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The EU–Russia–China energy triangle☆

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Abstract

There is a growing worry in the EU that a rapprochement between Russia and China can have negative implications for the EU. This paper argues that energy relations between the EU and Russia and between China and Russia influence each other. To do this, the paper analyzes interactions in oil and gas trading, electricity exchanges, energy technology exports and energy investments. No evidence for a negative spillover of developing Russia–China energy relations on the EU is found.

Keywords: energy, geo-economics, China, Russia, EU.
JEL classification: F21, Q37, Q4.

1. Introduction

Energy is a key area for cooperation between the European Union and Russia, and between China and Russia. These bilateral relationships influence each other and each relationship is of strategic interest to the respective third party. This paper outlines the main spillovers from each bilateral energy relations to the third party in each case in order to explore the risks and opportunities. This is done by discussing five key hypotheses:

1) There is no direct competition between the EU and China for Russian oil and gas;
2) China and the EU both have an interest in curbing excessive Russian energy rents;
3) The EU, Russia and China compete on the global energy technology market, but specialize in different technologies;
4) Intercontinental electricity exchange is unlikely;

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5) Russia seems more worried about Chinese energy investments with strategic/political goals, than EU investments.

2. There is no direct competition between the EU and China for Russian oil and gas

Oil and gas exports continue to be the backbone of Russia's economy. In 2018 they accounted for 59 percent[1] of the total value of Russia's exports and represented 46 percent[2] of Russia's total federal revenue. On the other side, in 2018, 70 percent of Russian natural gas exports went to the EU, while 15 percent of Russian oil exports went to China.[3] For China and the EU, energy imports are not insignificant either. In 2018, 27.3 percent of the EU's total oil imports and 40.2 percent of its total gas imports came from Russia.[4] Meanwhile, Russian oil accounted for 15.4 percent[5] of China's total oil imports (Russia's share of China's total gas imports is only 1 percent) (Figs. 1–2).

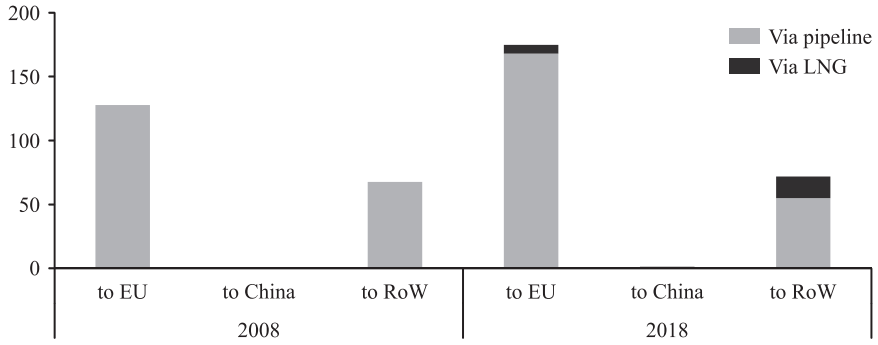

Fig. 1. Russian gas exports to the EU, China and rest of the world (RoW) (bcm).

Sources: Author's calculation based on data provided by BP (2009, 2019) and Bank of Russia.

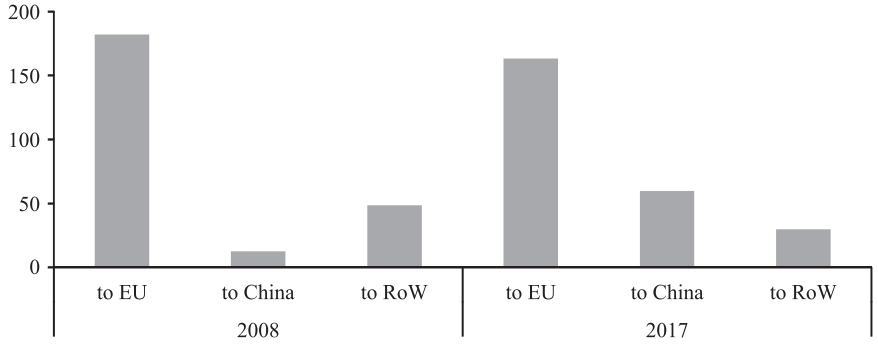

Fig. 2. Russian oil exports to the EU, China and rest of the world (RoW) (millions of tonnes).

