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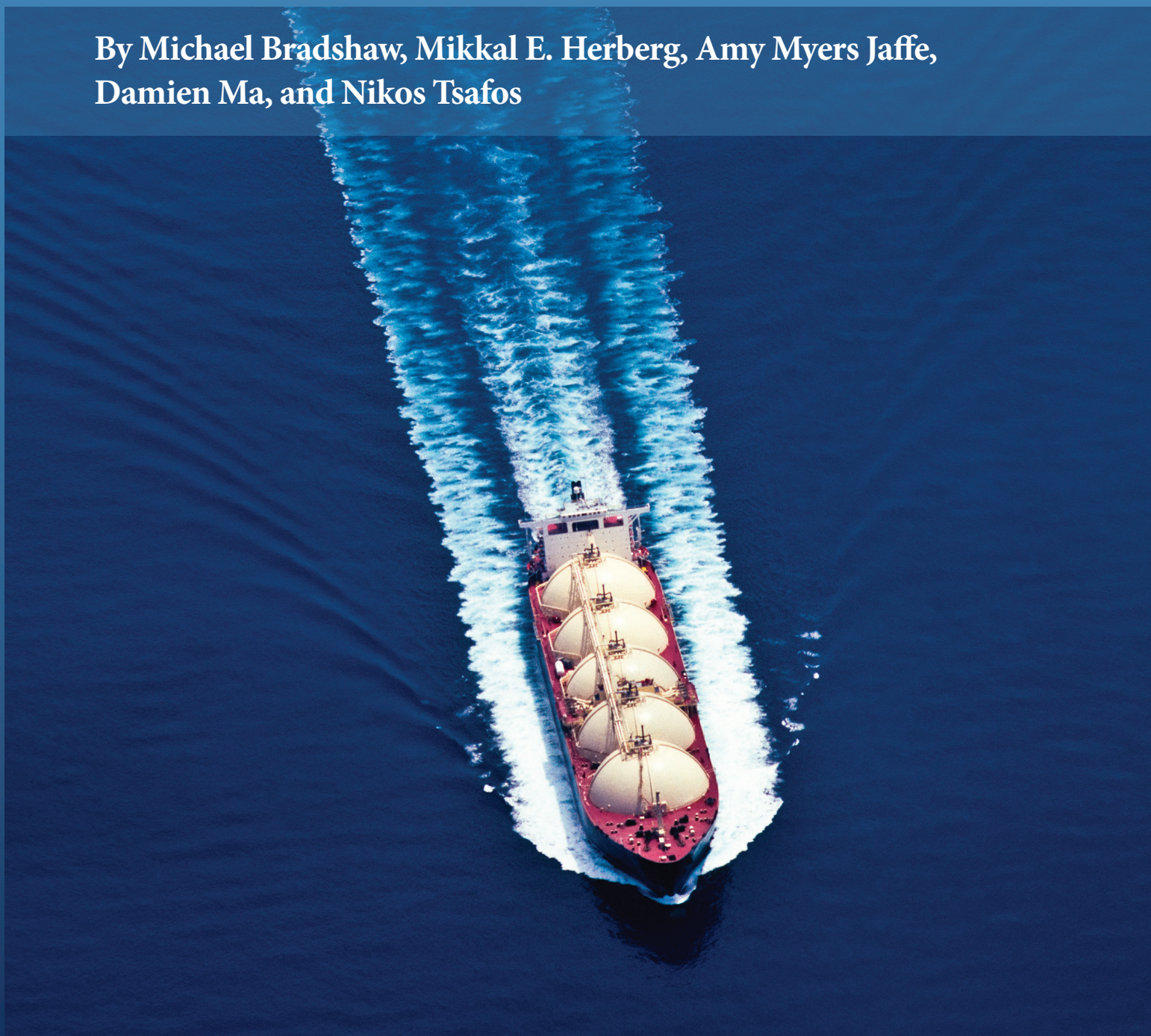
NBR SPECIAL REPORT #44 | NOVEMBER 2013

ASIA'S UNCERTAIN LNG FUTURE

By Michael Bradshaw, Mikkal E. Herberg, Amy Myers Jaffe, Damien Ma, and Nikos Tsafos



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Introduction

Mikkal E. Herberg

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Asia's incredible economic growth has powered an enormous increase in energy demand over the past two decades. The region has now become "ground zero" for global energy demand growth. Demand for every fuel type and energy source has soared to meet skyrocketing consumption and to prevent energy from becoming a bottleneck to economic growth and job creation. As demand has risen, Asia's dependence on imported supplies has increased as well. While this has led to new and deeper trade ties between Asia and its neighbors, such import dependence has also fostered regional anxieties—particularly among policymakers wary that it will increase regional vulnerabilities to global market shocks. For both policymakers and consumers across the region, energy security thus remains not only a critical strategic and economic concern but increasingly an issue defined by the search for reliable and affordable supplies.

In this search for greater energy security, Asia has rising hopes that natural gas can become a key component of its future energy mix. Indeed, there is enormous scope for the region to increase its gas use and benefit from lower emissions and energy-supply diversification. While natural gas use in Asia has been rising sharply in recent years, natural gas overall is still relatively underutilized. For example, outside Asia, natural gas makes up 30% of global energy use, whereas within the region gas makes up only 11.3% of total energy use. In part this is because of China's very low gas share of only 5% of total energy in 2012. But even excluding China, the region's gas share is still only 19%.[1]

As Asia seeks to expand its use of natural gas, demand for liquefied natural gas (LNG) will grow. Much of the gas it does use comes in the form of imported LNG, due to the long maritime distances in Asia that separate markets from supplies. In fact, the region has traditionally accounted for two-thirds of the global LNG market. Japan and South Korea alone have been the large base-load buyers of LNG, typically accounting for over half the global LNG market. And Asia's overall LNG consumption is expected to grow dramatically over the next twenty years as China and India boost their LNG imports and as Japan and South Korea substitute LNG for declining use of nuclear energy. Even Southeast Asia, traditionally a significant exporter of natural gas to Northeast Asia, is seeing a dramatic shift in consumption and will also become increasingly dependent on imported LNG.

This relatively rosy picture for LNG demand is, however, highly uncertain. Perhaps most importantly, China's potential LNG demand depends on many factors, including the scale of pipeline gas imports from Central Asia and Russia, the future of potential shale gas production inside China, domestic demand policies, and the pace of domestic gas price and industry reform. In terms of volume, China's choices could have the single largest impact on the region's future LNG demand levels. Japan's future LNG demand depends heavily on the very uncertain pace and scale of the return of nuclear power generation in the wake of the Fukushima nuclear disaster. South Korea also faces resistance to expanded nuclear use and uncertainty over possible pipeline gas supplies from the Russian Far East that weigh heavily on future projections of LNG demand. The pace of growth in LNG use in Southeast Asia and India is likewise subject to wide variability.

On the supply side, there is also significant uncertainty about the extent to which Asia can rely on LNG to meet its future gas needs. Major new supplies are expected over the next decade from Australia, Russia, the United States (including potentially Alaska), Canada, and offshore East Africa, and there are further possible new supplies from the Persian Gulf. Australia's new projects put the country on track to become the largest LNG exporter in the world by 2020, but further expansion is threatened by rising cost pressures. Potential U.S. and Canadian LNG exports to Asia have been stalled by domestic politics, objections from indigenous populations, and environmental constraints.

[1] All figures in this paragraph are from BP plc, "BP Statistical Review of World Energy," June 2013.

Potential LNG supplies from the Russian Far East remain subject to opaque Kremlin energy politics and competition between Russia's two major state energy firms—Gazprom and Rosneft. Finally, Persian Gulf supplies are, as always, threatened by chronic geopolitical uncertainty.

Moreover, the future of Asia's LNG consumption and supply growth will depend heavily on the evolution of LNG prices. The region's current LNG prices, because they are linked to sky-high oil prices, are nearly four times U.S. natural gas prices and almost double average European natural gas prices. Asian LNG consumers, especially in Japan and South Korea, are thus looking for more competitive prices. A key benefit of potential new LNG imports from the United States would be the introduction of competitive hub-based gas pricing that eventually could help reduce Asia's high LNG prices.

Hence, growth in LNG could bring enormous benefits to Asia in terms of energy security and supply diversification, as well as a cleaner energy mix. Nevertheless, as the preceding discussion illustrates, there are major uncertainties in the outlook for LNG markets and pricing, as well as in the domestic politics and geopolitics of LNG.

To address these issues, the National Bureau of Asian Research (NBR) organized its ninth annual Energy Security Workshop in Washington, D.C., on June 21, 2013. Building on NBR's ongoing initiative to bring together policymakers, industry leaders, and key stakeholders concerned with Asia's energy future, the annual workshop convenes senior specialists for high-level discussions on the future of Asian energy markets. The arguments presented at this event are then used to inform discussion throughout the year, as well as in this final report. This year's program—"Asia's Uncertain LNG Future"—focuses on the implications of growing LNG consumption and production for regional energy security in the Asia-Pacific. As in past years, we are grateful for the generous support of our sponsors—the Asian Development Bank, Chevron, ConocoPhillips, and ExxonMobil—whose contributions enable us to examine the central energy-security challenges facing the United States and the Asia-Pacific today.

To explore these themes in depth, NBR commissioned four essays to generate program discussions, which then built on the insights from the workshop. Each essay addresses a key issue in the emerging Asian LNG landscape: (1) the changing nature of Asia's LNG market supply and demand, (2) the geopolitics of growing LNG use in the region's major gas importers, (3) the production and geopolitical outlook for its big LNG suppliers, and (4) the implications for Asia's energy security of the growing energy abundance in the United States. This NBR Special Report includes these four essays along with a concluding essay drawing together some of the key conclusions from the overarching program.

In the opening essay, Nikos Tsafos of PFC Energy/IHS provides a superb overview of Asia's overall natural gas and LNG markets to establish a strong foundation for the report. Tsafos identifies several key trends. First, Asia's gas market is highly diverse, comprising large net importers like Japan and South Korea, countries in the middle like China that produce most of their gas but are also growing importers, and the traditional net exporters of LNG such as Indonesia and Malaysia. Second, while Asia increasingly relies on supplies from outside the region, including from the Middle East, over time it is benefiting from an increasingly diversified set of LNG suppliers that is strengthening the region's LNG supply security. Third, high LNG prices represent a growing financial drain on importers, with Japan being especially hard hit by rising prices and import volumes. Partly because of this trend, Asia's LNG importers are actively supporting their national oil companies to go out and invest in the next large tranche of LNG projects as a way to strengthen supply security and,

hopefully, reduce prices. Fourth, Tsafos believes that LNG supplies should be ample over the next decade, meaning that LNG will accelerate the move away from coal and biomass and thus offer significant environmental benefits. Importantly, China is likely to be the place where LNG and pipeline gas converge on the continent, potentially giving Beijing an important pricing role for gas. Finally, Tsafos argues that more "Western" gas from the United States, Canada, and Australia will be beneficial in terms of diversification, while the potential for Russian supplies remains very unclear due to uncertainty about Kremlin energy politics.

Next, Damien Ma from the new Paulson Institute provides an excellent overview of the LNG outlook for China, which could become the largest swing importer of LNG over the next two decades. Ma suggests that Beijing has very aggressive plans to increase natural gas use for both environmental and energy-security reasons. China will be able to access large gas supplies by pipeline from Central Asia, Myanmar, and possibly Far East Russia, and domestic gas production is expected to rise significantly. Yet given the demand outlook and the scale of the government's goals, China will likely also require large imports of LNG. With this in mind, Beijing is encouraging state energy companies to invest in LNG projects overseas, as well as seeking a very diversified set of suppliers to reduce risk. Ma argues, however, that there are strong political concerns in Beijing about relying on U.S. LNG supplies and that Chinese companies have chosen to be more active in Canada and Australia as a result.

In the third essay, which addresses LNG supply issues, Michael Bradshaw of the University of Leicester in the United Kingdom provides an excellent overview of the outlook for potential Russian Far East LNG supplies to Asia. Russia is already a significant LNG supplier through the Sakhalin-2 project by Shell-Gazprom, but gas resources in the Russian Far East could support huge new pipeline and LNG supplies to Asia. The challenge is to sort out the conflicting agendas among the Kremlin, Gazprom, Rosneft, and other key players over the priorities for various projects. Gazprom has developed the Eastern Gas Program for Asia, but a linchpin for that plan is the construction of a large gas pipeline to China that has been under negotiation for over a decade, with no firm deal in sight. As a result, Gazprom and Rosneft are increasingly competing to control the Sakhalin and other Far East gas resources that would supply various possible LNG projects. Expansion of the Sakhalin-2 project, the most commercially viable plan, has been blocked by Gazprom's preference for a new and wildly expensive LNG plant in Vladivostok that is backed by President Vladimir Putin for political reasons, including promoting regional development. A Rosneft-ExxonMobil plan for a new LNG plant based on ExxonMobil's Sakhalin-1 project is likewise uncertain because of resistance from Gazprom, which wants to control that gas supply for use at Vladivostok. Hence, it remains unclear which of these projects will move forward, and as a result, Asia is not very confident about the scale of future Russian LNG supplies.

In the final essay, Amy Myers Jaffe from the Energy and Sustainability Initiative at the University of California–Davis analyzes the geopolitical implications of the increasing oil and natural gas production in the United States and the country's growing self-sufficiency. Some have suggested that declining dependence on energy imports could lead the United States to become more isolationist and gradually turn away from its historical role in shaping the Middle East and global energy geopolitics. Jaffe argues, on the contrary, that energy self-sufficiency will allow the United States to pursue a more active agenda for global energy security. Declining dependence will open the possibility for creative leadership by the United States on energy matters, ranging from using its large emergency oil stocks to assist allies to being better able to pursue human rights and democratization.

Washington will no longer need to plead with allies or oil exporters to cooperate on global supply issues or the use of energy sanctions as a diplomatic tool. Jaffe thus argues for a new national dialogue on foreign policy that recognizes the United States' growing energy and economic strengths and ability to shape events abroad.

Overall, the four essays in this report paint a picture of Asia as a region where LNG will be an increasingly vital component of energy security while also strengthening the environmental outlook. Although there are significant uncertainties about the evolution of LNG demand, supply, and pricing in Asia, the outlook is relatively positive. The biggest uncertainties will revolve around six key questions: the outlook for Japan's LNG demand as it grapples with its nuclear demons; China's gas choices, which will drive its LNG needs; key supply uncertainties surrounding the rising cost of Australia's LNG projects; U.S. and Canadian policies on LNG exports; Russia's energy politics surrounding its large Far East gas supplies; and crucially, the evolution of LNG pricing in Asia.

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The New Geography of Asian LNG

Nikos Tsafos

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NOTE: The analysis in this essay draws on forecasts and data from PFC Energy, which is now an IHS company.

