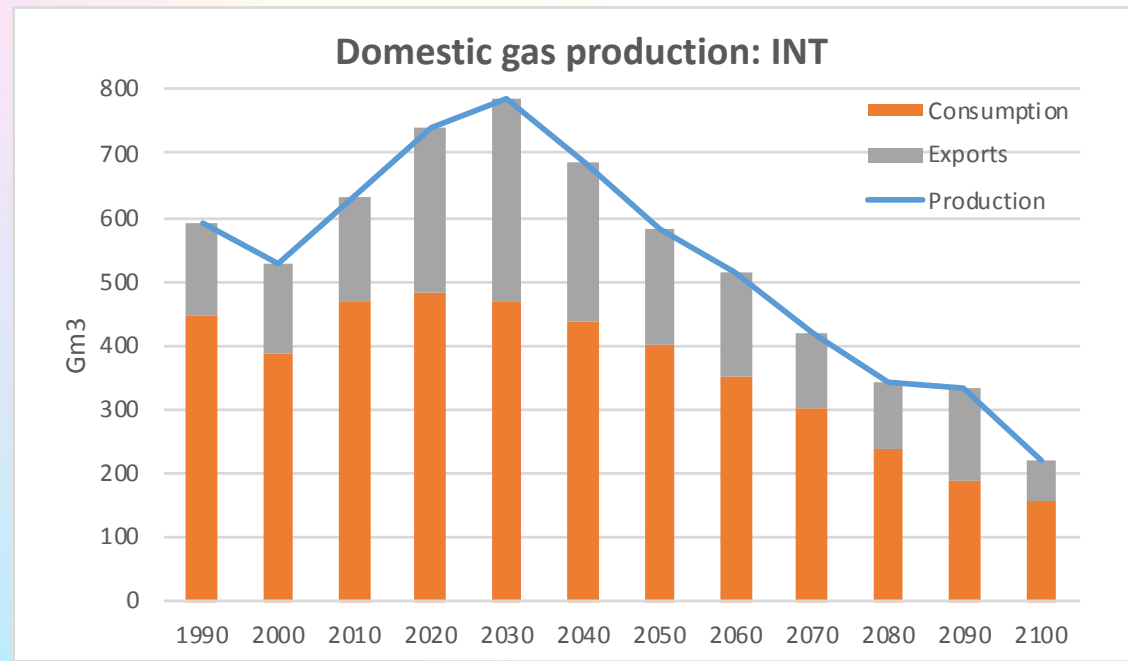
Russia's gas exports outlook

- In the INT scenario, European markets will continue to be the main destination for Russian natural gas exports for the next decade, although they peak nowadays. Exports to the EU decline in line with the EU decarbonization strategy.
- Asian markets, such as China, India, Japan, and South Korea, are the most promising for Russian natural gas export, because of the capacity to accommodate larger volumes of natural gas, dynamics of energy consumption, and phasing out of coal.
- Although Russia reorients some exports towards emerging economies, the new export destinations hardly compensate for the demand decline in the EU.
 - As shown by He (2020), a 2D scenario implies curbing China's gas demand after about 2040, which puts at risk the potential for Russia's export expansion beyond this time horizon.
- The decline of pipeline gas supplies towards the EU reinforces the relative role of LNG in Russia's export strategy. Under condition of demand-side constraint, enhancing international competitiveness of Russian LNG producers becomes a priority.



Russia's natural gas production outlook

- Due to reserve abundance, Russia's gas production is usually considered as demand-driven.
- Russia intends to increase its gas production to 860-1000 bcm by 2030 (ES 2035), accounting on expanding gas demand in foreign markets due to environmental benefits of gas as a clean fossil fuel.
- Under the impact of both domestic and external demand contraction in the case of decarbonization policies, Russia's gas production peaks around 2030 declines afterwards till the end of the century.
- This exposes Russia's gas industry to stranded assets risks. The demand-side constraint to production growth strategy is likely to stimulate competitive pressures in the upstream segment.



Hydrogen: an interesting vector for Russia?

Gas reserve abundance and availability of transportation infrastructures allow expanding the hydrogen production in Russia (RF Energy Minister Novak, 2020)

Hydrogen can be produced either by using renewable energy by electrolysis, or through pyrolysis of natural gas. Russia is able to do both and is also developing technology to capture the carbon emissions created during hydrogen production from natural gas.

POLES model does not reveal the emergence of hydrogen economy even in the long run due to weak cost competitiveness of the technology. Therefore, scaling the use of hydrogen will require strong policy support to be put in place.

Hydrogen exports are seen as a way to monetize the huge gas reserves and use existing export infrastructures to avoid sunk costs. However, grey H₂ is not a good solution for global emission reductions.

