COLUMBIA | SIPA
Center on Global Energy Policy

HOW SANCTIONS ON RUSSIAN CRUDE OIL COULD IMPACT MARKET SHARE FOR MAJOR REGIONAL SUPPLIERS

BY KAUSHIK DEB AND ABHIRAM RAJENDRAN
MAY 2022

Many countries have condemned Russia's invasion of Ukraine, and have sought to impose sanctions against the country. Increasingly, these sanctions are targeting Russia's revenue-producing energy sector. The United States, the United Kingdom, Australia, and Canada are the only countries that have announced sanctions against Russian oil imports,[1] while Germany said it plans to eliminate such imports this year.[2] Although the European Union has not yet collectively included oil in its sanctions list (which includes coal), it has announced plans to reduce its reliance on Russian oil and gas.[3] The REPowerEU plan focuses on diversifying the European Union's natural gas import portfolio, but no targets have been set for how much Russian oil to ban and by when.

In general, the continued conflict is likely to result in a Western sanctions regime that eventually includes oil, even if there are some exemptions or carveouts for smaller importers like Hungary and Slovakia.[4] In the medium to long term, North American and European buyers could permanently pare back purchases of Russian supply to continue to mark the Putin regime's pariah status internationally and insulate against the weaponization of Russian energy exports, as has happened with Russian gas exports to Poland and Bulgaria.[5] Western oil and shipping companies are already "self-sanctioning" Russian cargoes, as evidenced by reports that no European customer bid for Rosneft PJSC's tenders for May and June 2022 deliveries.[6]

All the countries aligned with the Western sanctions regime together import about 3 million barrels per day (b/d) of crude from Russia.[7] A quarter of this crude export to Europe is via the Druzhba pipeline system,[8] and the remaining via tankers.[9] Plans are underway for replacing nearly all of the crude with other sources, except for 500,000 b/d that LUKOIL's

Neftohim Burgas in Bulgaria and Rosneft's PCK Schwedt refinery in Germany are still getting from Russia.[10] If the remaining 2.5 million b/d of Russian crude oil exports to the Western Hemisphere are formally sanctioned, two questions emerge:

1. How can the West fill such a large gap?
2. Can the sanctioned Russian crude find a new home?

These questions will shape the future market share of oil supplying regions and the price of crude oil.

Who Can Fill the Gap in Europe?

The growing sanctioning of Russian crude from the West will have limited impact on some countries such as the United States, Canada, and Australia, which import little or no crude from Russia. The ramifications for the European market will be much more significant. Pre-war, Russia accounted for close to 30 percent of Europe's crude oil imports, by far the largest supplier and close to 2.5 times the size of the next largest single country: the US (see Table 1). The European Commission is actively pursuing a phasing out of Russian crude oil within six months and refined oil by the end of the year, except for those carveouts for some smaller members. If successfully enacted, Europe will continue to purchase Russian crude for a large part of the rest of 2022 but look to gradually find other suppliers to offset 2.5 million b/d of Russian imports.

Table 1: European crude imports, 2020

Country/region	Million b/d
Russia	2.70
Others in the Commonwealth of Independent States[11]	1.29
West Africa	1.28
US	1.13
Iraq	0.88
Saudi Arabia	0.82
North Africa	0.62
South and Central America	0.24
Mexico	0.17
Canada	0.09
Kuwait	0.05
Others in the Middle East	0.03
Others in the world	0.01

Source: BP, Statistical Review of World Energy 2021, 70th ed., 2021, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf.

Producers around the Atlantic basin (including the Americas and West Africa) could offer some incremental supply. The regions exported just under 3 million b/d to Europe in 2020, out of which 1.1 was from the US. In the US Energy Information Administration's Short Term Energy Outlook forecast, the US is likely to increase crude production by more than 1 million barrels per day between March and December 2022.[12] Much of this increase will come from "light sweet" tight oil that is not a direct substitute for the "medium sour" Urals oil blend that Russia exports to Europe.[13] While there is some potential for increasing the US light sweet exports to Europe, it is unlikely to be able to replace a very large proportion of Russian exports and will require blending with imports from other sources. Canadian crude production, a better alternative in terms of substitution, is growing, but there are constraints in export infrastructure capacity. Some Latin American production is also closer to Urals oil, but these producers are either very small (Ecuador, Columbia, Cuba) or face structural issues that have impacted their production, such as in Venezuela.[14]

Crude production in West Africa appears to be in structural decline, falling by nearly 1.8 million b/d between 2010 and 2020, and is unlikely to respond to this challenge.[15] Overall, production increases from around the Atlantic basin are likely to be only gradual over the course of 2022, limiting the spare volumes available for Europe.