EXECUTIVE SUMMARY

This essay examines Asia's growing demand for liquefied natural gas (LNG) and explores the geoeconomic and geopolitical implications of Asia's quest to secure sufficient LNG supplies to meet its energy needs.

MAIN ARGUMENT

Asia's LNG market is being transformed by the growth in the number of buyers and sellers as well as by a wider reach that will link Asian buyers to suppliers in Australia, North America, and East Africa. The diversification of supply sources will boost Asia's energy security but will also create new linkages requiring careful political management. Much of Asia's new supply will come from Australia, the U.S., and Canada. In the recipient countries, foreign investment from Asian companies could create a backlash at the local and national levels; in the importing countries, dependence on the West could easily trigger insecurity and calls for openness and a level playing field. Thus, despite the undeniable energy-security benefit that will come from greater diversification, political oversight and management will be essential to sustain this system and contain the geopolitical fallout that such large-scale trade relationships often entail.

POLICY IMPLICATIONS

- The diversification of Asia's LNG markets will have positive effects on energy security by creating system resilience and reducing the vulnerability of buyers and sellers to individual disruptions in the supply chain.
- Despite new linkages between buyers in Asia and suppliers in Australia, North America, and East Africa, the growth in supply choice will not trigger a massive decline in prices and thus the quest to lower the import burden from energy costs will continue.
- The trade relationships created by LNG will need to be carefully managed to ensure that foreign investment does not trigger a backlash in the host countries and that importing countries—in particular, China—do not feel beholden to the West.

Demographics, economic growth, and a transition to cleaner energy will transform Asia's energy market. By 2030, Asia's population is expected to grow by 500 million, roughly the size of the European Union today.[1] Real per capita income will increase by 90% across the region and by 32% outside China and India.[2] Rising incomes will boost demand for cleaner energy. Coal is predicted to make up 45% of the fuel mix by 2030, down from 48% in 2011, and biomass will shrink from 12% to 8%. Use of nuclear energy will likely grow in China, India, and South Korea, while Japan and Taiwan will probably scale down their ambitions. In turn, natural gas's share of the fuel mix will grow from 10% to 13%; excluding China and India, gas will provide a fifth of Asia's energy.[3]

Demand for gas in Asia will thus roughly double, and this appetite will need to be met by imports from outside the region—the Middle East, Central Asia, Australia, North America, and East Africa. This new geography will create new trade flows and weaken the strategic importance of old ones, which is the inevitable byproduct of diversification. In some ways, these new flows will depoliticize energy, inasmuch as trade takes place between countries with non-energy ties. But they will also create friction as foreign investment clashes with local politics. After a decade of scarcity, Asian buyers see that gas is finally more abundant. Furthermore, Asian companies are now major investors in developing these new resources. For a region concerned about energy security, increased supply and greater control will be reassuring. Yet there are risks too. By the 2020s, Australia, Canada, and the United States could supply a third of the world's liquefied natural gas (LNG)—a trend that could worry China. The United States, in particular, will need to resist the temptation to leverage gas for political gain. It will also need to carefully manage its relationships with Canada and Australia, whose economies will be further tied to China. Oddly, it could be Russian gas that lessens these anxieties in China by offering the country a source of supply that is free of Western influence and Western-patrolled sea lanes. Either way, the era of relative abundance will require active oversight and management.

The first section of this essay presents a snapshot of the Asian gas market, focusing on the differing circumstances of individual countries in Asia. The next section reviews the supply sources to which Asian countries will turn to meet their growing demand needs and explains the relative merits of the competing suppliers. The third section outlines the geoeconomics of the LNG trade and explores both the economic implications of Asia's dependence on LNG imports and the strategies that countries employ to reduce their energy bills. The essay concludes by considering the geopolitical dimension of the new geography of LNG and the opportunities and challenges for policymakers in managing this evolving market.

A Snapshot of Asia's Gas Market

There is no such thing as an "Asian" gas market. In countries such as Bangladesh, Malaysia, and Pakistan, gas is dominant; in other countries such as China, India, the Philippines, and Myanmar, gas is marginal, providing less than 10% of total energy; and in countries such as Singapore, Japan,

[1] United Nations, "World Population Prospects: The 2010 Revision," May 2011, http://www.un.org/en/development/desa/publications/world-population-prospects-the-2010-revision.html.

[2] These projections for real per capita income are based on PFC Energy forecasts.

[3] These projections for Asia's fuel mix are based on PFC Energy forecasts.

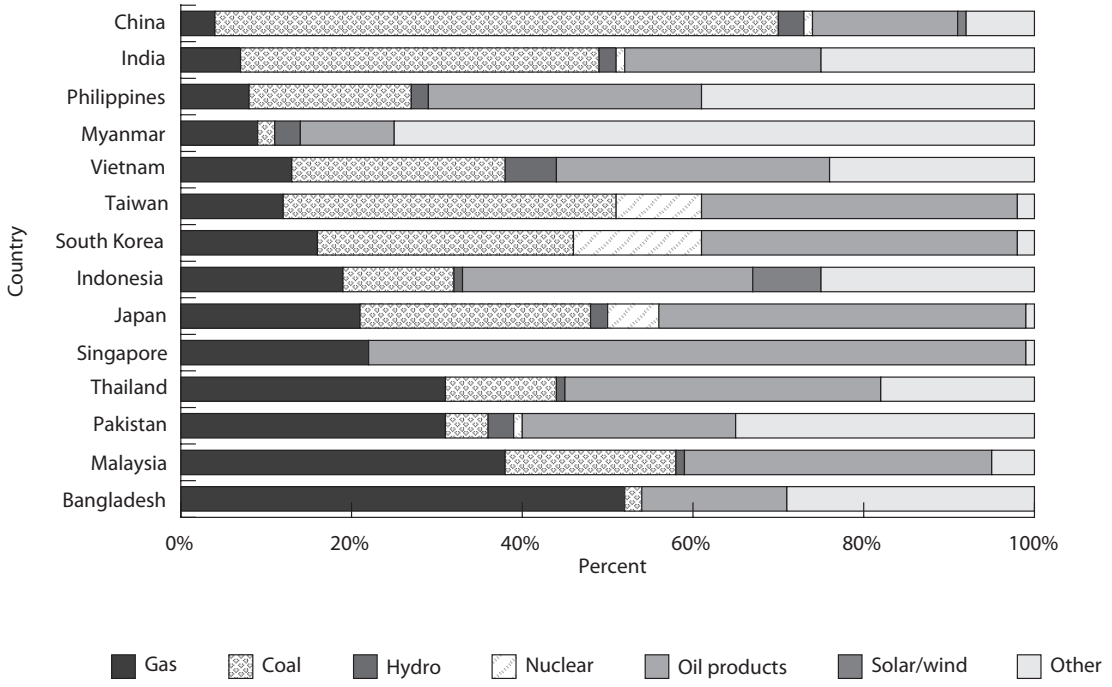
Indonesia, South Korea, Taiwan, and Vietnam, gas makes up 10%–20% of total energy (see **Figure 1**).[4] Across the region, gas is a fuel for the power, industrial, and petrochemical sectors. Yet gas use outside these sectors is and will remain marginal in most countries.

Resource endowments are similarly varied. There are countries that rely almost entirely on imports (Japan, South Korea, Taiwan, and Singapore); other countries are self-sufficient (Bangladesh, Pakistan, the Philippines, and Vietnam); some have sizeable domestic production but still rely on imports (China, India, and Thailand); others are net gas exporters (Myanmar, Indonesia, Malaysia, and Brunei); and some countries use little or no gas (Cambodia, Nepal, Laos, and Sri Lanka). Despite this variability, Asia can be divided into five subregions that serve as useful analytical reference points.

Japan, South Korea, Taiwan, and Singapore. These four countries are fully dependent on imports, which creates a high sense of energy insecurity. Only Singapore has access to pipeline gas, while all others rely exclusively on LNG imports. These countries' ability to pay for gas is high—underpinned by both affluence and government support for domestic monopolistic or quasi-monopolistic markets.

China, India, and Thailand. All three countries became importers only recently (Thailand in 2000, India in 2004, and China in 2006). China and Thailand import both LNG and pipeline gas, and their pipeline gas comes from countries for which that trade is paramount (Turkmenistan and Myanmar, respectively). China and India have domestic supply potential, both conventional and

FIGURE 1 Asia's energy mix by country, 2011



SOURCE: PFC Energy.

[4] PFC Energy analysis based on data from the International Energy Agency (IEA), *Energy Balances of OECD Countries: 2012* (Paris: OECD, 2012); and IEA, *Energy Balances of Non-OECD Countries 2012* (Paris: OECD, 2012).

unconventional, at the right price and under the right terms. All three states are focused on how to integrate more expensive imports with their domestic gas, although Thailand has made much more progress in this area than either China or India.

Bangladesh, Pakistan, Vietnam, and the Philippines. These countries are gas producers that are self-sufficient but nonetheless need LNG because their projected demand outstrips their projected supply. (Pakistan is also considering pipeline imports from Iran.) All four countries have faced considerable challenges, however, in convincing investors to either invest in import infrastructure or supply them with gas. Price and a challenging environment for foreign investment are the main barriers. Given that securing enough gas will remain a problem, these countries are as likely, and perhaps more likely, to develop non-gas alternatives, such as burning more oil, coal, or biomass.

Malaysia and Indonesia. Both countries are net gas exporters but built LNG facilities to receive gas. Indonesia's gas trade is internal (from one part of the archipelago to another), but the country has mulled importing LNG if the price is right. Malaysia, by contrast, will retain two parallel gas businesses, with exports to Asia from one part of the country (Sarawak) and imports into another part of the country (Peninsular Malaysia, where most people live). In both Malaysia and Indonesia, net exports will decline.

Myanmar, Brunei, and Papua New Guinea. These countries are and will continue to be important exporters. Yet they are also countries whose economies are highly dependent on oil and gas. Brunei was the first Asian country to develop LNG and has been exporting it since 1972. LNG provides about half of the country's exports, with oil providing most of the balance.[5] Myanmar began exporting gas more recently—in 2000 to Thailand—and gas now accounts for about 30% of its exports.[6] Papua New Guinea will begin exporting LNG in 2014–15, and the International Monetary Fund anticipates that exports will boost GDP by 20%.[7]

This is the reality of Asian gas: mostly, countries are looking to import gas, although their ability to do so varies. Only two countries are unequivocally expanding net exports—Myanmar and Papua New Guinea—but these volumes are modest relative to Asia's demand. With demand doubling, Asia will thus need gas from outside the region.

Asia's Suppliers: Old and New

In Asia, gas is traded mostly via LNG, although there are some pipelines in Southeast Asia and into China from Central Asia and Myanmar. The largest LNG consumers worldwide are from Asia, and the region has imported at least 60% of the world's available LNG in each year since 1980.[8] Since 2000, LNG has provided roughly a third of the region's total gas demand, and it will provide 38% by 2020. This LNG supply increasingly comes from sources outside Asia. Until 1988, 90% of Asia's LNG needs came from within the region (from Pakistan to Southeast Asia, excluding Australia but including Russia). After Australia and Qatar began to export LNG in 1989 and 1997, respectively,

[5] International Monetary Fund (IMF), "Brunei Darussalam: Statistical Appendix," Country Report, no. 12/193, July 2012, 31.

[6] IMF, "Myanmar: 2011 Article IV Consultation," Country Report, no. 12/104, May 2012, 21.

[7] IMF, "Papua New Guinea: 2012 Article IV Consultation," Country Report, no. 12/126, June 2012, 4.

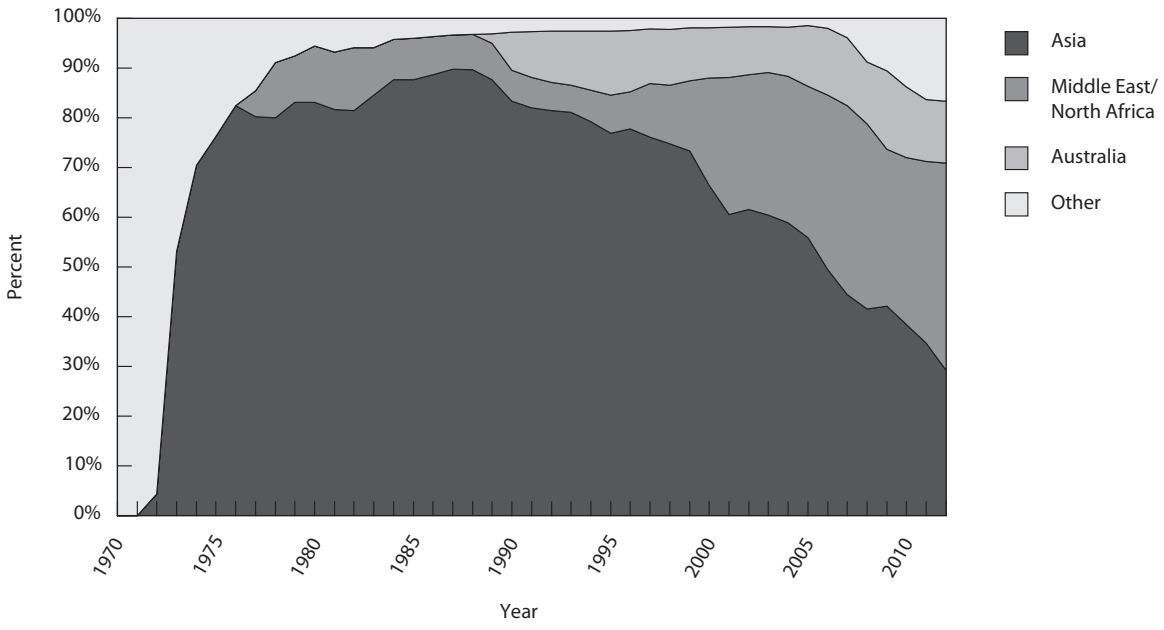
[8] This discussion draws on PFC Energy analysis based on data from Cedigaz, "Natural Gas in the World," various editions; BP plc, "BP Statistical Review of World Energy," various editions; International Group of Liquefied Natural Gas Importers (GIIGNL), "The LNG Industry," various editions; and Waterborne Energy, LNG reports and online database.

Asia's reliance on non-Asian supplies grew; by 2012, the region sourced only 29% of its LNG from within Asia (see **Figure 2**).

At the same time, Asian buyers have also diversified their LNG supplier mix. One way to measure diversification is to calculate the Herfindahl-Hirschman Index (HHI), which first squares and then sums the market share of each supplier (see **Figure 3**). A number of 10,000 equals a perfect monopoly, where one company has a 100% market share (100^2 equals 10,000). A number of 1 equals perfect competition. All importing countries in Asia except India have a more diversified supply base than they did a few years ago.[9] Diversification is also accelerating: Japan took 40 years to reach the diversification rate that China was able to accomplish in fewer than 5 years. However, it is interesting to note that, despite this overarching trend, when the LNG market tightened in 2011–12, all countries except Japan saw an increase in market concentration, meaning that in a time of need they went to suppliers they knew best. Only Japan reduced its concentration index: 22 countries sold LNG to Japan in 2012, and none provided more than 20% of the total LNG.