Conclusions

- Natural gas provides about half of Russia's primary energy demand and is one of the key macroeconomic drivers.
- The climate agenda poses significant risks to Russia's gas exports and country's macroeconomic equilibrium. A 2D type of scenario suggests a phase-out of gas starting from now, which implies that current Russian gas production and exports are around their peak levels and will decline in future years.
- Natural gas could play a versatile role in the short and long term energy transition :
 - Reshaping the national energy mix does not seem a priority in the Russian Energy Strategy till 2035, but needs to be addressed in longer term in order to avoid the emissions lock-in.
 - In the power generation, the role of gas as a contributor during peak periods must be considered and valued.
 - Strengthening the gas demand in industry requires industrial competitiveness policies and softening trade barriers, especially for the export-oriented sectors.
 - Gas can assert itself as an appropriate solution in the transportation sector, which is looking for an alternative to liquid hydrocarbons at least in short and medium term.
- Increasing climate ambition as soon as possible could contribute to support the domestic equipment manufacturing of clean technologies.
- Natural gas pyrolysis could become an interesting option for hydrogen production but it requires strong policy support in order to scale the deployment.

References

- Bashmakov, I.A. (2020). Russian low carbon development strategy. *Voprosy Ekonomiki*. 2020;(7):51-74. (In Russian)
- Boute, A., A. Zhikharev (2019). Vested interests as driver of the clean energy transition: Evidence from Russia's solar energy policy. *Energy Policy* 133 (2019) 110910
- Bylkin, A., Posypanko N., Lvova A. (2018). Domestic Gas Demand: a Trend towards Stagnation? Vygon Consulting, March 2018
- Decree No. 767 of Government of RF (2013) On regulation of relations in the area of gas motor fuel use, including the use of natural gas as a motor fuel
- Doctrine of energy security of Russian Federation (2019). Adopted by Decree of President of Russian Federation of 13 May 2019 No.216.
- Energy Strategy of Russian Federation for the period until 2035 (2020). Adopted by Decree of Government of RF No 1523-p, June 9, 2020.
- Government of the Russian Federation (2020). Decree of 16.03.2020 No.289-13 On amendments to the state program of RF The Development of Nuclear Energy and Industry Complex.
- He, J. (2020). Launch of the Outcome of the Research on China's Long-Term Low-Carbon Development Strategy and Pathway. Institute of Climate Change and Sustainable Development, Tsinghua University. https://mp.weixin.qq.com/s/S_8ajdq963YL7X3sRJSWGg
- IEA, (2020). World Energy Outlook 2020. OECD/IEA.
- Khokhlov, A. and Melnikov, Y. (2019) Coal-fired generation in Russia: new challenges and opportunities. Skolkovo Energy Centre, January 2019 (in Russian)
- Kolbikova, E., Timonin I. (2018) Electric Vehicles: No Lift off Without State Support. Vygon Consulting – September 2018.
- Makarov, I., Chen H., Paltsev S. (2020). Impacts of climate change policies worldwide on the Russian economy. *Climate Policy* <https://doi.org/10.1080/14693062.2020.1781047>
- Minenergo (2020) Main characteristics of Russian power sector. <https://minenergo.gov.ru/node/532>
- Mitrova, T. & Yu. Melnikov, (2019) Energy transition in Russia. *Energy Transitions*, 3: 73-80.
- Mitrova, T. et al. (2020) Global Climatic Threat and Russian economy: Searching for the way. Skolkovo Energy Centre, May 2020.
- Novak, A. (2020) Russia rules out cutting fossil fuel production in next few decades. Interview to Guardian, taken by J. Ambrose, <https://minenergo.gov.ru/node/19287>
- Orlov, A., & Aaheim, A. (2017). Economy-wide effects of international and Russia's climate policies. *Energy Economics*, 68, 466–477. <https://doi.org/10.1016/j.eneco.2017.09.019>
- Ross, K. (2020) Russia's Proposed Climate Plan Means Higher Emissions Through 2050. World Resources Institute, April 13, 2020
- RUIE. (2020). On the position of The Russian Union of Industrialists and Entrepreneurs "On activities for Russian economy's adaptation to climate change". The statement of the Bureau of the Board of The Russian Union of Industrialists and Entrepreneurs. 3 December. In Russian. <https://media.rspp.ru/document/1/a/6/a61db51ebcd4b92ea4a44b13e38bce5c.pdf>
- Sharmina, M. (2017). Low-carbon scenarios for Russia's energy system: A participative backcasting approach. *Energy policy*, 104 (2017) 303–315
- MED RF. (2020). Strategy of the Long-Term Low-Carbon Economic Development for the period till 2050. Draft, published by Ministry of Economic Development of RF in March, 2020.
- Transport Strategy for the period until 2030. Amended by Decree of Government of RF No 1032-p, June 11, 2014.
- Tsafos, N. (2020), How Will Natural Gas Fare in the Energy Transition? CSIS, January 2020

THANK YOU!