This leaves core OPEC in the Middle East to play a key role in filling the remainder of the hole from lost Russian supply. Some of the largest suppliers of crude to the EU before the Russian war in Ukraine included Saudi Arabia and Iraq, both exporting about 0.8–0.9 million b/d to Europe.[16] Large OPEC members, such as the UAE and Kuwait, will have an opportunity to sell meaningfully greater amounts to Europe in today's climate. However, this would require a redirection of volumes currently exported elsewhere, including perhaps India and China. This could also be a short-term strategy, especially if the Middle East does not want to compete with discounted Russian crude. From a crude quality standpoint, replacing Russian imports with Arab, Basrah, and even Kuwaiti grades would be better like-kind substitutions than with US oil.[17]

The issue of shifting market share could become important over the medium to long term. Oil demand in Europe has declined by 17 percent between 2010 and 2020, and has likely already peaked. On the other hand, growth in developing countries in Asia, and in particular in China and India, continues to be robust. In the International Energy Agency World Energy Outlook 2021, growth in oil consumption in this region far exceeds everywhere else, both today and in all scenarios.[18] Thus, over time the large Middle Eastern oil producing countries would want to maintain their market share in Asia, also because these producers have historically been able to charge a higher price in the Asian market compared to elsewhere.

Finally, while all of these suppliers will play an incremental role in filling the void created by the sanctioning of Russia oil purchases into Europe, it is also likely that demand reduction will continue in the region, both because of high prices as well as policies encouraging less use. Exemptions from any EU decision-making could also mean that some marginal amount of Russian crude continues to flow into certain countries well beyond this year.

Impact on Russian Supply

Russian crude production has, by several reports, fallen by as much as 1 million b/d.[19] As the European sanctioning/embargo takes shape and includes International Oil Companies (IOCs) and service providers, this loss could grow to 1.5 million b/d (or potentially higher).[20] Over the medium and longer term, an exiting or limiting of investments from IOCs and oilfield service companies (who bring invaluable expertise and investment, especially to Russia's harder-to-manage fields, as well as technology and equipment) will lead to a reduction in production capacity. Underinvestment and poor management of the upstream oil sector following the collapse of the Soviet Union in 1991 resulted in Russian production falling by over 35 percent between 1990 and 2000, with a decline of 10 percent in the first year itself. In the current context, Russia's crude production pre-war was over 10 million barrels a day, a figure could that is set to drop below 9 in the very near future.[21] As Russian production capacity declines and eventually its crude exports to Asia start to hit limits, the large Middle East producers could start reclaiming their market share in Asia and the lower crude production globally would result in a "higher for longer" price outcome. If crude importing countries respond to a high oil price with significantly lower demand, investments in developing new fields in upstream oil are unlikely to increase. If crude importing countries find it difficult to reduce and substitute their oil consumption, the oil industry could very well be at the beginning of a new expansionary cycle of increased investment in finding and developing new oil resources.

A New Home for Russian Oil?

Of the total 2.5 million barrels a day of Russian supply impacted by Western sanctions and embargoes, around 1–1.5 million b/d will likely be shut-in, as explained earlier. Therefore, the other approximately 1–1.5 million would need to be rerouted. The only other region of the world with comparable volumes of crude are the developing countries in Asia, and in particular, China and India. Non-OECD Asia imported over 20 million b/d of crude in 2020, out of which Russian crude was less than 2 million (both figures slightly higher in 2021 as post Covid-19 demand rebounded).

Opportunity in China Mostly Involves Independent Refiners

Russia is already one of the largest crude oil exporters to China, a close second to Saudi Arabia, with each accounting for about 15 percent of China's oil imports, or 1.6 million b/d each.[22] It has been reported that Russian crude is being offered to China at very steep discounts. Despite that, the increase in Russian oil exports to China is reported to be less than 100,000 b/d,[23] including imports to build more strategic reserves.[24] Over time, China could increase imports of Russia oil by a few hundred thousand more barrels a day, but it is unlikely to exceed this amount without larger-scale investments in developing new refining and transport infrastructure.