This overall diversification trajectory is projected to continue, particularly as new supplies continue to come online. By 2017, Australia will surpass Qatar as the world's largest LNG seller.[10] Asia will benefit from Australia's growth: Japanese companies have committed to buy 32 million tons per annum (mmtpa) from Australia (for comparison, Japan's total imports in 2012 were 87 mmtpa); China has contracted 18 mmtpa (its 2012 imports were 15 mmtpa); and Malaysia, Taiwan, and India will purchase smaller amounts of LNG from Australia.[11] Australia will thus become Asia's

FIGURE 2 LNG imports to Asia by source



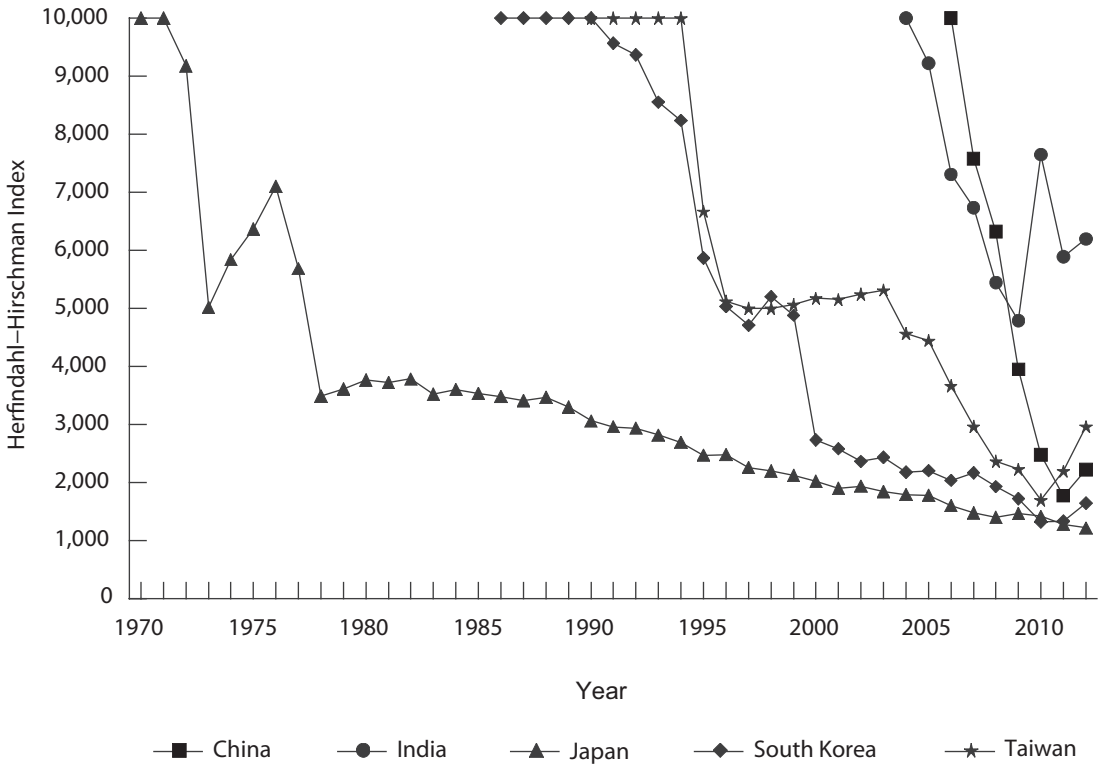
SOURCE: PFC Energy.

[9] India sourced 78% of its LNG from Qatar in 2012.

[10] This forecast is based on PFC Energy's project-by-project analysis of proposed LNG projects worldwide.

[11] The estimates for Japan and China are for the year 2017, since contracts have different start-dates and durations.

FIGURE 3 Concentration of Asian LNG imports



SOURCE: PFC Energy.

NOTE: Figure measures the concentration of LNG imports using the Herfindahl-Hirschman Index (HHI). A higher value equals a higher concentration.

largest supplier by 2017. There is a downside to that boom, however. The influx of investment into Australia has triggered a big rise in costs due to increased competition for resources,[12] raising the price at which projects need to sell their LNG by 12% to 30%.[13] Asian companies, which invested in these LNG projects, need to commit more capital to secure supply, and they (and their partners) need higher prices to justify their investments.

Future Sources of LNG

The industry is thus keen to find LNG that will follow the current boom in Australia. Broadly speaking, Asia has five sets of choices (see **Table 1**).

Import more gas from Australia and Southeast Asia. Despite Australia's current boom, the country has a lot more potential. By 2017, Australia's export capacity will be 88 mmtpa—yet companies have

[12] The Australian Bureau of Resources and Energy Economics characterizes the extent of the boom as follows: "In the ten year period 2003 to 2012, around 390 resources and energy major projects progressed to the Committed Stage with a combined value in nominal terms of A$394 billion, of which A$268 billion are still under construction and not yet complete." See Australian Government, Bureau of Resources and Energy Economics, "Resources and Energy Major Projects," April 2013, 26.

[13] This figure is based on PFC Energy's analysis of company announcements of costs at the time of final investment decisions and latest revisions as of April 2013.

proposed to bring the country's total to 130 mmtpa, meaning that there is another 40 mmtpa of planned capacity that could be developed. This volume equals China's expected LNG demand in 2018, so it is a significant number.[14] Besides in Australia, export capacity is incrementally growing in Malaysia, Indonesia, and Papua Guinea, albeit by smaller volumes. Although Australia offers more

TABLE 1 Summary of new options for Asia's LNG supply

Source	Advantages and attractions	Disadvantages and risks
United States	• Access to resources relatively open • Low gas prices (currently) and large resource potential • Political stability • Existing infrastructure offering lower unit costs for liquefaction	• Uncertain policy governing exports • Gas prices could rise substantially • Local opposition to select projects • Most project developers lacking deep balance sheets to finance projects
Canada	• Large estimated resource potential • Access to resources relatively open • Proximity to Asian markets • Possible economies of scale • Experienced project sponsors	• Resource poorly delineated so far • Cost inflation from LNG/oil sands • Large pipeline investments needed • Long lead time to negotiate pipeline right-of-way • Development to require high prices
Mozambique	• Large resource discovered • Possible economies of scale	• Limited government capacity • High entry (acquisition) costs • Developers lacking LNG track record • Number of stakeholders risks delays • Undefined terms for gas development
Tanzania	• Large estimated resource potential • Proximity to Asian markets	• Government potentially allocating some of the gas to the local market • Low government capacity to approve and advance projects • More discoveries needed to support large-scale projects
Russia		
Sakhalin (Gazprom)	• Existing infrastructure offering lower unit costs for liquefaction • Proximity to Asian markets	• Uncertain resource base
Sakhalin (Rosneft)	• Large existing resource • Proximity to Asian markets • Experienced partner (ExxonMobil)	• Uncertainty over the ability to export without Gazprom intermediation
Vladivostok	• Large resource base • Possible economies of scale	• Large pipeline investments needed • Limited partnership interest so far • Difficult to justify investment without also building a pipeline to China • Much less economic than an expansion at Sakhalin
Yamal	• Large resource discovered • Possible economies of scale	• Project operator lacking LNG track record • Uncertainty over the ability to export without Gazprom intermediation • Projects requiring an additional partner and lacking secure financing

[14] These estimates are based on PFC Energy analysis.

political stability than these countries, costs are higher and the potential exists for an environmental backlash against unconventional gas development in eastern Australia.

Import more gas from Russia. Russia supplied 6.5% of Asia's LNG in 2012, but it has vast resources in the Yamal Peninsula, East Siberia, and Sakhalin Island that could help satisfy greater demand from Asia. There are four major LNG projects in Russia that are targeting the Asian market, in addition to the ever-looming prospect of pipelines to deliver gas from Russia to China.[15] Yet although Russia offers sizeable reserves of resources, doing business with Russian companies is usually a drawn-out affair, and several deals have been in negotiation for many years.

Import gas from East Africa. Because of its proximity to Asia, East Africa has attracted significant attention.[16] Since late 2010, companies have discovered over 100 trillion cubic feet (tcf) of gas in Mozambique and Tanzania (for comparison, Asia's LNG demand in 2012 was 8 tcf). In 2012, Thailand's PTT Exploration and Production (PTTEP) paid $1.9 billion to acquire Cove Energy, a company that was part of one cluster of discoveries in Mozambique.[17] Similarly, in 2013, China National Petroleum Corporation (CNPC) paid an even greater $4.2 billion to enter into the other cluster. Indian companies are reportedly in discussions to enter these resources as well, while Japanese and Korean investors are already present.[18] East Africa thus offers a sizeable volume of resources, but the capacity to develop large infrastructure projects will test the ability of host governments to oversee, approve, and manage them.

Import gas from North America. Since 2010, North America has emerged as a potential LNG supplier in large part due to the growth of shale gas production in the United States. Asian buyers first eschewed this market, fearful that the U.S. government would not allow LNG exports. But over time they have warmed up to the idea. By mid-2013, Asian companies had made preliminary or final deals to import more than 28 mmtpa from the United States as follows: Japanese companies, 14.7 mmtpa; Indian companies, 10.3 mmtpa; and the Korea Gas Company (KOGAS), 3.5 mmtpa.[19] Meanwhile, there is more than 50 mmtpa of proposed capacity in western Canada, often with Asian companies as investors, although these projects have progressed more slowly than their U.S. counterparts.

Existing Supply

Perhaps the most important new development in LNG contracting has been the rise of "portfolio" deals, whereby a company buys LNG not from a project, as is customary, but from a company, which can source the gas from wherever it wishes. This may seem like an arcane commercial difference, but it has profound implications because it reallocates risk and enhances the reliability of supply by allowing sellers to meet their obligations through several means. In a traditional LNG contract, where supply comes from a specific source, any disruption to that supply source affects deliveries to the customer. Portfolio deals, by contrast, are supplied from a company's global portfolio, and suppliers can draw on multiple sources to make deliveries. Given the need for a large portfolio to support such deals, companies such as Shell, BG Group, GDF Suez, BP, and Total are active in this

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15 The four projects are Yamal LNG, led by Novatek, Russia's second-largest gas company; Vladivostok LNG, led by Gazprom, Russia's largest gas company; an expansion to the existing LNG facility at Sakhalin, also led by Gazprom; and a possible new facility at Sakhalin, led by Rosneft, Russia's largest oil company.

16 The distance from Mozambique to Japan is just 5%–10% longer than the distance from Qatar to Japan.

17 Eduard Gismatullin and Anuchit Nguyen, "PTTEP Left Sole Bidder for Cove as Shell Pulls Out of Race," Bloomberg, July 27, 2012.

18 Benjamin Haas and Aibing Guo, "CNPC to Buy Stake in Eni Mozambique Assets for $4.2 Billion," Bloomberg, March 14, 2013.

19 This estimate is based on PFC Energy's analysis of company announcements.

space. Asian buyers have committed to purchase around 27 mmtpa in 2019, roughly equivalent to the preliminary contacts signed for gas from the United States.[20]

Supply-Demand and Price Outlook

Asia's supply-demand trajectory is a function of two sets of variables: (1) the relative risk and reward of new supply sources and (2) the price elasticity of demand. The emergence of choice is the most fundamental shift in Asia's LNG market over the past two to three years. Australia's share of the market grew so big because there were no alternatives: an Asian LNG buyer in 2009–11 looking for a new long-term contract after 2015 had few options except Australia. Today's market is very different inasmuch as it offers a relative abundance of options. The speed with which these options materialize will depend both on their strategic and economic merits—such as how quickly the governments of Mozambique and Tanzania can develop the capacity to move projects forward or how quickly the U.S. government will approve new LNG-export projects—and on their attraction relative to one another. Whether the next investment boom will be dominated by a few or many major pockets of new supply is hard to predict; however, it seems more likely that the industry will develop two or three such pockets than that it will develop five or six.

Still, this new tranche of supply is unlikely to put significant downward pressure on prices for three reasons.[21] First, in order for prices to decline, costs for developing new projects have to come down as well—otherwise, companies will not invest in new supply. Projects in western Canada and East Africa are unlikely to be cheap to develop, given overall cost escalation in the sector and the large infrastructure that the projects need. LNG from the United States could be cheap, but only if one assumes that U.S. gas prices will remain depressed. A longer-term perspective suggests that U.S.-based LNG is unlikely to be that much cheaper than Asia's other alternatives. Second, because LNG projects have a long lead time and are very capital intensive, overbuilding is rare, unless a crisis or a major shift in demand takes place (as happened during the shale gas revolution in the United States); instead, investment slows down. Finally, Asia still has much demand potential purely from substituting oil in stationary uses such as power and industry—which also means that companies can afford to pay for LNG as long as it is cheaper than oil. In other words, one should think about the Asian market as a balanced market with limited scope for a sharp reduction in prices but with choice about how to meet future demand.