Sources: Eurostat; Bank of Russia; OEC; BP (2018).

[1] World Bank WITS (https://wits.worldbank.org/CountryProfile/en/Country/RUS/Year/2017/TradeFlow/Export/Partner/WLD/Product/All-Groups) and OEC (https://oec.world/en/profile/country/rus/).

[2] Author's calculation based on data provided by the Ministry of Finance of the Russian Federation.

[3] Author's calculation based on data provided by BP (2019).

[4] Eurostat.

[5] Author's calculation based on data provided by BP (2019).

There is a concern in the EU that greater energy cooperation between Russia and China could be detrimental to the EU's energy interests. For example, if Russia becomes less reliant on the EU as a destination for its energy exports, Russia might become more assertive in energy negotiations and also political negotiations.[6] And Russia's leadership has indeed highlighted at various occasions the increasing importance of China for the Russian energy sector.

But is such a shift realistic and would it be a problem for the EU?

Only about 10 percent of Russian oil exports go via direct pipelines to the EU and another 10 percent go via pipelines to China. In the oil market, it is already largely possible for Russia to ship all its oil to China via the sea route. But this would involve high transport costs, and refineries in China are not optimized for Russian oil grades. At the same time, the impact on the EU would be manageable because China would then have to import less oil from other countries — allowing the EU to buy elsewhere, though at higher transport costs and incurring some intra-European disruption (refineries in the east might become less competitive relative to refineries on the coast). This seems therefore to be a relatively symmetric lose-lose scenario without much strategic value for either side.

For gas, the story is more complicated. Russia's pipeline infrastructure is still largely directed to the EU — and this changes only slowly (Fig. 3). Of Russia's gas exports, 68 percent goes through pipelines to the EU[7]. Russia currently has no gas pipeline to China. And in terms of projects under construction, the Gazprom[8] projects to supply the EU (Nord Stream 2: 55 billion cubic metres (bcm) and Turkstream: 31 bcm[9]) have more capacity than the China-leaning projects (Power of Siberia: 38 bcm[10]). Europe continues to be a much more attractive market for Russia with existing pipeline infrastructure (345 bcm per year — EIA, 2017), better developed resources[11] and higher prices.[12] Connecting the West Siberian fields to China would be very expensive and time consuming.[13] Consequently, it appears likely that the bulk of gas exports to China, if they increase, will not be drawn from fields in Western Siberia. Furthermore, China so far has not given gas-import projects from Russia any preferential treatment, but seems to have commercially exploited Russia's eagerness to diversify its export portfolio by pushing through a very low gas price.[14]

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[6] We cannot explore the logic of the observed and potential Russian gas and oil projects as they are often a complex combination of foreign-policy objectives (such as forging alliances); economic motives (such as linking new sources to new consumers) and internal distributional motives (such as providing rents for powerful stakeholders).

[7] Author's calculation based on data provided by BP (2019).

[8] That has a state-monopoly on gas-exports via pipeline.

[9] Additional branches of both projects are being discussed.

[10] There are some more distant projects such as Power of Siberia II with 38 bcm.

[11] Reserves in East Siberian fields, which would be closer to China, are estimated at 3,510 bcm, while gas reserves in West Siberian fields, which can be connected easily to existing pipeline systems to the EU, are 31,685 bcm.

[12] China so far has not exploited Russia's political commitment to the pivot by seeking commercial concessions — and negotiating a gas contract that would arguably allow the Power of Siberia-pipeline only to break-even at oil-prices above USD 100 (Galkina, 2016).

[13] The discussed Altay pipeline would be 2,800 km long in Russia alone and the Power of Siberia pipeline that is planned to be commissioned in December 2019 will be 4,000 km long.