State-owned trading firms in China have reportedly declined to sign new supply contracts of Russian crude.[25] If so, the primary opportunity then available in China is with independent refiners, which imported about 3.3 million b/d in 2021, down from 3.5 million in 2020.[26] These companies are allocated fixed quotas of how much crude they can import, and China's

Ministry of Commerce has successively reduced these volumes for the last three years, starting in 2020.[27] As a result, these independent refiners could only absorb a few hundred thousand barrels a day of additional Russian crude.

In general, China is also likely to view larger dependence on Russian crude as a threat to its energy security and would prefer to have a more diverse portfolio of suppliers, even in the most normal of years. And the current set of sanctions on Russia's financial sector and currency make a large increase in oil trade between China and Russia riskier. There is also a looming threat of secondary sanctions, such as sanctioning countries importing Russian crude, that make additional Russian barrels an uncertain long-term proposition. Lastly, the Chinese market will continue to be well-supplied by Middle East producers. Conversely, longer-term opportunities with Russia could include expanding the East Siberia-Pacific Ocean pipeline and Russia's Kozmino terminal, but these would be costly and take multiple years.

India Might Buy All the Cheap Crude It Can

India is the world's third largest importer of crude from the Middle East—led by Iraq, Kuwait, Saudi Arabia, and the UAE—accounting for about 65 percent of the total crude imports to India in 2020. Imports from Russia, at 43,000 b/d in 2021,[28] are a very small proportion of India's crude import basket—less than 1.5 percent—and down from 50,000 in 2020.[29] Since the war began, and with the US and others sanctioning Russian oil exports, very significant discounts are being offered on Russian crude. These discounts have prompted Indian refiners to ramp up imports from Russia, totaling 40 million barrels so far in 2022,[30] or up to a fairly sizable 500,000 b/d. The opportunity for Russian crude in India is to replace at least some of the barrels arriving from the Americas and West Africa, which in 2020 totaled 1.2 million b/d (higher in 2021). However, these are likely very different grades of crude oil than Russian Urals oil. Nevertheless, there is some potential for increased Russian flows into India with some refiners able to process "all types of crude".[31]

The authors estimate that the nearly 3 million b/d of refining capacity in India that could potentially process Russian crude is mostly being served by Middle East suppliers. The large discounts on Russian crude are helping Indian refiners offset the higher prices offered by its Middle Eastern suppliers. For instance, Saudi Aramco sets prices for the crude it sells in Asia at a premium over the market determined benchmark of Oman/Dubai, and this premium hit a record high for May 2022 deliveries.[32] If the Russian discounts were to continue and the price of Russian crude arriving at Indian ports remains lower than imports from the Middle East and other suppliers, Indian refiners would likely continue to increase Russian crude purchases. The Indian Ministry of Finance,[33] Ministry of External Affairs,[34] and Ministry of Petroleum and Natural Gas[35] have all stated that India will continue to import Russian crude as long as it is cheaper than the competition. Middle East suppliers have subsequently had to adjust pricing (lower premiums) to get more competitive with the Russian discount dynamic to retain market share. This might change if secondary sanctions are announced targeting importing countries, or if Russia's ability to produce, export, and transport crude is affected.

Another aspect of the Indian oil sector that is supportive of more trade with Russia is the investments by Indian oil companies in Russia. ONGC Videsh Limited (OVL), a subsidiary of Indian state-owned ONGC, is part of the consortium developing the Sakhalin-1 project in

Russia for equity oil and hence is responsible for selling its share of crude oil produced from that project. OVL also owns a 26 percent stake in the Vankor field in Russia. On the Russian side, Rosneft owns 49 percent of Nayara Energy in India, which includes the Vadinar refinery—the second largest in India—and a network of 2,700 Essar-branded petrol stations.[36]

Other non-OECD Asia-Pacific Countries

Other countries in the Asia-Pacific region that have not yet announced sanctions against Russia and are not strongly aligned with countries doing so, have a similar crude import profile to India: the Middle East dominates the import portfolio (67 percent of the total), with other notable suppliers being the US (10 percent) and Africa (8 percent). Russia accounts for only 4 percent of the region's imports, and the region could buy a small number of additional cargoes over time.

There have not been notable actions in the region to increase Russian imports, though, except in Indonesia, where the national oil company, Pertamina, asked for permission to buy Russian crude. The other country in the region with oil ties to Russia is Vietnam; its national oil company, PetroVietnam, has a 49 percent stake in Rusvietpetro.