The Geoeconomics of LNG

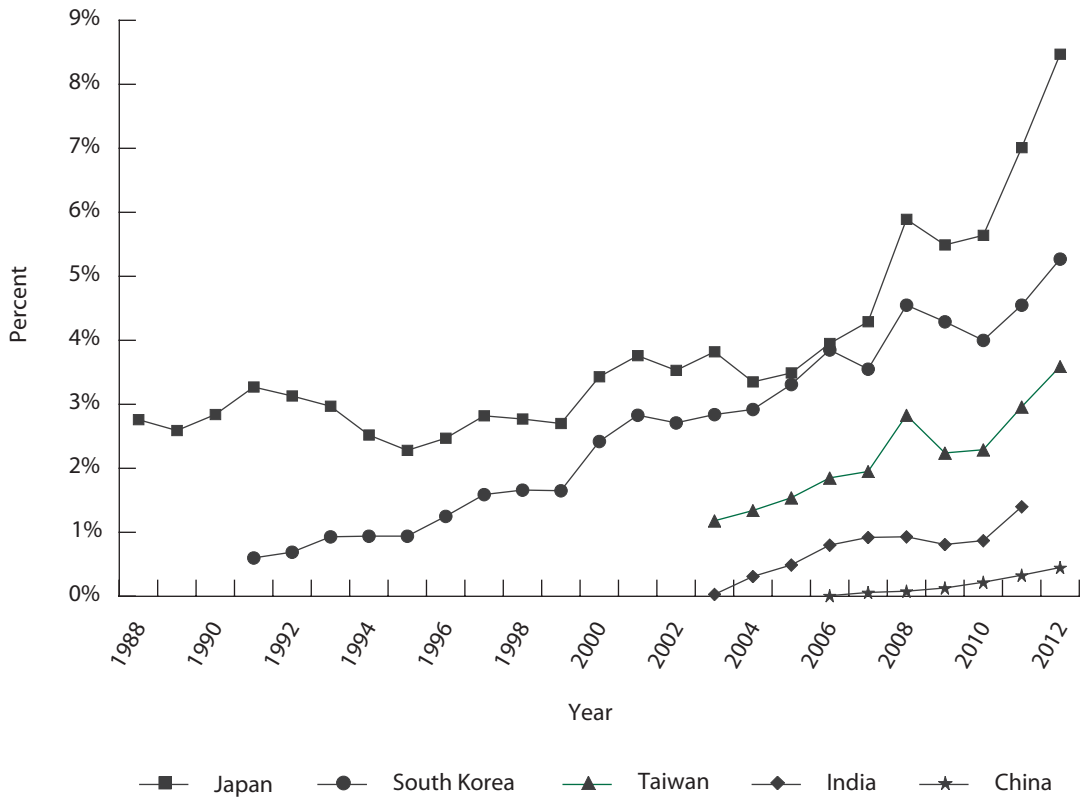
Energy in general, and LNG in particular, is a big and long-term business. In 2012, Asian buyers paid $128.1 billion for LNG.[22] This amount represented 3% of the region's total imports, although the burden varied from 8.5% in Japan to 0.4% in China and Thailand. Importantly, the LNG import burden has been rising (see **Figure 4**). In the 1990s, Japan spent about 2.8% of its import bill on LNG—a number that started to rise in the mid-2000s. LNG imports in South Korea and Taiwan have registered a similar trajectory: LNG made up 5.3% of all imports in South Korea and 3.6% in Taiwan in 2012. In China and India, LNG constitutes a smaller share of imports both because these

[20] This estimate is based on PFC Energy's analysis of company announcements.

[21] For example, prices falling to $10–$11 per million British thermal unit from the current level in the mid to high teens.

[22] The following discussion draws on PFC Energy's analysis of data from regional countries' finance, customs, and statistics bureaus.

FIGURE 4 Cost of Asian LNG imports as a percentage of total imports



SOURCE: PFC Energy.

countries import less LNG relative to other economies and because they started to import LNG via cheap contracts, lowering their weighted average versus Japan, South Korea, and Taiwan.

LNG imports and exports often represent the dominant form of trade between two countries. For Japan, LNG is the most significant import from Brunei and constitutes approximately 40% of its imports from Qatar and Malaysia, approximately 20% of its imports from Australia and Indonesia, and 10% of its imports from the United Arab Emirates (oil being more dominant). Incredibly, 30% of Japan's imports from Russia come from LNG. In this and other cases, LNG is creating a linkage between countries whose trade relationship would otherwise be trivial. The data for South Korea shows a similar pattern. LNG has helped forge trade relationships between South Korea and Nigeria, Trinidad and Tobago, and Yemen, and it now constitutes the overwhelming majority of South Korea's trade with Equatorial Guinea and Oman. The country has slightly deeper trade ties with Qatar, Brunei, and Indonesia, although that is often due to the trade of other hydrocarbons such as oil. Unlike Japan, only 3% of South Korea's imports from Australia are in the form of LNG.

This trade has macroeconomic implications. Japan's monetary and exchange-rate policy are both influenced by the impact of hydrocarbons on the country's balance of payments. For example, after the Fukushima tragedy in March 2011 led the country to replace its nuclear power with oil and LNG, Japan ran trade surpluses in only 4 of the next 24 months. Between 2010 and 2012, the

country spent 9.9 trillion yen more on imports; of that, 6.7 trillion yen was spent on fuels in general and 2.7 trillion yen on LNG in particular (oil imports totaled 3.7 trillion yen).[23]

Japan is obviously an extreme case due to its enormous size as an LNG consumer and its rapid shift from nuclear energy to oil- and LNG-powered electricity. But Japan's experience underscores a broader reality that Asian buyers have recognized: in normal times, cost trumps reliability as the primary energy-security concern. Asian economies that depend on export-led growth are particularly worried about the rising cost of imported energy. As a result, countries have encouraged their companies to become more involved in developing new supplies, hoping that such investment will lead to lower prices. Broadly speaking, companies and countries have three choices when it comes to securing supply.

- First, they can buy energy supplies from the market. This approach is akin to the portfolio contracts mentioned above: a company makes a commercial buy-sell transaction and nothing more.
- Second, companies or countries can help develop a supply source. Because LNG projects are capital intensive, developers reduce their risk through long-term sales contracts: a creditworthy buyer has always been the linchpin of a successful LNG project. Buyers bring reassurance and often capital, thus accelerating a project's development. For the most part, Asian companies have used the promise of buying LNG to acquire a usually small share of equity in a project's development. This equity has provided a sense of supply security, because companies are buying gas from a project in which they participate, and has led companies like South Korea's KOGAS to set targets for how much of their LNG will be sourced from equity projects.
- Third, companies or countries can develop a new energy source. Although Asia is the world's largest LNG-importing region, Asian investors rarely have been in the driver's seat as project operators. For example, Japanese companies (namely, Mitsubishi and INPEX) have only recently actually operated projects, both of which are still under construction.

Asian buyers are comfortable in the second tranche, as neither "arm's length" buyers nor project developers but as long-term partners and project enablers. Yet as the LNG market tightened, Asian buyers had fewer opportunities to participate in new LNG projects and found themselves as mere buyers. In Qatar, for example, Japanese companies were equity partners in all the projects that came online before 2000, but they participated in just 7.8 mmtpa of the 61 mmtpa developed after 2000. Qatar is an extreme case, but it symbolizes the shifting power between buyer and seller. Australia was different, and part of its attraction was that foreign companies could not only partake in project development but become sizeable equity owners. Asian companies have an equity stake, often a large one, in every project under construction in the country (see **Table 2**). Australia's problem, of course, is that it became too big and costs rose. But this equity template is one that Asian companies seek to replicate—frequently, as in the case of China's CNPC, by even delaying outright purchases of LNG in order to build an equity position from which to generate growth in the long term.

The magnitude of these investments should not be understated. Companies will invest over $200 billion (in real 2012 dollars) in Australian LNG over the course of the decade to 2017.[24] Since 2010, Asian companies have spent over $50 billion to acquire assets related to shale gas in North America—many of them in the hope of feeding LNG exports from that region.[25] Even in large

[23] Japan Ministry of Finance, "Trade Statistics for Japan," available at http://www.e-stat.go.jp/SG1/estat/OtherListE.do?bid=000001008809&cycode=1.

[24] This projection is based on PFC Energy's analysis of announced and estimated project costs.

[25] This estimate is based on PFC Energy's analysis of published company announcements and reports.

TABLE 2 Equity ownership of Australian LNG projects (existing and under construction)

Project	Equity ownership (%)
North West Shelf Trains 1–5	BHP Billiton, 16.7%; BP, 16.7%; Chevron, 16.7%; Shell, 16.7%; Woodside, 16.7%; Mitsubishi, 8.3%; and Mitsui, 8.3%
Darwin LNG Train 1	ConocoPhillips, 57.2%; Santos, 11.4%; INPEX, 11.3%; Eni, 11.0%; Tokyo Electric Power Company, 6.1%; and Tokyo Gas, 3.0%
Pluto LNG Train 1	Woodside Petroleum, 90.0%; Kansai Electric, 5.0%; and Tokyo Gas, 5.0%
Queensland Curtis Train 1; Queensland Curtis Train 2	BG Group, 50.0%, and China National Offshore Oil Corporation, 50.0%; BG Group, 97.5%, and Tokyo Gas, 2.5%
Australia Pacific LNG Trains 1–2	ConocoPhillips, 37.5%; Origin Energy, 37.5%; and Sinopec, 25.0%
Gladstone LNG Trains 1–2	Santos, 30.0%; Petronas, 27.5%; Total, 27.5%; and KOGAS, 15.0%
Gorgon LNG Trains 1–3	Chevron, 47.3%; ExxonMobil, 25.0%; Shell, 25.0%; Osaka Gas, 1.3%; Tokyo Gas, 1.0%; and Chubu Electric, 0.4%
Ichthys LNG Trains 1–2	INPEX, 66.1%; Total, 30.0%; Tokyo Gas, 1.6%; Osaka Gas, 1.2%; Chubu Electric, 0.7%; and Toho Gas, 0.4%
Prelude LNG (floating)	Shell, 67.5%; INPEX, 17.5%; KOGAS, 10.0%; and CPC, 5.0%
Wheatstone LNG Trains 1–2	Chevron, 62.1%; Apache, 13.0%; Kuwait Foreign Petroleum Company, 7.0%; Shell, 6.4%; Japan Oil, Gas, and Metals National Corporation, 3.4%; Mitsubishi, 3.2%; Kyushu Electric, 1.5%; Nippon Yusen Kabushiki Kaisha, 0.8%; and Tokyo Electric Power Company, 0.7%

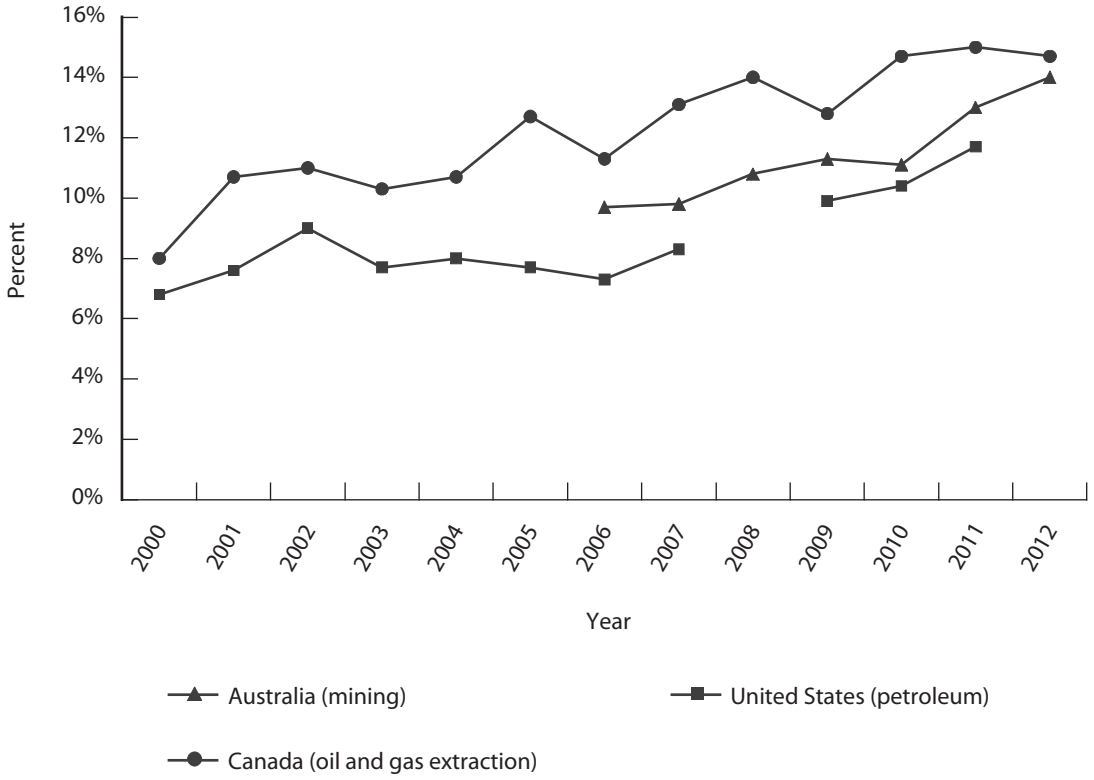
SOURCE: PFC Energy's analysis of company announcements.

economies such as Australia, Canada, and the United States, foreign investment in resources forms a sizeable and growing part of the economy (see **Figure 5**). In 2012, foreign investment in "oil and gas extraction" accounted for almost 15% of Canada's stock of inward FDI; in Australia, the percentage was 14% (for the FDI category "mining"), while in the United States it was almost 12% in 2011 (for the category "petroleum"). Inevitably, such large-scale investments create strong linkages between countries as well as friction at both the national and local levels. In particular, policymakers need to be vigilant to avoid a backlash against major foreign investment that could sour relations between states.

The Geopolitics of LNG

How will these relationships between states, investors, and companies affect and be affected by politics? The link between politics and energy is far from linear. Increased trade provides countries with a more solid foundation for future partnerships, but it also generates more sources of friction. Chinese investment in the United States, for example, brings the countries closer, but it also allows politicians to pander to xenophobic and mercantilist instincts. Additionally, such investment creates a physical presence that could be disrupted amid escalating tensions between the two countries. As a result, extrapolating from economics to geopolitics requires significant caveats. There are, however,

FIGURE 5 Share of FDI stock for Australia, Canada, and the United States



SOURCE: PFC Energy.

several general conclusions about the likely geopolitics of LNG in Asia that can be drawn from the preceding analysis.

First, there is clear momentum in Asia toward diversification. Less dependence on any one supplier could improve energy security and should enhance the resilience of the overall system, thus lessening anxieties about disruptions, intentional or not. Such diversification also reduces the vulnerability of buyers to chokepoints such as the Strait of Hormuz or the Strait of Malacca. In addition, it reduces the leverage of any one supplier, which further enhances energy security by normalizing trade relationships and minimizing the political wrangling that often accompanies transactions where one side is overly dependent on the other. More generally, diversification is coinciding with the emergence of supply clusters that will enhance the universality of the LNG market. Because the LNG trade is conducted through long-term contracts that connect sellers to buyers, disruptions tend to affect companies and countries in disproportionate ways. For example, if Thailand imports 100% of its LNG from Qatar under a long-term contract with a specified pricing formula, a disruption in Australia would normally have no short- and medium-term impact on the Qatari-Thai trade. But in a world where all Asian buyers are invested in similar regions, they are more likely to see that their fates are intertwined. Buyers thus share an interest in maintaining the stability and predictability of the system as a whole rather than merely at select pockets—more akin

to what is happening in the oil market, where the U.S. presence in the Middle East is a public good from which many countries benefit (even if they do not share the costs).

Second, Asia's largest companies are heavily involved in developing the next tranche of LNG supply from Australia, North America, and East Africa. This trend too should boost energy security, reduce the real cost of energy (given that the companies importing LNG also earn money as sellers), and create a more interdependent nexus of buyers and sellers. At the same time, a large-scale foreign presence in the extraction industry often leads to tensions on the ground and friction at the local and national levels. Governments will need to manage such tensions and prevent them from escalating into calls for trade retaliation or, worse, expropriation.