[14] https://www.polygraph.info/a/gazprom-china-supply-natural-gas-deliver-fact-check/29549348.html

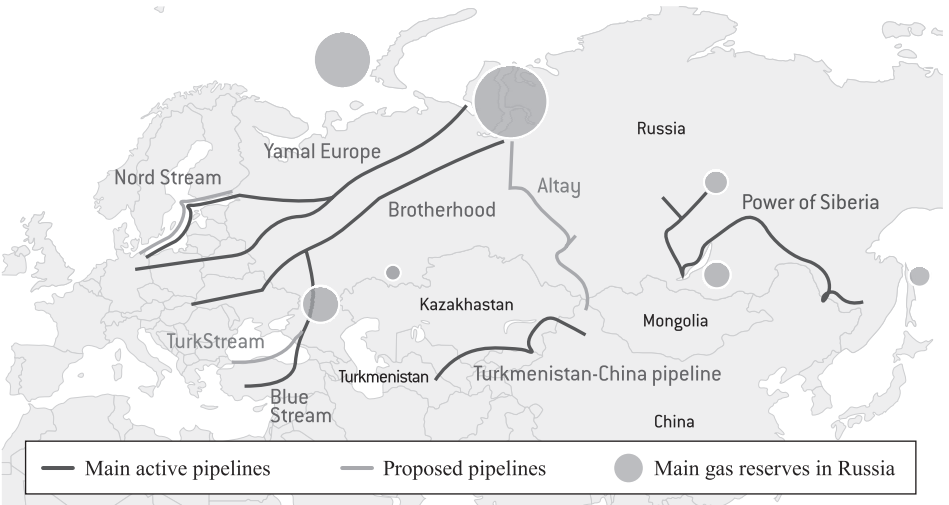

Fig. 3. Main gas reserves and cross-border pipeline systems in Eurasia.

It is expected that by 2040 China's gas import demand — which is currently at about a fifth of the EU's — will increase drastically despite significantly increasing domestic production.[15] According to the IEA (2018) new policies scenario it will be more than half of the EU's gas import demand by 2040 (Fig. 4), while according to the BP (2019) scenario it would even surpass the import demand of the EU.[16] In this context, it is actually more surprising that Russia continues to expand its currently underutilized gas pipelines to the EU at a faster pace than those to China.

As Russia in principle holds sufficient reserves to meet both China's and the EU's import demand for many decades there will be no competition for limited Russian reserves. Furthermore, the increasingly liquid market for shipments of liquefied natural gas (LNG) would counteract any future Russian strategy of depriving the EU market of gas and oversaturating the Chinese market.[17] As for oil, the result would be no shortage in the EU, but an expensive re-routing of international LNG-routes that would symmetrically hurt both Russia and the EU.

In sum, Russia has enough oil and gas reserves to supply both the mature European market and the developing Chinese market. Increasing oil and gas exports to China will not provide Russia with new strategic options in its energy relationship with the EU. By contrast, the EU needs to carefully assess how to manage the risks associated with an increasing share of Russian gas in its gas imports.[18]

[15] It appears unlikely today that China will make itself dependent on Russian imports by meeting its growing import demand mainly from Russia.

[16] Author's calculation based on data provided by BP (2019).

[17] This would require a massive build-up of Russian-Chinese pipeline connections (in total about four times the length and four times the diameter of the €10 bn Nord Stream II project), which would be very expensive and time-consuming.

[18] On the other hand, Russia also remains dependent on gas exports to Europe (which are expected to contribute more than USD 40 bn or 9 percent of export revenues in 2019) (https://www.reuters.com/article/us-gazprom-results/gazprom-braces-for-decline-in-european-gas-exports-prices-idUSKCN1VJ0MI). Disruptions to these exports — for example due to a potential transit dispute with Ukraine — could imply substantial trouble for Gazprom, which has long-term supply obligations with European customers.