Conclusion

If the next round of Western sanctions includes banning Russian crude oil from most of Europe and North America, as expected, at least 2.5 million barrels per day of Russian crude exports would be affected. Of this, around 1–1.5 million could find its way to developing countries in Asia, in particular China and India in the short and medium term, at considerable discounts. The remaining 1–1.5 million could be at risk of permanent supply/capacity impairment; there are signs of sizable production shut-in already.

The outcome for displaced Russian oil will depend partially on whether Asia's largest suppliers in the Middle East decide not to compete with discounted supplies and instead fill the crude oil gap in Europe. Over time, Western sanctions on Russia could degrade Russia's crude production capacity and exports. The Middle East could then start to reclaim its market share in developing Asia, and possibly at a higher price if some of Russia's crude capacity and exports are permanently lost.

Notes

1. "Tracking sanctions against Russia," Reuters Graphics, May 12, 2022, accessed May 14, 2022, https://graphics.reuters.com/UKRAINE-CRISIS/SANCTIONS/byvrjenzmve/.

2. "We will be at zero by the end of the year,'" Der Spiegel, April 21, 2022, https://www.spiegel.de/wirtschaft/annalena-baerbock-gruene-will-ende-2022-kein-oel-mehr-aus-russland-importieren-a-76dadd3f-b453-4ab7-8e55-c6e73d351013?utm_source=dlvr.it&utm_medium=twitter#ref=rss.

3. Josep Borrell Fontelles (@JosepBorrellF), "Russia's Unprovoked War against Ukraine Affects Global Security. We Are Working on the 6th Package of Sanctions Which Aims to

De-Swift More Banks, List Disinformation Actors and Tackle Oil Imports. These Measures Will Be Presented to the Council for Approval." Twitter, May 3, 2022, https://twitter.com/JosepBorrellF/status/1521490927663173638?s=20&t=p2tmTO1N0oKr7-g0RWeFYg.

4. Jacopo Barigazzi, Barbara Moens, and Leonie Kijewski, "EU considers shelving ban on Russian oil as Hungary blocks sanctions," Politico, May 12, 2022, https://www.politico.eu/article/eu-considers-shelving-ban-on-russia-oil-as-hungary-viktor-orban/.

5. Tsvetelia Tsolova and Anna Koper, "Europe Decries 'Blackmail' as Russia Cuts Gas to Poland, Bulgaria," Reuters, April 27, 2022, https://www.reuters.com/business/energy/gazprom-says-it-halts-gas-supplies-poland-bulgaria-payments-row-2022-04-27/.

6. Sherry Su, , "Russia's Rosneft Fails to Award Big Oil Tender With Buyers Wary," Bloomberg, April 25, 2022, https://www.bloomberg.com/news/articles/2022-04-25/russia-s-rosneft-fails-to-award-big-oil-tender-with-buyers-wary.

7. BP, *Statistical Review of World Energy 2021*, 70th ed., 2021, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf.

8. For more details about this pipeline network, see International Association of Oil Transporters, "Druzhba Pipeline," https://www.iaot.eu/en/oil-transport/druzhba-pipeline.

9. IEA, "Energy Fact Sheet: Why Does Russian Oil and Gas Matter? – Analysis," March 21, 2022, https://www.iea.org/articles/energy-fact-sheet-why-does-russian-oil-and-gas-matter.

10. LUKOIL's Neftohim Burgas and Rosneft's PCK Schwedt refinery are continuing to buy Russian crude and have not announced any plans to substitute or eliminate imports via the Druzhba system; "Factbox: Who Is Buying Russian Crude Oil and Who Has Stopped," Reuters, May 12, 2022, https://www.reuters.com/business/energy/who-is-still-buying-russian-crude-oil-2022-03-21/.

11. Includes Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

12. US Energy Information Administration, "Short-Term Energy Outlook," May 5, 2022, https://www.eia.gov/outlooks/steo/.

13. For definitions, see Szymon Wlazlowski, Björn Hagströmer, and Monica Giulietti, "Causality in crude oil prices," *Applied Economics* 43, no. 24, 3337–3347, https://www.tandfonline.com/doi/abs/10.1080/00036841003636250?journalCode=raec20; Platts periodic table of oil, accessed May 14, 2022, https://www.spglobal.com/commodityinsights/plattscontent/_assets/_files/downloads/crude_grades_periodic_table/crude_grades_periodic_table.html.