Third, the relative abundance of LNG means that it will remain a primarily economic rather than geopolitical issue; that is, countries will be more concerned with prices than their actual access to LNG. Yet the supply-demand dynamic in Asia makes it unlikely that prices will drop significantly. As a result, the search for ways to reduce prices will continue, as will the effort to limit the macroeconomic effects of higher prices. For countries such as Japan that are very sensitive to trade deficits, the persistence of high LNG prices will intensify calls for expansionary monetary policies that make Japanese goods more competitive in overseas markets.

Fourth, the relative availability of LNG will accelerate Asia's move away from coal and biomass toward gas. Of course, the transition will be slow, and coal will remain the dominant fuel. But more gas is better for the environment at a local and global level, even though domestic production in countries such as China and India will be as important as LNG for the transition to gas.

Fifth, China will become the arc where LNG meets pipeline gas, thereby serving the same purpose as the European coast does on the other side of Eurasia. The interplay among domestic supply in China; pipeline imports from Central Asia, Myanmar, and possibly Russia; and LNG supplies holds the greatest potential to restructure the dominant, oil-linked pricing system in Asia. However, a pricing point in China could easily provoke geopolitical anxieties among that country's neighbors. Developing a non–oil price benchmark that is commercially and politically acceptable to the major players will prove an enormous challenge, but one that can boost transparency and potentially lower costs as well.

Sixth, there is a noticeable Westernization of LNG given that Australia, Canada, and the United States will supply as much as a third of the world's LNG within a decade. This dependence could produce anxiety in China and in turn accelerate its search for gas both within its borders and in areas such as East Africa and Russia. This shift also places an onus on the United States to think strategically about its new role. Chinese investors already fear that their ability to do business in the United States and even Canada is precarious. The slow pace with which Washington has approved LNG-export projects merely reinforces the Chinese impression that these decisions are political rather than commercial. It will be quite tempting for the United States to seek influence through hydrocarbons, even though such diplomacy usually yields few tangible results. Combined with Washington's overall rebalancing to Asia, the politicization of LNG could prove more trouble than it is worth, especially for a country whose prosperity is closely connected with open markets.

Seventh, the United States will need to carefully manage its relationships with both Canada and Australia. The former is already feeling the adverse side effects of the boom in U.S. oil and gas. For the past few years, Canada has been unable to build a large corridor to the Pacific Coast for exporting oil to Asia. As a result, the deepening of economic ties between China and Canada has been delayed. LNG, however, will face fewer environmental barriers and bring greater trade between the two

countries. Australia is much farther ahead in the process of exporting LNG to Asia. Although it is an ally of the United States, Australia's economic fortunes will be increasingly tied to Asia in general and China in particular, with LNG accounting for a significant portion of those ties. The United States should be thinking not just about how to use its natural gas but about how the increased trade flows of its allies are likely to affect their own geopolitical calculations in the coming decade.

Finally, Russia has a key role to play in delivering additional gas to Asia and thus serves as a counterweight to the Westernization of Asia's LNG market. Access to an alternative source of supply would yield significant benefits for the region, specifically by lessening China's anxiety over energy security. Yet to this point Russia has been its own greatest enemy and has failed to become a serious player in the Asian market. Moscow needs to show the region that it is serious about delivering gas and not just holding summits that merely promise gas. While the commercial case for a bigger Russian role is perhaps limited, the political case is much greater.

Conclusion

The new geography of Asian LNG will provide a framework for a diversification of Asia's supply sources that should reduce geopolitical anxiety. With more buyers and sellers, the leverage of any one player will diminish and with it the inclination to use energy to gain political leverage. At the same time, the new LNG supply will be concentrated in the hands of a few large (and chiefly Western) suppliers, which could heighten insecurity among buyers such as China. Given this dynamic, it is easy to see heated trade rhetoric escalating, especially in a world where Asian suppliers are investing heavily in exporting gas from Western countries. Active management by politicians on all sides, including in the United States, will be crucial to avoid the excessive politicization of a resource that is already political.

THE NATIONAL BUREAU *of* ASIAN RESEARCH

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China's Coming Decade of Natural Gas?

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EXECUTIVE SUMMARY

This essay examines the outlook for China's gas market, the implications for the country's sense of energy security, and the possible global impacts of China's liquefied natural gas (LNG) policies.

MAIN ARGUMENT

Through 2020, China intends to undertake profound shifts in its energy profile. As part of this process, natural gas stands to benefit as the country seeks to move toward a cleaner energy mix and shift away from coal. Yet as the government continues to encourage the use of gas, the potential scale of China's demand may be beyond expectations. At the same time, it appears that domestic gas production will be insufficient and that the country's much-heralded unconventional gas development will not be easily achieved over the next five to ten years. These broad dynamics bode well for significant increases in gas imports in the interim, particularly of LNG. Given the scale of China's energy demand, the growing appetite for gas will have profound effects on both gas markets and geopolitics more generally.

POLICY IMPLICATIONS

- China's dependence on natural gas imports could easily reach 50% over the next five to ten years. To promote a greater sense of energy security, Beijing is likely to prioritize pursuing a diversified base of stable and credible international suppliers. Beijing currently has a number of options that meet this criterion. This will likely also make its gas geopolitics different from its oil bids, in which China relied more on suppliers in so-called frontier markets with heightened political risk.
- Although China generally favors overland pipelines for gas supplies, it may lean more toward LNG imports. Price considerations, the desire to promote LNG-related infrastructure to bolster the Chinese economy, and concerns about the outlook for Russian and Burmese pipeline supplies may all favor China increasing its reliance on LNG.
- While the economics of U.S. LNG exports to China make sense in the current low-price environment, the prospects for this trade remain doubtful. Even if exports to China were to be approved by the U.S. Department of Energy, Beijing may view buying these supplies as fostering an unacceptable level of energy dependence on the U.S.

Through 2020, China intends to make profound changes to its energy profile. This shift will necessarily entail a recalibration from a production-intensive economy to a more consumption-oriented one. The country's emphasis on production and rapid industrialization over the last decade has had significant knock-on effects on Chinese energy consumption, both in terms of scale and in the type of resources consumed. Industry in China continues to be responsible for the vast majority of energy consumption—primarily in the form of coal—and for most of the associated environmental degradation and emissions from consuming fossil fuels. In short, China's current growth model has an investment bias toward heavy industry and massive infrastructure, largely powered by coal, that worsens environmental degradation and puts undue pressure on limited resources. Moreover, such a growth model itself is unsustainable and will require a transition to a less energy-intensive and more consumption-driven economy. If this so-called rebalancing is to succeed, the transition to a more sustainable phase of growth will require China to begin reducing support for heavy industry and slowing the country's overall growth, which should have the concomitant benefit of reducing the overwhelming dominance of coal in its energy mix.

As part of this process, natural gas stands to gain an increasing share in China's energy mix. This resource is attractive to China for many of the same reasons that it is attractive to the United States. First, even though China has invested heavily in renewable and nuclear energy, by 2015 non-fossil fuels will still only constitute about 11% of its total primary energy consumption based on current targets.[1] This makes natural gas a "bridge fuel"—that is, a less carbon-intensive fuel than coal and oil—to facilitate the country's transition toward cleaner sources of energy. Second, gas is cheap and abundant, at least for the time being. Third, there appear to be numerous willing suppliers, which reinforces China's sense of supply security. Finally, China believes that over the long term it can replicate the U.S. model of domestic unconventional gas production to dramatically enhance its energy security and buttress its long-standing aversion to dependence on foreign suppliers.

Yet as the government continues to encourage the use of gas through policies and incentives, the potential scale of China's gas demand may exceed the expectations of current government and some industry projections. At the same time, it appears that domestic gas production will be insufficient, particularly as the much-heralded unconventional gas–production explosion in China will not be easily achieved over the next five to ten years. These broad dynamics bode well for significant increases in gas imports in the interim, particularly of liquefied natural gas (LNG). Domestic drivers and policy incentives such as pricing reform are likely to reinforce the appeal of LNG in the medium term. In addition, pipeline gas alone is not likely to satiate anticipated Chinese demand. The enormity of China's appetite for LNG will have profound effects on gas exporters, global prices, and even geopolitics.

Rebalancing the Chinese economy to promote sustainable development will necessitate a simultaneous rebalancing of the country's energy profile. The Chinese government has sent clear signals that it wants to close the curtains on the "golden era" of coal, which could usher in a new period of growth in gas consumption. In the likely absence of a domestic gas boom in China, major gas exporters stand to benefit from growing Chinese demand. Indeed, there is little doubt that, as far as energy is concerned, whatever China does can no longer be contained within its borders. Natural gas will be no exception.

[1] State Council of the People's Republic of China (PRC), "Guowuyuan guanyu yingfa nengyuan fazhan 'shier wu' guihua tongzhi" [Notice on State Council's Twelfth Five-Year Plan on Energy], January 1, 2013, http://www.gov.cn/zwgk/2013-01/23/content_2318554.htm.

This essay will briefly examine the outlook for China's gas market and how its development could affect the country's sense of energy security both at home and beyond its borders. The first two sections consider the Chinese government's efforts to realize a less coal-intensive economy and the broad context in which gas consumption will increase as a result. The third section then discusses the implications of rising gas consumption for Chinese energy security, as well as the geopolitical dynamics that could play out as China takes actions to secure gas supplies. Finally, the essay offers some conclusions about China's energy conditions.

Less Coal, More Gas

It is worth reiterating that China's economic model has determined its energy consumption. Soon after the country entered the World Trade Organization in 2001, it began an unprecedented expansion of infrastructure and fixed-asset investments that also led to today's property sector boom. To meet these macro-economic demands, China put in place a sprawling heavy industry (e.g., steel, aluminum, and cement) that is unrivaled in the world in terms of scale. The industry largely ran on coal and depended on imported commodities such as iron ore and coking coal to operate. By 2011, Chinese coal consumption had risen 250% since 2000, gobbling up nearly as much coal as the rest of the world combined (see **Figures 1** and **2**).[2]

Indeed, coal's presence in China's energy mix is formidable in large part because it is the only indigenous fuel resource that the country has in abundance. That abundance of supply has meant relatively cheap coal prices compared with other fuels—though that is changing too—which is an important factor in a developing country where the vast majority of citizens have little tolerance for high energy costs. Yet abundance of supply is increasingly not the government's only consideration in shaping its national energy policies. Coal's complicity in severe environmental pollution, high carbon emissions, and significant health hazards has been amply documented.[3] These negative externalities, as well as the government's inability to meet its own targets for reducing carbon intensity if reliance on coal remains very high, are strong reasons for rapidly diversifying away from coal. In fact, a string of recent policies on coal, including production limitations, imminent resource taxes, and binding targets for reducing carbon intensity, all imply that the Chinese government intends to constrain the use of this resource.[4]

A sustained shift away from coal could well give rise to a golden era of natural gas for China, as gas consumption is expected to grow significantly. This is precisely what has been outlined in China's twelfth five-year plan on energy. At the macro level, China seeks to more than double its gas consumption from about 107.5 billion cubic meters (bcm) in 2010 to roughly 260 bcm in 2015,

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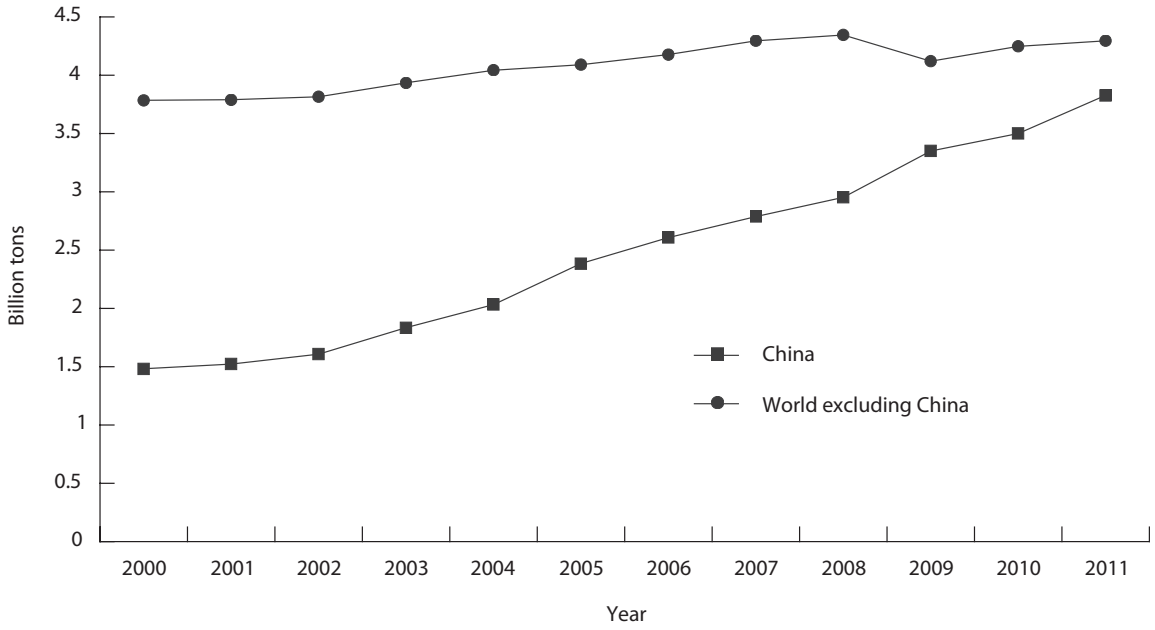
[2] "China Consumes Nearly as Much Coal as the Rest of the World Combined," U.S. Energy Information Administration (EIA), January 29, 2013, http://www.eia.gov/todayinenergy/detail.cfm?id=9751.

[3] See, for example, Bernhard Zand, "The Coal Monster: Pollution Forces Chinese Leaders to Act," ABC News, March 9, 2013, http://abcnews.go.com/International/coal-monster-pollution-forces-chinese-leaders-act/story?id=18677198.

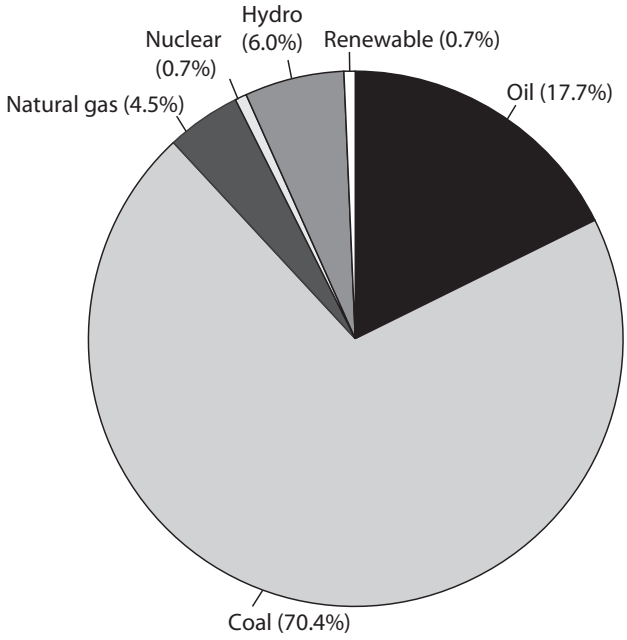
[4] "Meitan ziyuanshui gaige jian zai xian shang, nian nei huo jiang tuichu congjia jizheng" [Resource Tax on Coal Imminent, Moving to a Value-based Tax within the Year], Xinhua, June 9, 2013, http://energy.people.com.cn/n/2013/0609/c71890-21799802.html. The latest mood within the coal industry seems to be one of resignation, with businesses openly lamenting the end of the "golden era" of coal in China. See Ji Beibei, "The Golden Era Over for Coal Mines and Traders, Analysts Say," *Global Times,* June 6, 2012, http://english.peopledaily.com.cn/90778/7837024.html.