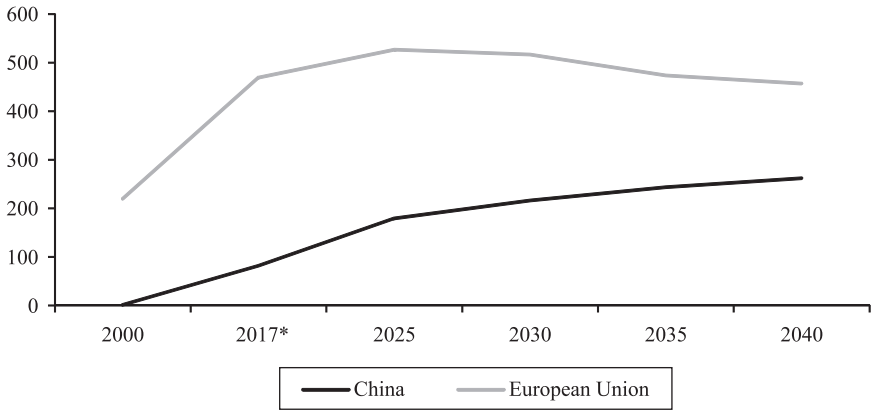

Fig. 4. Gas import demand in the EU and China (million tonnes of oil equivalent).

Note: EU production includes Norway. * Estimated.
Source: Bruegel based on gas production and consumption in the new policies scenario by the IEA (2018).

2.1. Excursus: Competition for central Asian gas between EU, Russia and China

Central Asia has significant gas reserves, in particular in Turkmenistan (19,000 bcm), Azerbaijan (2,100 bcm), Kazakhstan (1,000 bcm) and Uzbekistan (1,200 bcm).[19] Russia, China and the EU are interested in tapping into these resources. In the past, Russia was the only country connected via pipeline to Central Asia. It used its exclusive access to manage the price and volume of exports from the region. China broke this monopoly by building the 55 bcm Central Asia-China gas pipeline to Turkmenistan in 2009. Currently Uzbekistan and Kazakhstan provide nearly 40 percent of China's total gas imports via the Central Asia-China gas pipeline. An additional pipeline from Turkmenistan to China ("Line D" bypassing Kazakhstan by going through Kyrgyzstan) was announced in 2013 (Lelyveld, 2019). But in 2019 Russian Gazprom — somewhat surprisingly — began buying gas from Turkmenistan, securing gas volumes that Turkmenistan could otherwise export to China.[20]

The EU has also been trying to gain access to the region's resources, while avoiding reliance on existing or planned Russian pipelines. The Transcaspian pipeline would bring Central Asian gas to Azerbaijan from where it could potentially flow to the EU (through the southern gas corridor). Russia has so far been able to block this project. One main stumbling block — the legal status of the Caspian Sea — was recently resolved, but Russia and Iran continue to indicate that they will not allow easily such a project to go ahead quickly.

It thus appears more likely that any collision of energy interests in Central Asia will involve Russia and China, rather than China and the EU (which infrastructure-wise will be largely kept out of the region[21]).

[19] Author's calculations based on data provided by BP (2019).
[20] We cannot say whether this is just a way for Gazprom to meet its supply obligations or a move to limit direct Central Asian exports to China.
[21] Unless there are some unlikely developments in Iran–EU relations.

3. China and the EU have an interest in curbing excessive Russian energy rents

Russia is a dominant gas and oil supplier to the EU. In the gas market, Russia has exercised its market power in various ways to prevent competition and achieve higher prices. Measures include various interventions (export taxes, export monopoly, dominance of state-owned enterprises, control over foreign investments, preventing independent pipeline transit from Central Asia), specific infrastructure investments (in pipelines and storage) and pricing strategies (such as price discrimination between countries and predatory pricing).

In the oil market, Russia has played a major role in allowing the Organization of the Petroleum Exporting Countries (OPEC) to coordinate supply cuts to stabilize global oil prices since 2016.[22] The Russian government was, for example, able to convince companies to observe production limits.[23]

Such an approach implies higher oil and gas prices (compared to a properly competitive market) for both the EU and China, and thus a transfer of welfare from the importers to the exporters. The EU and China therefore have an interest in mitigating Russia's market power in the oil and gas markets.

If China and the EU could convince Russia to open its exploration and production sector to foreign companies and to allow them to export in a non-discriminatory way, energy costs for China and the EU could be substantially reduced. The welfare transfer out of Russia could be mitigated by non-discriminatory export taxes, while true competition on the production side could bring down production costs and completely remove the detrimental impact of inefficient state companies.