14. Luisa Palacios and Francisco Monaldi, "Venezuela Oil Sanctions: Not an Easy Fix," Center on Global Energy Policy, https://www.energypolicy.columbia.edu/research/commentary/venezuela-oil-sanctions-not-easy-fix.

15. OGJ editors, "Rystad: West Africa's crude output in lasting decline," *Oil and Gas Journal*, November 5, 2021, https://www.ogj.com/general-interest/economics-markets/article/14213539/rystad-west-africas-crude-output-in-lasting-decline.

16. BP, *Statistical Review of World Energy 2021*, 70th ed., 2021, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf.

17. Platts periodic table of oil, accessed May 14, 2022, https://www.spglobal.com/commodityinsights/plattscontent/_assets/_files/downloads/crude_grades_periodic_table/crude_grades_periodic_table.html.

18. IEA, *World Energy Outlook 2021 – Analysis*, October 2021, https://www.iea.org/reports/world-energy-outlook-2021.

19. "How to Make Sense of Russia's Contradictory Oil Data," Bloomberg, April 29, 2022, https://www.bloomberg.com/news/articles/2022-04-29/how-to-make-sense-of-russia-s-contradictory-oil-data; Jill Junnola, Gary Peach, and John van Schaik, "Russia Redirects Energy Strategy," Energy Intelligence, April 28, 2022, https://www.energyintel.com/00000180-52d1-dcd6-afe5-57ff12c50003.

20. "How to Make Sense of Russia's Contradictory Oil Data," Bloomberg, April 29, 2022, https://www.bloomberg.com/news/articles/2022-04-29/how-to-make-sense-of-russia-s-contradictory-oil-data.

21. Jill Junnola, Gary Peach, and John van Schaik, "Russia Redirects Energy Strategy," Energy Intelligence, April 28, 2022, https://www.energyintel.com/00000180-52d1-dcd6-afe5-57ff12c50003.

22. BP, *Statistical Review of World Energy 2021*, 70th ed., 2021, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf.

23. "China's Independent Refiners Start Buying Russian Oil at Steep Discounts," Financial Times, May 3, 2022, https://www.ft.com/content/4f277a24-d681-421a-9c94-29d6fd448b20.

24. "China in Talks with Russia to Buy Oil for Strategic Reserves," Bloomberg, May 19, 2022. https://www.bloomberg.com/news/articles/2022-05-19/china-in-talks-with-russia-to-buy-oil-for-strategic-reserves-l3cusjp0.

25. "Exclusive: China state refiners shun new Russian oil trades, teapots fly under radar" Reuters, April 6, 2022. https://www.reuters.com/business/energy/exclusive-china-state-refiners-shun-new-russian-oil-trades-teapots-fly-under-2022-04-06/.

26. "China Allocates Last Batch of Crude Import Quotas for 2021 at 14.89 Million Mt," S&P Global Commodity Insights, October 15, 2022, https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/oil/101521-china-allocates-last-batch-

of-crude-import-quotas-for-2021-at-1489-million-mt.

27. Ibid.

28. Nidhi Verma, "India's Russian Oil Purchases since Ukraine Invasion More than Double 2021 Total," Reuters, April 25, 2022, https://www.reuters.com/world/india/indias-russian-oil-purchases-since-ukraine-invasion-more-than-double-2021-total-2022-04-25/.

29. BP, *Statistical Review of World Energy 2021*, 70th ed., 2021, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf.

30. Nidhi Verma, "India's Russian Oil Purchases since Ukraine Invasion More than Double 2021 Total," Reuters, April 25, 2022, https://www.reuters.com/world/india/indias-russian-oil-purchases-since-ukraine-invasion-more-than-double-2021-total-2022-04-25/.

31. Debjit Chakraborty and P R Sanjai, "Billionaire Ambani's refinery makes millions from war windfall," Bloomberg, May 7, 2022, https://www.bloomberg.com/news/articles/2022-05-07/billionaire-ambani-s-refinery-makes-millions-from-war-windfall.

32. "Saudi Aramco Raises May Crude Osps to Highest-Ever Level," S&P Global Commodity Insights, April 4, 2022, https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/oil/040422-saudi-aramco-raises-may-crude-osps-to-highest-ever-level.