FIGURE 1 China's coal consumption



SOURCE: U.S. Energy Information Administration (EIA).

FIGURE 2 Chinese primary energy consumption, 2011



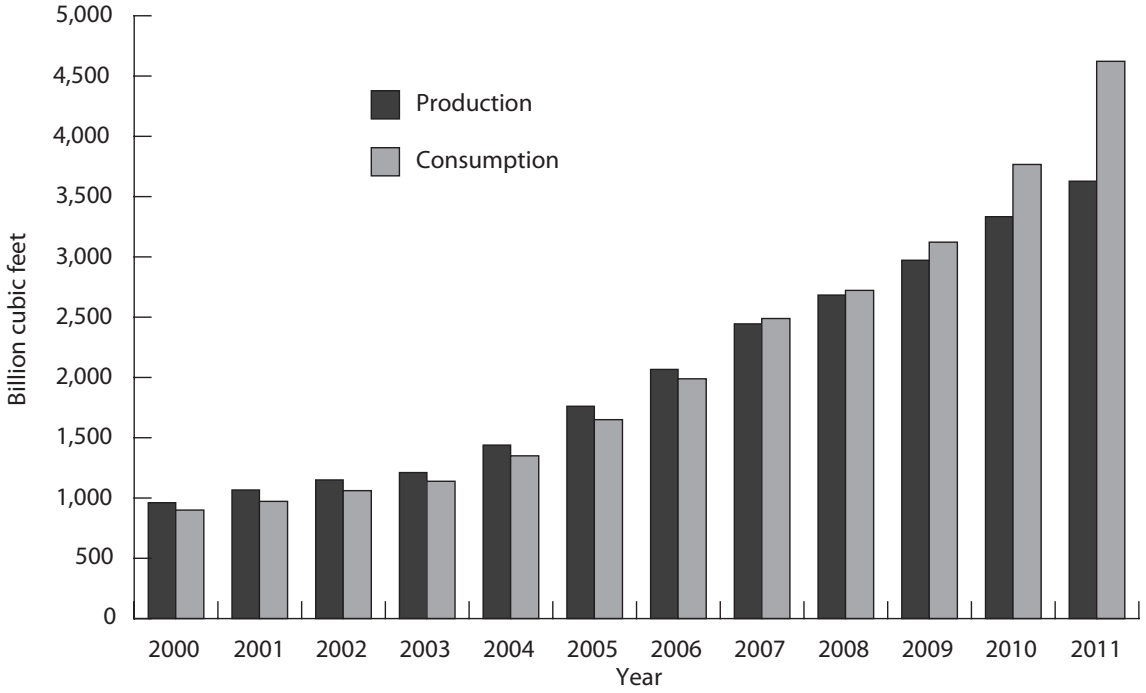
SOURCE: BP plc, "BP Statistical Review of World Energy 2012," June 2012.

according to the National Development and Reform Commission (NDRC).[5] This would result in natural gas rising from around 4% of primary energy consumption to roughly 8%.

Several demand drivers are expected to support this growth. The residential, power, and transportation sectors will support increased gas consumption as part of China's rapid urbanization and the expansion of an urban middle class that increasingly prefers cleaner fuel. For the power sector in particular, gas-based power generation is expected to more than double in absolute terms, although it will still be miniscule relative to other fuels used in the power sector. Still, by 2015 China could potentially derive more electricity from gas than from nuclear power.

Domestic gas production, on the other hand, is expected to considerably lag behind the rise in demand, as has been the case over the last several years. Domestic demand spiked in the late 2000s, perhaps even catching the Chinese government off guard (see **Figure 3**). In recent years, consumption has been growing at roughly double the rate of domestic production. Preliminary estimates from the China National Petroleum Corporation (CNPC) state that China's 2012 gas consumption was 147.5 bcm (up 13% year-on-year), while production reached only 107.7 bcm (up 6.5% year-on-year).[6] The mismatch between supply and demand has meant that China has increasingly relied on the global market for gas supplies—buying gas from countries ranging from Australia to Turkmenistan—to the point that it now relies on foreign countries to supply nearly 30% of its gas.

FIGURE 3 China's natural gas production and consumption, 2000–2011



SOURCE: EIA, "International Energy Statistics," April 22, 2013.

[5] Other estimates from the National Development and Reform Commission put Chinese gas consumption at only 230 bcm by 2015, and future revisions to the target may be expected. See, for example, NDRC, "Tianranqi fazhan shier wu guihua" [Twelfth Five-Year Plan on Natural Gas], http://zfxxgk.nea.gov.cn/auto86/201212/W020121203312244945303.pdf.

[6] "Woguo tianranqi duiwai yicundu jiang da 32%, gongxu xingshi zongti pianjin" [China's Natural Gas Import Dependence to Reach 32%, Supply to Remain Relatively Tight], *Economic Observer,* February 4, 2013, http://www.ce.cn/cysc/ny/gdxw/201302/04/t20130204_21332608.shtml.

Strategies and Policies for Ensuring Gas Security

Because being a net gas importer is a relatively recent role for China, Beijing has scrambled to react to this development and ensure the country's energy security in a new realm. For instance, it has needed to build transnational pipelines and LNG terminals to receive exported gas and accommodate increasing import volumes. Recent history exhibited a similar dynamic when China became a net oil importer in the mid-1990s. The government's growing concern over the security of the oil supply led to a "going out" strategy that took many of China's state oil giants to Africa, the Middle East, and South America. With its rate of dependence on oil imports now approaching 60%, China has stakes in various regions throughout the world due to its energy interests. In some cases, these interests reside in places that the Chinese government would prefer to avoid or for which it receives condemnation from global public opinion. But central government policies guiding overseas investments over the last decade were largely reactive and tended to lag behind the economic reality of growing energy demand in China. The same judgment, in time, may apply to China's expanding gas interests. But for now, and because it started from a low base, the country has diversified its suppliers enough to avoid being entangled in gas politics to the extent that it has been on the oil front. Natural gas could easily reach 50% import dependence, especially over the next five to ten years when China's domestic production is expected to persistently lag behind demand. Although the Chinese government estimates that domestic production will be around 170 bcm by 2015, this goal seems overly ambitious given that production stood at just 108 bcm in 2012. To hit that target in three years will require growth rates—at least 15% a year—that are much higher than recent norms. Those who hope that Chinese unconventional gas production will come to the rescue will likely be disappointed over the next few years. Even as Beijing unambiguously backs the development of domestic resources such as coalbed methane and shale gas, their production is unlikely to make a material difference over the next three to five years.[7] Both sectors are beset with problems that make it difficult to achieve production targets.[8]

As for shale, in particular, the bidding rounds for awarding exploration blocks continue to hit snags.[9] Moreover, many Chinese state and private companies lack the technological expertise to properly conduct horizontal drilling and fracking and require partnerships with foreign entities or acquisition of foreign technology. Additionally, although China technically holds shale reserves that are estimated to be more than 1,000 trillion cubic feet, it is not clear that all these resources are economical to explore and develop.[10] For instance, economists at China National Offshore Oil Corporation (CNOOC) estimate that it costs around $15 million to develop a single well. To reach the production target of 60–100 bcm by 2020, twenty thousand wells would need to be drilled at a price tag of approximately $350 billion. Furthermore, since the government still controls gas prices, CNPC estimates that it could lose about $0.10 for every cubic meter of shale gas.[11] Given the large

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[7] For instance, the Chinese government has set a target for reaching 30 bcm of coalbed methane and 6.5 bcm of shale production at the end of the twelfth five-year period. See NDRC, "Tianranqi fazhan shier wu guihua"; and NDRC, "Meicengqi (meikuang wasi) kaifa liyong shier wu guihua" [Twelfth Five-Year Plan on Coalbed Methane], December 2011, http://www.nea.gov.cn/131337364_31n.pdf.

[8] The coalbed methane sector continues to face entry barriers and bureaucratic turf battles that have stalled meaningful production over the last few years. However, the central government has been willing to provide more incentives for the sector, possibly galvanizing more investment.

[9] See Mavin Duncan, "China's Bid for Shale-Gas Riches in Doubt," *Wall Street Journal,* January 23, 2013, http://online.wsj.com/article/SB10001424127887323539804578259243934254484.html.

[10] A map of China's shale reserves is available from EIA and Advanced Resources International, Inc. See EIA, "World Shale Gas and Shale Oil Resource Assessment," May 17, 2013, http://www.eia.gov/analysis/studies/worldshalegas/pdf/chaptersxx_xxvi.pdf?zscb=27504323.

[11] Pu Jun and Huang Kaiqian, "China's Lofty Goals for Shale Gas Development Just Pipe Dreams, Experts Say," Caixin, August 26, 2013, http://english.caixin.com/2013-08-26/100574015.html.

upfront capital investments required, uncertainty over adequate returns on investments would naturally give companies pause, even state-owned oil giants flush with cash.

Thus, the current excitement over Chinese shale has primarily focused on potential rather than reality. Even those companies that have begun exploration, such as Sinopec in Sichuan, still remain in the preliminary stages of development. While the Chinese government genuinely aspires to replicate the shale gale that has proved so successful in the United States, whether it will be able to accomplish this is unclear in large part due to the unique constraints that face China—chief among them being inadequate technology and scarcity of water and land. For now, that China will even be able to hit its proposed 2015 production target seems unlikely, calling into question the credibility of its projections on a longer time horizon. Indeed, CNPC, the oil giant that owns significant shale blocks and has the biggest financial muscle, has apparently said that it hopes to achieve just 1.5 bcm of production by 2015, which is not even a quarter of the target set in the shale gas plan.[12]

Imports: By Land and Sea

The continued challenges and delays in China's development of shale gas should prove a boon for gas imports in the medium term. Already a major player in global gas markets, China currently has numerous choices when it comes to gas suppliers, including several countries that are not considered highly volatile (e.g., Qatar, Australia, Papua New Guinea, and Turkmenistan). This is unlike China's oil bids, which tended to be concentrated in frontier markets where conditions are far less predictable. Therefore, in the case of gas, China's energy security is not necessarily compromised by reliance on imports if the gas suppliers are dependable and stable, both economically and politically.

Structurally, the country's options for importing gas are limited to either pipeline imports or LNG. Thus far, Beijing has been committed to both options. Because pipelines and LNG both require enormous upfront capital to develop infrastructure, investment decisions are determined by China's own calculations weighing the strategic and economic costs and benefits of pipelines versus LNG imports and which can better accommodate Chinese demand.

Pipelines

Gas is delivered to China through the Turkmenistan-China pipeline (also sometimes called the Central Asia–China pipeline), which then connects to the gargantuan west-east pipeline (WEP) that sends gas from Xinjiang to the coastal provinces where demand is high.[13] The WEP has several phases, with the first phase delivering gas to the Yangtze River Delta and the second to the Pearl River Delta in southern China. Both phases are now operational. This energy linkage to Turkmenistan aligns with China's broader Central Asia strategy. Beijing has methodically worked to enhance the region's economic integration with Chinese markets, with some Chinese policymakers even musing about rebuilding the historical Silk Road trade route that extended to Europe. Fully cognizant of the security role that Russia still plays in the region, China has deliberately focused on strengthening economic ties with Central Asia.

The other major planned pipelines are from Myanmar and Russia.[14] The $2.5 billion China-Myanmar pipeline has reportedly begun operations in 2013 and, once at full capacity, could

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12 Jun and Kaiqian, "China's Lofty Goals."

13 "China President Opens Turkmenistan Gas Pipeline," *BBC News,* December 14, 2009, http://news.bbc.co.uk/2/hi/asia-pacific/8411204.stm.

14 Pu Zhendong, "China-Myanmar Oil and Gas Pipelines to Lower Energy Costs," *China Daily*, June 6, 2013, http://www.chinadaily.com.cn/cndy/2013-06/06/content_16574102.htm.

deliver up to 12 bcm of gas to southeastern Chinese provinces, particularly Guangxi. This pipeline is designed to receive gas from the Middle East and Africa in order to bypass the Strait of Malacca, which proponents in China argue can reduce shipping costs and enhance security.[15] With the pipeline now online, Beijing will need to manage an already shaky relationship with Myanmar that has been made all the more difficult as the country undergoes economic and political transitions.

The long-planned Sino-Russian pipeline from Siberia continues to be slowed by disagreement over the price Gazprom wants to charge for the gas. However, the realization of the pipeline may be closer now that Chinese president Xi Jinping made it a priority on his first visit to Moscow.[16] If an agreement can be finalized, the pipeline is expected to eventually deliver more than 30 bcm of gas to northern China. A more tight-knit energy relationship would likely draw Beijing and Moscow closer strategically, given that friction between the two sides might put at risk a major source of gas supplies to China. Moreover, because China seems to be rather interested in access to the Arctic shipping route, it has a stronger interest in maintaining at least a stable, if not cordial, relationship with Russia, a country that Beijing has long distrusted.

LNG

Yet while China generally favors overland pipelines for gas supplies because it feels that pipelines are more secure, it may begin to lean more toward LNG imports for several reasons. First, given the recent political transformations in Myanmar, Beijing may judge that the political risk is too high to expand pipeline investment in a country that is undergoing change, especially when other options exist for importing gas. The continued delays with Russia likewise may lead China to rethink the security of linking to a pipeline from its northern neighbor. Because the existing pipelines with other suppliers have capacity limits, any incremental demand increase will have to be met by importing LNG, whether China wants to or not.

Second, China may expand its LNG imports to support related economic and industrial goals. Investing in LNG means that the country must also invest in LNG ships. As a matter of industrial policy, the domestic development of the Chinese shipping industry is being encouraged, especially for the sector to specialize in advanced and super-size tankers.[17] Chinese companies are certainly interested in building LNG tankers as well as container ships that can rival the likes of Valemax-class iron-ore ships. Increasing reliance on LNG imports would also offer a strong incentive to the domestic shipbuilding industry to earn market share in these high-tech and high–value added transport vessels. China currently has five LNG carriers and intends to commission five more.[18] Such moves could help rejuvenate a flagging domestic shipping industry.