4. The EU, Russia and China compete on the global energy technology market, but specialize in different technologies

The EU, Russia and China all export energy technology to one another and to the rest of the world (Fig. 5). *China* has been very successful in exporting coal-fired power plants. Since 2010, it has invested USD 45.5 billion in the coal sector and USD 3.8 billion[24] in the solar sector abroad. The photovoltaic (PV) panel industry also plays an important role for China: in 2018, the total value of PV products exported was USD 16.1 billion.[25] This success has been accompanied by foreign complaints about unfair trade practices — and has even led the EU to implement temporary protective measures on photovoltaic panels.[26]

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[22] https://www.opec.org/opec_web/en/press_room/3944.htm

[23] https://www.reuters.com/article/us-oil-opec-russia/russian-oil-output-down-in-february-misses-global-deal-target-idUSKCN1QJ04T

[24] Boston University Database, https://www.bu.edu/cgef/#/all/EnergySource/Coal

[25] https://www.renewableenergyworld.com/articles/2019/02/chinese-solar-manufacturers-increased-production-export-in-2018-while-domestic-installations-fell.html#gref

[26] The EU imposed anti-dumping tariffs on Chinese solar panels in 2013 (https://www.theguardian.com/business/2013/jun/04/eu-tarriffs-dumping-china-solar-panels). However, tariffs were lifted in 2018 (http://trade.ec.europa.eu/doclib/press/index.cfm?id=1904). As a result, in the first half of 2019, China's photovoltaic exports increased to USD 9 billion (https://www.pv-magazine.com/2019/07/26/chinese-solar-production-figures-continue-to-ramp-up/).

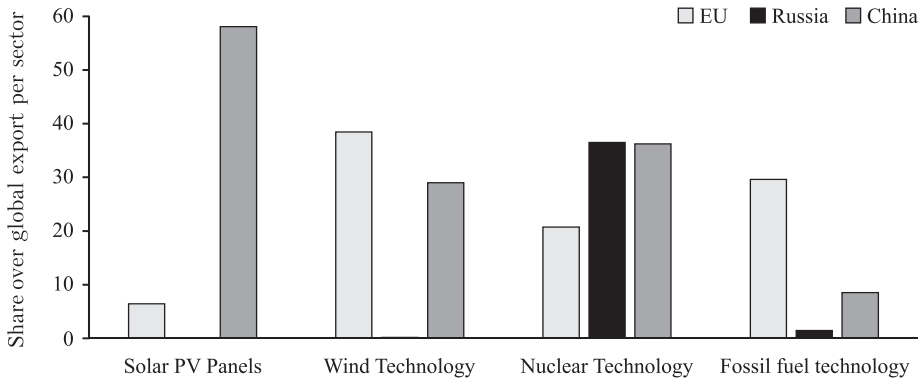

Fig. 5. Market share in global energy technology exports (%).

Note: Aggregation performed by Harmonized System Code. Solar PV Panels (854140); wind technology (850231, 730820); nuclear technology (840110, 840120, 840140); fossil-fuel technology (841990, 841181, 841199, 841182, 841950, 840420).
Source: UN Comtrade.

So far, China's wind and nuclear industries remain focused on its growing domestic market.[27]

Russia remains one of the big players in the export of nuclear power plants. Russia has even secured important projects in the EU (Hungary) and China.[28] Russian nuclear technologies abroad at time of writing include nine operating power plants in Ukraine (2), Iran (1), China (4) and India (2). A further seven are under construction and 11 have been contracted (World Nuclear Association, 2019). In other energy technologies Russia remains largely limited to post-Soviet markets.

EU energy technology exports are very diversified. Wind and gas turbines, network infrastructure and energy management systems are some of the EU's strengths. But the EU has become less competitive in global markets for coal, nuclear and photovoltaic plants.

Consequently, the competition between Russia, China and the EU on the global market for electricity supply technologies is less a competition over where a certain type of technology (e.g., PV panels) comes from (typically China), but rather over what technology is installed (for example, a Russian nuclear reactor or a European wind park).