33. "India to Continue Oil Purchases from Russia - Finance Minister," Reuters, April 1, 2022, https://www.reuters.com/business/energy/india-continue-oil-purchases-russia-finance-minister-2022-04-01/.

34. Ibid.

35. Krishna N. Das, "India Says Sudden Halt to Russian Oil Imports Would Hurt Citizens," Reuters, May 4, 2022, https://www.reuters.com/world/india/india-says-sudden-withdrawal-russian-oil-purchases-will-lift-prices-2022-05-04/.

36. Vasily Shikin and Amit Bhandari, "Russia – India Energy Cooperation: Trade, Joint Projects, and New Areas," Russian International Affairs Council and Gateway House, October 2017, https://www.gatewayhouse.in/wp-content/uploads/2017/10/GH-RIAC_Russia---India-Energy-Paper_Web_2017.pdf.

About the Authors

Kaushik Deb is a Senior Research Scholar at the Center on Global Energy Policy at Columbia University's School of International and Public Affairs, where his research focuses on policies to achieve a just and efficient energy transition in developing countries, especially the role of oil and gas markets. Prior to joining the Center, Kaushik led the Markets and Industrial Development Program at the King Abdullah Petroleum Studies and Research Center in Riyadh, managing the Center's engagement with Saudi Arabia's Ministry of Energy in supporting

the development of short and long term strategies for oil and gas markets to achieve the Kingdom's energy sector objectives.

Before this, Kaushik was the Head, Global Gas Markets in Group Economics in BP overseeing analysis that formed the basis for the investment and trading strategy of the company in natural gas. He also led the gas sections of BP's flagship publications, the Statistical Review of World Energy and the Energy Outlook. Prior to BP, at IDFC (now IDFC Bank), his portfolio included policy research and advocacy on infrastructure and environmental economics issues such as low carbon infrastructure, decentralized electricity services in rural areas, and organized intermediate public transport systems for small towns. He has also guided and implemented research in applied economics in TERI (The Energy and Resources Institute) and was the Programme Director of the MBA Programmes at TERI University.

Kaushik has a Doctor of Science degree from ETH Zürich and a Master of Arts in Economics from the Delhi School of Economics.

Abhi Rajendran is an Adjunct Research Scholar at Columbia University's Center on Global Energy Policy. In his full-time capacity, he is a Director of Research & Advisory at Energy Intelligence. He leads the firm's North America-focused research practice, and is also responsible for identifying/analyzing key trends and themes across global energy sub-sectors and commodities ranging from upstream, midstream, oilfield services to downstream (refining, LNG and petrochemicals).

Prior to joining Energy Intelligence in July 2017, Mr. Rajendran spent two years as an investor in the following sectors -- Energy (E&Ps, OFS, Infrastructure/MLPs, Majors/Integrated), Renewables, Refining and Chemicals (Petrochemicals, Specialty Chemicals). Mr. Rajendran also spent over seven years as a sell-side equity research analyst, including five at Credit Suisse where he was a lead analyst for the MLP/Infrastructure/LNG sectors and also covered Chemicals.

Mr. Rajendran earned a bachelor of arts in Computer Science & Economics from Cornell University and holds a master of science in Information Systems Management from Carnegie Mellon University.

ABOUT THE CENTER ON GLOBAL ENERGY POLICY

The Center on Global Energy Policy at Columbia University SIPA advances smart, actionable and evidence-based energy and climate solutions through research, education and dialogue. Based at one of the world's top research universities, what sets CGEP apart is our ability to communicate academic research, scholarship and insights in formats and on timescales that are useful to decision makers. We bridge the gap between academic research and policy — complementing and strengthening the world-class research already underway at Columbia University, while providing support, expertise, and policy recommendations to foster stronger, evidence-based policy. Recently, Columbia University President Lee Bollinger announced the creation of a new Climate School — the first in the nation — to tackle the most urgent environmental and public health challenges facing humanity.

Visit us at www.energypolicy.columbia.edu

@ColumbiaUEnergy

ABOUT THE SCHOOL OF INTERNATIONAL AND PUBLIC AFFAIRS

SIPA's mission is to empower people to serve the global public interest. Our goal is to foster economic growth, sustainable development, social progress, and democratic governance by educating public policy professionals, producing policy-related research, and conveying the results to the world. Based in New York City, with a student body that is 50 percent international and educational partners in cities around the world, SIPA is the most global of public policy schools.

For more information, please visit www.sipa.columbia.edu