Third, Beijing may lean more toward LNG imports in a number of cases because such imports are potentially cheaper than domestic LNG supplies. Although China does have small-scale LNG-production facilities, they are located in western China and require long-distance transport,

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[15] The inability of the Chinese navy to protect its shipments passing through the Strait of Malacca has been a long-standing concern for the Chinese government, which is preoccupied with energy security.

[16] Erica S. Downs, "Money Talks: China-Russia Energy Relations after Xi Jinping's Visit to Moscow," Brookings Institution, April 1, 2013, http://www.brookings.edu/blogs/up-front/posts/2013/04/01-china-russia-energy-relations-downs.

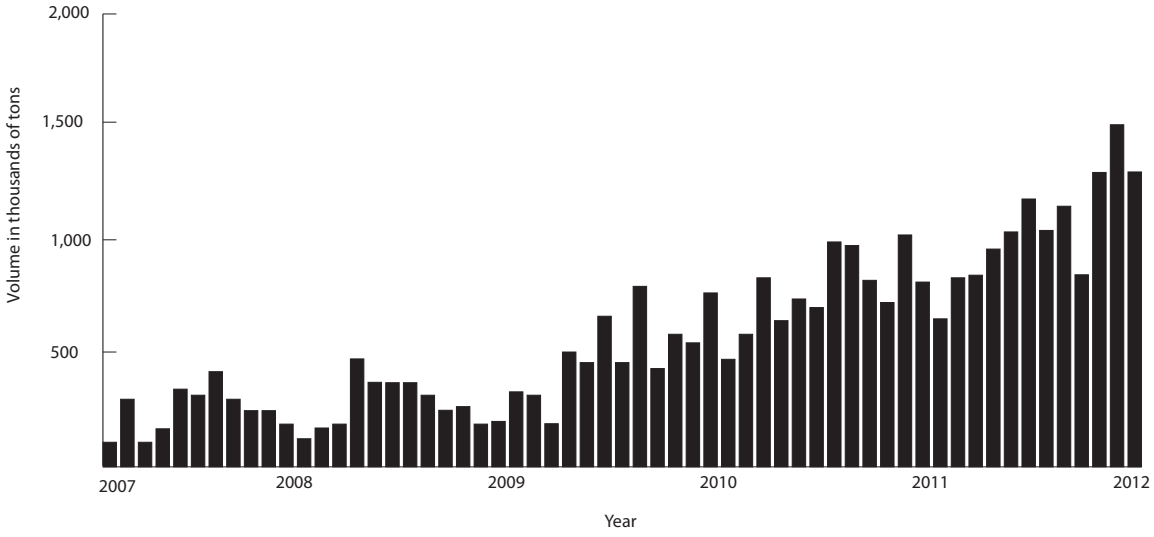
[17] Gabriel B. Collins and Andrew S. Erickson, "LNG Carriers to Aircraft Carriers? Assessing the Potential for Crossover between Civilian and Military Shipbuilding in China," China SignPost, web log, December 19, 2010, http://www.chinasignpost.com/2010/12/lng-carriers-to-aircraft-carriers-assessing-the-potential-for-crossover-between-civilian-and-military-shipbuilding-in-china. See also Pu Jun and Wu Jing, "Will Valemax Ore Ships Sink or Swim in China?" *Caixin,* June 28, 2012, http://english.caixin.com/2012-06-28/100405082.html.

[18] "Commercial and Strategic Opportunities for LNG in China," DNV Clean Technology Centre, October 2011, http://www.norway.cn/Global/SiteFolders/webbeij/DNV%20-%20China%20LNG%20Final%20Report.pdf.

via truck or pipeline, to the eastern demand centers. Depending on the long-term contracts signed, it may be less costly to import LNG than to rely on transporting gas across the country.[19] Furthermore, two of the drivers of gas demand—power generation and residential use—are likely to see the greatest growth potential in coastal China as the mega cities proceed with urbanization. According to one industry estimate, urban-residential gas demand will be more than six times commercial-sector gas consumption by 2030.[20] Relying on imported LNG in areas of population density and robust power demand makes more economic sense than depending on domestic supplies, especially if domestic prices are liberalized to converge with global prices.

Chinese companies have actually signed many more LNG contracts than they have built pipelines. As a result, Chinese oil companies have invested extensively in LNG terminals, with four currently in operation—along the coast in Fujian, Guangdong, Shanghai, and Jiangsu—and as many as fourteen planned terminals could become operational by 2015 (see **Figure 4**). According to CNPC estimates, LNG imports could reach 16.5 million tons in 2013, an increase of nearly 15%.[21] If the planned terminals all come online as expected, China should have an import capacity of 87 million tons, more than five times the current level of LNG imports.[22]

FIGURE 4 China's LNG imports



SOURCE: Reuters, based on General Administration of Customs data, February 21, 2012.

[19] In fact, transport bottlenecks have been a major reason that China has been a net coal importer for the last several years. Coal imported into Guangdong from Australia has been cheaper than coal from Shanxi, for example.

[20] "Commercial and Strategic Opportunities for LNG in China" (presentation from Det Norske Veritas Pte Ltd., October 14, 2011), http://www.norway.cn/Global/SiteFolders/webbeij/DNV%20-%20China%20LNG%20Final%20Report.pdf.

[21] "Woguo tianranqi duiwai yicundu jiang da 32%."

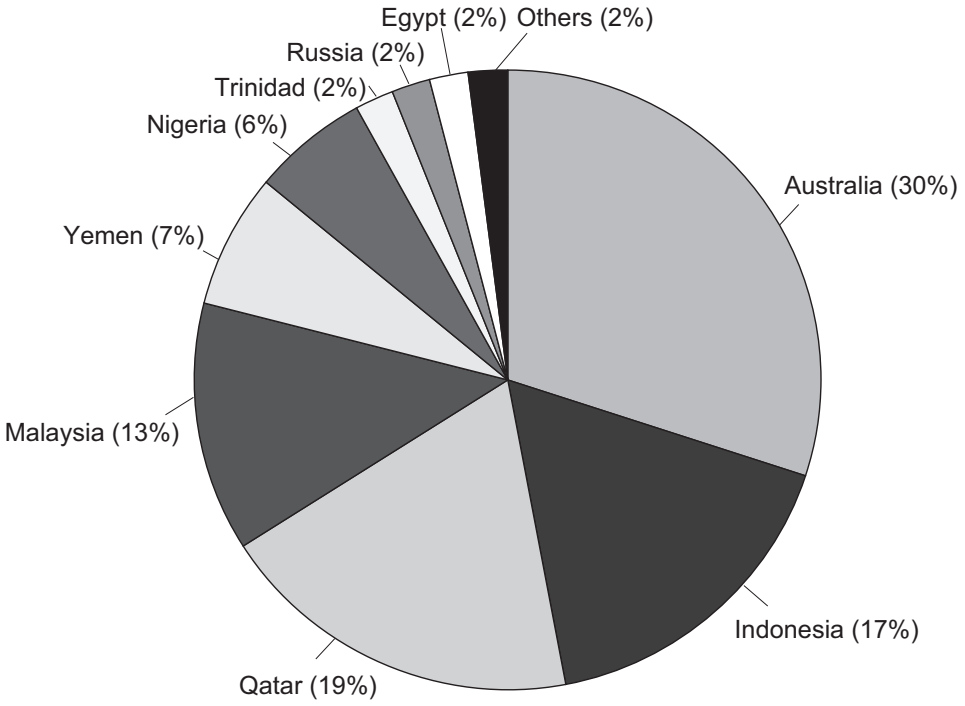
[22] "Commercial and Strategic Opportunities for LNG in China."

The Politics of Gas

Just as dependence on oil imports has reshaped aspects of Chinese foreign policy—even if unwittingly—China's increasing appetite for gas will potentially have similar spillover effects. Unlike its engagement with oil-producing countries, however, Beijing has been more tactical by striking supplier partnerships with numerous countries, including advanced and stable countries like Australia, rather than relying on just a few states. In fact, about 85% of China's current LNG supplies come from five different countries: Australia, Indonesia, Malaysia, Qatar, and Yemen (see **Figure 5**). This diversification strategy should help limit China's exposure to any specific disruption to supplies. Beijing has traditionally been wary of becoming overreliant on any particular country for its energy needs, believing that such dependence would allow other powers to exert leverage.

Such wariness may also figure strongly in Beijing's attitude toward receiving gas exports from the United States, if they were approved. Even though the economics seem to make sense, given the relative abundance of cheap gas in the United States, as the "weaker" power in the relationship, China may feel that relying on the United States for gas supplies would further reduce its already limited leverage. In fact, virtually all the countries from which China receives gas are essentially resource states that would not be able to exert much political and economic leverage over China. At the same time, if China wants U.S. gas, it will need to compete with Japan, whose search for gas supplies has accelerated after the Fukushima nuclear tragedy. (In fact, Washington has already approved the

FIGURE 5 China's LNG import sources, 2011



SOURCE: EIA based on FACTS Global Energy.

Freeport LNG facility in Texas to export gas to Japan.)[23] An expanding energy relationship between Japan and the United States may deter China from competing for U.S. exports because within some quarters in Beijing such a move could be interpreted simply as an "energy Trans-Pacific Partnership" to benefit Japan at the expense of China.[24] Consequently, in the North American market, Beijing is perhaps more likely to look toward Canada first for gas exports, viewing it as the "Australia of North America"—Australia being another resource-rich nation that does not inspire the kind of anxieties of strategic competition that the United States does. It is possible, however, that growing political and populist backlash in Canada from groups that view China as "buying up the country" may lead to more restrictive policies on Chinese investment.

Conversely, it is also possible that Beijing and Moscow will draw closer together should the gas pipeline deal finally be sealed. The volumes from that pipeline could be even more significant than the expected volumes from the Turkmenistan pipeline. To ensure that the supplies remain undisrupted, China will have to maintain a stable relationship with Russia. Beijing is well aware of Moscow's practices of squeezing European countries on gas supplies and prices. Russia appears to be undertaking a shift of "looking toward the east" for future energy demand, particularly as the EU economies continue to experience a sluggish recovery. Moreover, certain better-performing economies, such as Germany, are increasingly moving away from fossil fuels as a matter of general energy policy.

Beyond geopolitics, the politics of commodity prices will likely also rise to the forefront. As the last decade has amply demonstrated, Chinese demand effectively drove prices for resources ranging from iron ore to coal. Some have even blamed China for rising oil prices, an accusation that Beijing vehemently denies. This charge that China is responsible for the rise of global commodity prices has been a sensitive issue within the country, even though in reality it is difficult to see how China's impact on global oil prices was anything but negligible. Because China buys so much in the global market, price inflation eventually affects the domestic market, where Chinese consumers, who already pay more for a gallon of gasoline than their American counterparts, must foot the bill. Such a scenario could be repeated should Chinese demand for gas exceed current projections, and Beijing may once again find itself "blamed" for sustaining the rise of global gas prices. From an economic standpoint, this scenario may lead to slower adoption of gas in the power sector or, alternatively, to a more rapid transition from gas to less carbon-intensive fuels. Politically, this issue will likely continue to be a sensitive subject for Beijing. Incidentally, opposition to unfettered U.S. gas exports rests on similar arguments that gas prices will quickly become expensive as demand from Asia and other regions skyrockets.

Conclusion

China has embarked on a strategy to rebalance its energy resources for reasons ranging from promoting sustainable energy growth and addressing environmental and pollution concerns to aligning corporate and strategic interests. It is clear that China punches far below its weight in terms of gas consumption in its energy mix—about five times below the global average rate of roughly 24%.

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[23] See Keith Johnson and Ben Lefebvre, "U.S. Approves Expanded Gas Exports," *Wall Street Journal*, May 18, 2013, http://online.wsj.com/article/SB10001424127887324767004578489130300876450.html.

[24] The Trans-Pacific Partnership (TPP) has become a U.S.-led free-trade initiative intended to expand U.S. trade and economic engagement with the Asia-Pacific. Beijing tends to view the TPP as a way for the United States and Japan to strengthen their economic partnership while excluding China.

The government has thus made it a priority to boost gas use significantly, in large part to establish a healthier balance between coal, oil, and gas. Moreover, Chinese national oil companies are actively transforming themselves into major gas companies and are now champions of government policies to increase the role of gas in the Chinese economy. Similar to those in the United States, Chinese oil companies make the case for gas based on the need for greater security of supplies and cleaner fuel and the potential for enormous windfalls from domestic production.

In the foreseeable future, the effort to double gas consumption will require China to increasingly tap the global market, since domestic production is unlikely to be sufficient. Many have pinned hopes for significantly boosting domestic production on China's ability to replicate the shale gas revolution in the United States. But it will likely be a slow-burning revolution that might take at least a decade to produce meaningful results. In the interim, the Chinese government will have little choice but to pursue additional options to meet the rising demand for natural gas and manage the associated politics of securing energy from abroad. Consequently, LNG imports are likely to climb dramatically, particularly if drivers of domestic demand, such as urbanization and shifts in the transportation sector to cleaner fuels, continue unabated.

Yet the unavoidable reality of China's size and scale means that, irrespective of how well the country manages its gas policy, the impact of its decisions will be felt globally. The upside is that China's experience with global oil markets should help it shape better policies, both at home and abroad, that enhance its energy security without being subject to the accusations of mercantilism that have been lodged against China's oil policy.

The uncertainty is not over whether Chinese demand will be significant but rather over how significant it will turn out to be. Decadal projections are perilous to undertake because of their usual inaccuracy when viewed in hindsight. Judging by the collective economic development objectives and policy incentives behind China's rebalancing of energy resources, current projections for Chinese gas consumption could very well fall short of actual future demand. Few could have predicted back in 2001 that merely ten years later China would be producing nearly 50% of the world's steel, consuming half of the world's coal, and importing close to 60% of the country's oil. That China is investing heavily in LNG terminals, potentially building ahead of full demand realization, suggests that policymakers are anticipating strong imports given that China has few other options in the medium term. Gas exporters hedging against the potential growth of domestic shale gas production in China can probably rest assured that any boom will likely take longer to transpire than previously thought.

The choices that China makes now about the structure of its economy and the resources used to support its economic transition will have significant implications for its energy security. Indeed, China's energy security has always been dictated by the way in which its economy has functioned. These choices are becoming much clearer now, suggesting that the next decade will be a particularly interesting and rich one for natural gas.

THE NATIONAL BUREAU *of* ASIAN RESEARCH

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Russian LNG Exports to Asia: Current Status and Future Prospects

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EXECUTIVE SUMMARY

This essay examines the key drivers that are leading Russia to want to expand its LNG exports to Asian markets and evaluates the prospects for the various projects now under development in the Russian Far East.