5. Intercontinental electricity exchange is unlikely

Russia in 2018 exported about 4 terawatt hours (TWh) to the Baltic countries, 8 TWh to Finland and 3 TWh to China.[29] Together, these exports only represented a little over 1 percent of Russian electricity production (1100 TWh).[30]

[27] "China is the world's largest wind power market in both new and cumulative installations. In 2018, the country installed 20.2 GW of onshore wind energy and 1.6 GW of offshore wind farm, representing 44% and 37% of global market share respectively" (https://www.evwind.es/2019/08/14/china-is-the-worlds-largest-wind-power-market/68449) and in 2018 seven nuclear power units (8.8 GW) were installed — out of total nine units globally.
[28] http://www.globalconstructionreview.com/news/russian-reactors-china-rosatom-signs-deal-deliver-/
[29] These are net exports. See https://so-ups.ru/fileadmin/files/company/reports/disclosure/2019/ups_rep2018.pdf
[30] Currently, electric power is transmitted from Russia to China through three AC lines (two 220 and one 110 kV lines) and one DC line (500 kV).

One exciting prospect for China-Russia-EU collaboration would be the opportunity to transmit electricity from one end of the Eurasian landmass to the other. With high shares of renewables it would in principle be very attractive if wind-power from the Atlantic and Pacific coasts, solar power from Central Asia and hydropower from Siberia could be pooled together to ensure more stable electricity supply.

The Russian power grid already integrates 10 time zones and is interlinked with 15 countries (forming the Integrated Power System) (IRENA 2017). Interconnecting this huge grid in synchronous[31] or asynchronous[32] mode with the EU continental power system (Entso-E) has been discussed and studied in the past (UCTE, 2008). But currently it seems more likely that EU countries (the Baltic States) and non-EU countries (Ukraine, Moldova) that are still linked to the Integrated Power System will disconnect to join the European power system typically referred to as Entso-E. In the east, high-voltage direct current connections (i.e. without synchronization) between China and its northern neighbors are under discussion.[33]

The Russian network would need to be substantially strengthened to carry significant intercontinental flows. Currently, for example, electricity flows between the European Russia & Urals and the Siberia price zones within Russia are constrained, leading to persistent price differences between the two zones. And east-west transmission bottlenecks in some parts of Asian Russia only allow electricity equivalent to the generation from a single coal-fired power plant to be transmitted in one direction or the other (see Pipkin, 2016). Consequently, even strong interconnectors between Russia and China together with a full synchronization of Russia and the EU, would not imply significant intercontinental electricity exchanges unless intra-Russian transmission is substantially strengthened.

An alternative that has been discussed in the EU (e.g., Ardelean and Minnebo, 2017) and China (e.g., GEIDCO[34]) is a dedicated intercontinental supergrid. Instead of coupling existing alternating current transmission systems, a new dedicated direct current system would be constructed. The Ardelean and Minnebo (2017) proposal foresees a 4–10 gigawatt connection over a distance of 5,600 km, costing some €15 billion. This would imply that such a line would only be commercially viable either if capital costs are very low or the price differentials between the EU and China would be high in most hours.[35] Current price pointers for China (which only feature regional experimental markets such as Guangdong) and the EU (where we use

[31] Synchronization implies that two alternating current transmission systems are run as one system with the same frequency at each point of the system.

[32] Asynchronous connection of two alternating current transmission systems is established by converting the alternating current of one system into direct current and then converting this direct current again into alternating current with the frequency of the other system.

[33] "One such initiative is the Northeast Asia Power Grid Interconnection (NEAG) which aims at linking the north-eastern Asian countries by a high voltage power grid. The planned network consists of 12 EHV/UHV DC interconnections sized at 800 kV and 8-10 GW with distances of 200–2300 km" (Ardelean and Minnebo, 2017, p. 6).

[34] Global Energy Interconnection Development and Cooperation Organization.

[35] At 5 GW, 5 percent interest rate and 10 percent losses and 100 percent utilization, absolute price differentials must average €20/MWh to pay only for the capital cost.

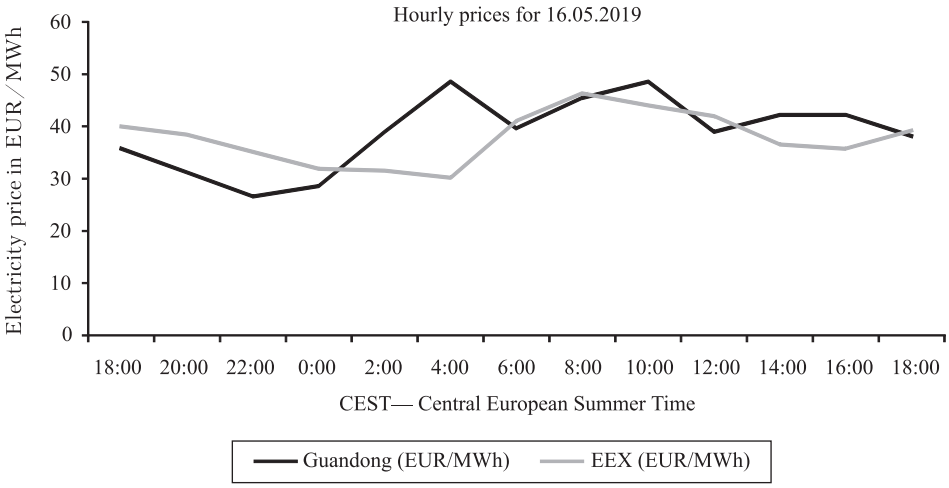

Fig. 6. Comparing hourly electricity prices for the same moment in EU and China.

Source: Author's calculation based on data provided by The Sino-German Energy Partnership and EEX Group.

the German wholesale electricity price (EEX) that is also relevant for most of Germany's neighbours) indicate that price differentials at the same moment can be quite small (Fig. 6). Consequently, on a commercial basis, a dedicated intercontinental electricity system seems rather unlikely, unless the cost of these systems drops dramatically, or high and persistent price differentials emerge.

Therefore, in terms of electricity-system development, increased continental integration between Western Russia and the EU and Eastern Russia and China seems the most cost-efficient, while intercontinental electricity exchanges are likely to remain limited.

6. Russia seems more worried about Chinese energy investments with strategic/political goals, than about EU investments

EU-based companies are important players in the Russian energy sector. Uniper (11,235 MW), Enel (9,429 MW) and Fortum (4,794 MW) are among the largest electricity producers in Russia; BP owns a 19.75 percent share of the world's largest oil producer Rosneft, and many major EU oil and gas players (including Shell, Eni, Total and Wintershall DEA) are engaged in exploration and production joint ventures in Russia. EU energy technology companies including ABB, Siemens and Schneider Electric make and sell energy technology in Russia.

Involvement of EU companies in Russia seems, however, carefully guided by the Russian side. Participation in oil and gas production projects appears to be contingent on joint ventures with Russian companies (with strong connections to the state). Activity in the electricity sector is — as in all countries — largely driven by the regulatory framework. For EU companies that play by these rules, activity appears in general to be very profitable. It has been argued that Western money was a helpful disciplining device contributing to the modernization of Russian

economic policy, and that the decline of investment from the West was followed by a deterioration of the business climate.[36]

Chinese investments in Russia focus on the mineral extraction sector[37] and lag foreign trade flows.[38] Chinese investment is dominated by a few big transactions in oil and gas exploration, the single largest example being the liquefied natural gas export projects implemented by Chinese companies jointly with Novatek.[39] Moreover, some other major FDI-projects that were announced have so far not materialized. Chinese investment in Russia appears much more politicized than European investments, with state-owned Chinese companies investing in heavily government regulated sectors in Russia.

Therefore, reviving the old idea that Europe could offer Russia a partnership for modernization[40] while China would make Russia into an ancillary supplier of raw materials will likely attract the interest of the Russian economic elite. It seems, for example, plausible to us that investments by private European companies in the Russian energy sector will have more positive spill-overs (in terms of know-how and general business climate) than investments by Chinese state-owned enterprises. Moreover, the future of hydrocarbons becomes more and more uncertain. Hence, Russia would be well advised to shift investments towards new sectors such as hydrogen production or renewables.

7. Conclusion

In the interconnected energy world, unilateral actions and bilateral relationships have an impact on third parties. Which bilateral partnerships are mutually beneficial therefore depends on the concrete subject matter. EU–Russia energy collaboration remains dominated by Russian *gas and oil* exports to the EU. The emergence of China will not dramatically alter this picture. Russia's reliance on oil and gas exports to the EU and China continues to increase. However, given Russia's huge resources, the globalising energy market and the secular trend away from fossil fuels, there is little competition between the EU and China for Russian resources. This implies that the Russian pivot to Asia in terms of energy exports is likely to continue but with limited negative consequences for the EU. However, both the EU and China have an interest in reducing Russian pricing power over oil and gas. As hydrocarbon markets are essentially global, the EU and China are on the same side.

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[36] "Western money is not doing the talking in Moscow these days, so it seems, paradoxically, that by imposing sanctions on Russia the U.S. and its allies may have whittled away an instrument of leverage they once had" (Trickett, 2019).

[37] "Mineral resource sectors comprise about 68% of the total implemented FDI from China into Russia" (Analytical Credit Rating Agency, 2017).

[38] Financial flows between Russia and China lag significantly behind foreign trade flows: in 2015–2016, the share of China in the Russian foreign trade turnover was 10.1 percent, while the share of direct investments was as low as 5.4 percent.

[39] "[T]he only significant multi-billion dollar projects in which major Chinese firms take part have been Novatek's Yamal and Arctic LNG projects. (These investments, as noted above, are registered through offshore vehicles, so China does not appear in official statistics as their point of origin.) China's turn away from the acquisition of shares in oil giant Rosneft has likewise signalled concerns about getting too close to state-owned firms in Russia" (Trickett, 2019).

[40] https://europa.eu/rapid/press-release_IP-10-649_en.htm

We see fewer economic opportunities currently in connecting the *power systems*. For this to happen, substantial technical and political challenges would have to be overcome, and the benefits remain limited because the individual systems are already today quite large and diversified.

We see strong competition between Russia, China and the EU on the *global energy technology market*. Currently, this competition is less about which of the three delivers a certain type of equipment (e.g., a coal plant), but whether one technology that Europe is good at, or another that China is good at, is being deployed.

There is *competition between the EU and China for the Russian energy market*. China has so far remained relatively restrained and has mainly focused on upstream oil and gas projects. There is a risk for Russia that isolated investments by Chinese state-owned companies will reinforce the trend of Russia becoming a mere resource provider. By contrast, investments by European companies have probably led to much more positive spillovers in terms of know-how transfer, anchoring reforms that improve the business climate and diversify the economy. But some of those benefits have been lost with the rollback in Russia in recent years of the more liberal market environment in which European companies could operate competitively.

Finally we hope, that our five hypotheses:

1) There is no direct competition between EU and China for Russian oil and gas;
2) China and the EU have an interest in curbing excessive Russian energy rents;
3) The EU, Russia and China compete on the global energy technology market, but specialize in different technologies;
4) Intercontinental electricity exchange is unlikely;
5) Russia seems more worried about Chinese energy investment with strategic/political goals, than about EU investment;

can be a useful basis for discussion.

Economic relations are already difficult as the EU, Russia and China follow quite different economic, legal and regulatory models — but politically motivated economic sanctions between the EU and Russia, concerns over Russian use of financial and energy resources for political purposes and concerns over politically motivated investments by Chinese companies in strategic sectors in the EU and Russia further amplify the differences.

Hence economic policy tools such as trade and investment agreements or regulatory harmonization find their limits in the larger political landscapes — that are not to be discussed in this paper. Within these political framework conditions, we see no reason for the EU to relinquish a self-interested energy policy focused on pushing hydrocarbon import prices lower, exporting EU energy technology and conducting profitable investments. Due to the quickly shifting and very uncertain future demand and supply in the energy sector, this will be largely based on transactional basis than long-term strategic alliances.

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