MAIN ARGUMENT

The current desire on the part of the Russian government to expand LNG exports from the Russian Far East is a response to three policy drivers: first, the need to promote the economic development of the region; second, in the face of increased competition in Europe, the need to create new gas market opportunities in Asia; and third, the desire on the part of the Russian government to gain a 20% share of the global LNG market by 2030. To date, Gazprom has been given a monopoly over gas exports; however, the liberalization of LNG exports is resulting in competing projects in Russia vying to gain new market share in what promises to be a very competitive Asian market toward the end of this decade. Nonetheless, if political considerations continue to override commercial logic, it may well be that Russia will fail to realize its plans to expand LNG exports to Asia.

POLICY IMPLICATIONS

- In the face of increasing competition in Europe, Gazprom needs to create new market opportunities in the highly dynamic, but increasingly competitive, Asian gas market; however, it has no experience in developing new markets and is making very slow progress (though this situation would change if a deal were signed with China).
- Gazprom's Eastern Gas Program commits the state-controlled company to massive investments, but the net financial return on these investments is unclear, and they could have a negative impact on the company's performance.
- The liberalization of Russian LNG exports means that the new entrants—Rosneft and Novatek—will complete with Gazprom to expand exports to Asia. It is unlikely that all these projects will proceed as announced, but the one project that could compete with LNG projects outside Russia—the expansion of Sakhalin-2—is on hold due to Gazprom's focus on an alternative project at Vladivostok.

Although Russia remains the world's largest natural gas supplier, trade flows in global gas markets are shifting. Europeans have traditionally been the country's most significant customers, but these gas trade volumes are now declining, leading Russian leaders to envision a shift east toward Asia. Such a change carries with it implications for how Russia will need to deliver its gas to global markets and may ultimately benefit the development of liquefied natural gas (LNG) projects that can more readily reach Asian consumers. In 2012, Russia held 17.6% of the world's conventional gas reserves and accounted for the same share of global gas production. Yet while it was responsible for 26.4% of global pipeline trade, it accounted for only 3.3% of global LNG trade.[1] Moscow is actively interested in addressing this imbalance and has announced that by 2030 Russia will be responsible for 20% of global LNG trade. Still, how and to what extent Russia's LNG-development goals can be achieved will depend on a range of factors that are driven by both market and geostrategic considerations.

To assess the current status of Russian LNG exports and the prospects for the future, this essay combines an appreciation of the geographical factors that influence current and future developments with an analysis of the geopolitical and commercial drivers that underpin these trends. The essay is divided into three sections. The first section places developments in Pacific Russia in the wider context of Moscow's national energy strategy and desire to develop a new "eastern vector" to both promote the effective occupation of the Russian Far East and increase trade with the Asia-Pacific region. The second section examines the development of the first-generation Sakhalin projects, their current status in relation to gas production and exports, and the lessons learned. The third section reviews Moscow's current plans for the development of new LNG capacity in the Russian Far East and considers the challenges facing the implementation of these projects. The essay concludes by considering the tensions between geopolitics and commercial opportunities and assesses the prospects of expanding Russia's LNG exports to Asia in a timely fashion.

Russia's Eastern Energy Vector: Pacific Russia in National Strategy

Russia's energy strategy is driven as much by geopolitics and the fiscal needs of the Russian state as by commercial opportunities. In Pacific Russia, concerns about the "effective occupation" of the region date back to the Soviet period, as does the notion of complementarity between a resource-rich Pacific Russia and a resource-poor Northeast Asia. Pacific Russia combines the Russian Far East Federal District with the region around Lake Baikal known as the Transbaikal. The Russian Far East, which is two-thirds the size of the United States, comprises just over 36% of Russia's territory, yet it accounts for only 4.4% of the country's total population—just 6.3 million people—according to the 2010 census. By contrast, the northeastern regions of China, just to the south, have a combined population of over 100 million people. This has raised concerns in Moscow about Chinese encroachment, and the government is interested in promoting greater migration to Pacific Russia from other parts of the country to counter this imbalance. Such efforts, however, have been complicated by a weak economic outlook. The Russian Far East was badly hit by the transitional recession of the early 1990s and then by the Asian financial crisis, and it has since struggled to keep

[1] BP plc, "BP Statistical Review of World Energy 2013," June 2013.

pace with development elsewhere in Russia.[2] The economic weight of the Russian Far East now lies in the southern regions—Khabarovsk Krai, Primorsky Krai, and Sakhalin Oblast—which in 2010 together accounted for 60% of its population, 62.1% of its Gross Regional Product, 77.8% of its exports, and 90.6% of its imports.[3]

With this in mind, Moscow believes that greater gasification of the region could serve as an anchor for increased economic development. As noted by Gazprom, the average level of gasification in the region is less than 7%, compared with the Russian average of 62%.[4] Consequently, over the last 30 years, numerous development programs have aimed at rejuvenating the region by increasing Pacific Russia's gasification level. This is part of the strategic logic for the Eastern Gas Program (which will be discussed later), and it parallels a new state program: the "accelerated development of the Baikal Area and the Russian Far East through 2025" that aims to turn the area "into a competitive region with a diversified economy and improve the social and demographic situation in the macro-region's territory."[5]

This latest program highlights Moscow's desire to promote the economic development of the region, and oil and gas exports to Asia are essential to that ambition. Without Asian buyers, Pacific Russia's gas resources are essentially stranded: they are too far from established centers of consumption in European Russia and beyond, and the domestic market in the region is very modest. Thus, the only way to market the region's gas resources is to finance an eastern vector through exports to Asia.

Besides Moscow's desire to promote economic growth in Pacific Russia, additional impetus to develop the region's gas resources comes from Russia's national energy strategy and the current challenges facing Gazprom in global gas markets. The mainstay of Gazprom's export strategy has been production based on fields in West Siberia and a transcontinental pipeline network aimed at Europe. In the past, this trade has accounted for 25% of Gazprom's production but 75% of its income. However, the European gas market is now in a state of flux. The 2006 and 2009 Russia-Ukraine gas disputes alerted the European Union (EU) to its exposure to interruptions in supply from Russia. In response, Europe has increased its LNG import capacity, improved internal interconnections, and promoted spot-market and hub-based trading. Furthermore, the continuing economic recession in the euro zone and competition from heavily subsidized renewables and cheap coal from the United States have dampened gas demand. The net result is that Gazprom is facing increased competition in a stagnant market and must make price concessions to preserve market share, especially given that its main competitor, Norway's Statoil, is willing to trade at spot-market prices. Gazprom's share of natural gas imports from the EU-27 fell from a peak of 47% in 2003 to 34% in 2011.[6]

Not only is Gazprom concerned about the situation in European export markets, but it also now faces increasing competition in the domestic market. In particular, new pressure is emerging from oil companies and independent producers—particularly Rosneft and Novatek—that wish to market their gas to Russian and international customers. Gazprom's share of Russian gas production has

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[2] For an analysis of developments in the region in the 1990s, see Michael J. Bradshaw, ed., *The Russian Far East and Pacific Asia: Unfulfilled Potential* (London: Curzon, 2001).

[3] These statistics were obtained from the online version of *Regiony Rossii 2011* [Regions of Russia], available from the Russian Statistical Agency, http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/publications/catalog/doc_1138623506156.

[4] See "Gasification Development in Eastern Russia," Gazprom, http://www.gazprom.com/about/production/projects/east-program.

[5] "Putin Criticizes 'Bloated' Far East Mega Plan," RIA Novosti, May 7, 2013, http://en.rian.ru/business/20130507/181010830.html.

[6] Anders Åslund, "Gazprom's Demise Could Topple Putin," Bloomberg, June 9, 2013, http://www.bloomberg.com/news/2013-06-09/gazprom-s-demise-could-topple-putin.html.

fallen to 75% from 90% a decade ago. In this context, it is no surprise that the company is looking to invest in Pacific Russia to gain access to new markets and new sources of revenue. As **Table 1** shows, Russia's energy strategy to 2030 envisages a reorientation of gas exports toward Asia. Yet even there, as will be outlined later, Gazprom faces new sources of competition, both within Russia and beyond.

TABLE 1 Russia's key gas targets for East Siberia and the Russian Far East

	2008 (actual)	Phase 1 (2008–12)	Phase 2 (2013–20)	Phase 3 (2020–30)
The share of East Siberia and the Russian Far East in total gas production	2% (11.3 bcm)	7%–8% (43–53 bcm)	12%–14% (91–122 bcm)	15% (130–152 bcm)
Eastern gas exports	–	24–36 bcm	55 bcm	70–75 bcm
Share of the Asia-Pacific region in gas exports	–	11%–12%	16%–17%	19%–20%
Share of LNG in export structure	–	4%–5%	10%–11%	14%–15%

SOURCE: Russian Ministry of Energy, *Energeticheskaya Strategiya Rossii na period do 2030* [Energy Strategy of Russia to 2030] (Moscow: Ministerstvo Energetiki Rossiyskoye Federatsii, 2009), 141; and Shinichiro Tabata and Xu Liu, "Russia's Energy Policy in the Far East and East Siberia," in *Russia's Energy Policy: National, Interregional and Global Levels*, ed. Pami Aalto (Cheltenham: Edward Elgar, 2012), 156–81.

The Current Status of Gas Production and LNG Exports in Pacific Russia

Pacific Russia is home to a number of projects, which are in the form of both pipelines and LNG terminals. Although both Sakhalin-1 and Sakhalin-2 owe their origins to a compensation agreement signed between the Japanese government and the Soviet Union in the 1970s, at present the only Russian gas that it is physically being exported to customers in Asia comes from the Sakhalin-2 LNG project. Sakhalin-1 is also theoretically capable of exporting gas to Asia but is not currently doing so; instead, it has been providing gas to the Russian region of Khabarovsk Krai since 2005, and to date has delivered over 8 billion cubic meters (bcm).[7] Both Sakhalin projects are now past cost recovery and are providing gas under the terms of their production-sharing agreements that is marketed locally by Gazprom. A total of 1.1 bcm was supplied to the Russian state by the two Sakhalin projects in 2012.[8] In that same year, Sakhalin-2 supplied 393 million cubic meters (mcm) to Sakhalin Island and 798 mcm to the northern gas terminal of the Sakhalin-Khabarovsk-Vladivostok pipeline that started operation in 2011. The pipeline is 1,350 kilometers (km) long, and its initial phase—costing at least $11 billion—has a capacity of 6 bcm, which could later be expanded to 30 bcm.

[7] Exxon Neftegas Limited, "Sakhalin-1 Project Overview," 2012, 21.

[8] Sakhalin Energy Investment Company (SEIC), "Sustainable Development Report 2012," 2012, 20.

Sakhalin-2

The Prigorodnoye LNG plant on Aniva Bay in the south of Sakhalin Island is part of Sakhalin-2, which is an integrated oil and gas project that has constructed the infrastructure to export oil and gas production from offshore of northeast Sakhalin. The project's first phase focused on early oil production to generate a revenue stream. The second phase—initially costing $9.6 billion—created the infrastructure to enable year-round exports of oil and LNG. In 2000, Shell became the operator of the project, and under difficult circumstances a final investment decision for the second phase was made in 2003.[9] The project experienced considerable delays and became the focus of an international campaign by environmental groups.[10] The project also attracted the criticism of Russian president Vladimir Putin, who felt that the terms of the production-sharing agreement were too generous and who harbored a desire for a Russian company to take control of the project. In 2006 the Russian government used the project's alleged environmental infractions to create an opportunity for Gazprom to purchase a controlling share of the project on attractive terms, which it did for $7.5 billion, taking majority ownership (50% plus one share) in April 2007. Thus, Gazprom joined the project late in the day, but its arrival cleared the way for trouble-free completion, enabling the delayed start-up of the LNG plant in early 2009. The final cost remains confidential but is well over $20 billion.

The Prigorodnoye plant consists of two trains with a combined capacity of 9.6 million tons per annum (mtpa). Sakhalin Energy Investment Company (SEIC) is now well established as a reliable supplier of LNG to the Asian market (see **Table 2**). Thanks to de-bottlenecking and equipment adjustments, the capacity of the plant has now been increased, and in 2012 it produced 10.9 million tons (mt), or 14.8 bcm, of LNG. In 2012, Japan was the destination for 76.3% of the plant's LNG exports. The plant benefits from operating at low ambient temperatures, which increases its efficiency, and from its close proximity to the Japanese market. For example, the journey from Ras Laffan in Qatar to Tokyo is 14.1 days, whereas the journey from Prigorodnoye to Tokyo is only 1.9 days. This shorter distance substantially reduces the transportation costs (as well as losses from boil off), although numerous short journeys can also present operational difficulties and can demand extra shipping capacity to enable supply to multiple customers in Japan.

TABLE 2 Sakhalin-2 LNG exports, 2009–12 (thousand tonnes per annum)

	2009	2010	2011	2012
Japan	2,884	6,127	7,416	8,317
South Korea	1,097	3,034	2,742	2,191
China	260	326	256	392
India	519	–	–	–
Taiwan	187	449	181	–
Kuwait	324	65	–	–
Thailand	–	–	64	–
Total	*5,271*	*10,000*	*10,670*	*10,900*

SOURCE: Sakhalin Energy Investment Company (SEIC).

[9] Rawi E. Abdelai, "Journey to Sakhalin: Royal Dutch/Shell in Russia (A)," Harvard Business School Case, no. 704-40, March 2004.

[10] Michael Bradshaw, "The 'Greening' of Global Project Financing: The Case of the Sakhalin-II Offshore Oil and Gas Project," *Canadian Geographer* 51, no. 3 (2007): 255–79.

Sakhalin-1

The Sakhalin-1 project encountered a more difficult exploration phase than Sakhalin-2, which has resulted in the project needing to develop its own export infrastructure. Through its subsidiary Exxon Neftegas Limited, ExxonMobil is the project operator, with a 30% share. The other shareholders are Rosneft, with 20% divided between its affiliates RN-Astra (8.5%) and Sakhalinmorneftegaz-Shelf (11.5%); the Japanese consortium Sakhalin Oil and Gas Development Company (SODECO), with 30%; and the Indian state oil company ONGC Videsh Limited, with the remaining 20%. Sakhalin-1's development strategy has focused on building the infrastructure required for year-round oil exports, and, as noted earlier, its initial gas production has targeted the domestic market. However, Sakhalin-1 has always involved a plan to develop a more substantial export-oriented gas phase, and in 2006 the project signed an agreement in principle with China National Petroleum Company (CNPC) to build a pipeline to China. Theoretically, the terms of the Sakhalin-1 production-sharing agreement allowed the project to export its gas production; however, because Gazprom has a legal monopoly over Russian gas exports, the company was able to block these plans. ExxonMobil and Rosneft have been willing to play a waiting game, but their Japanese and Indian partners have been frustrated by the delays and are eager to purchase LNG from Sakhalin-1.[11]

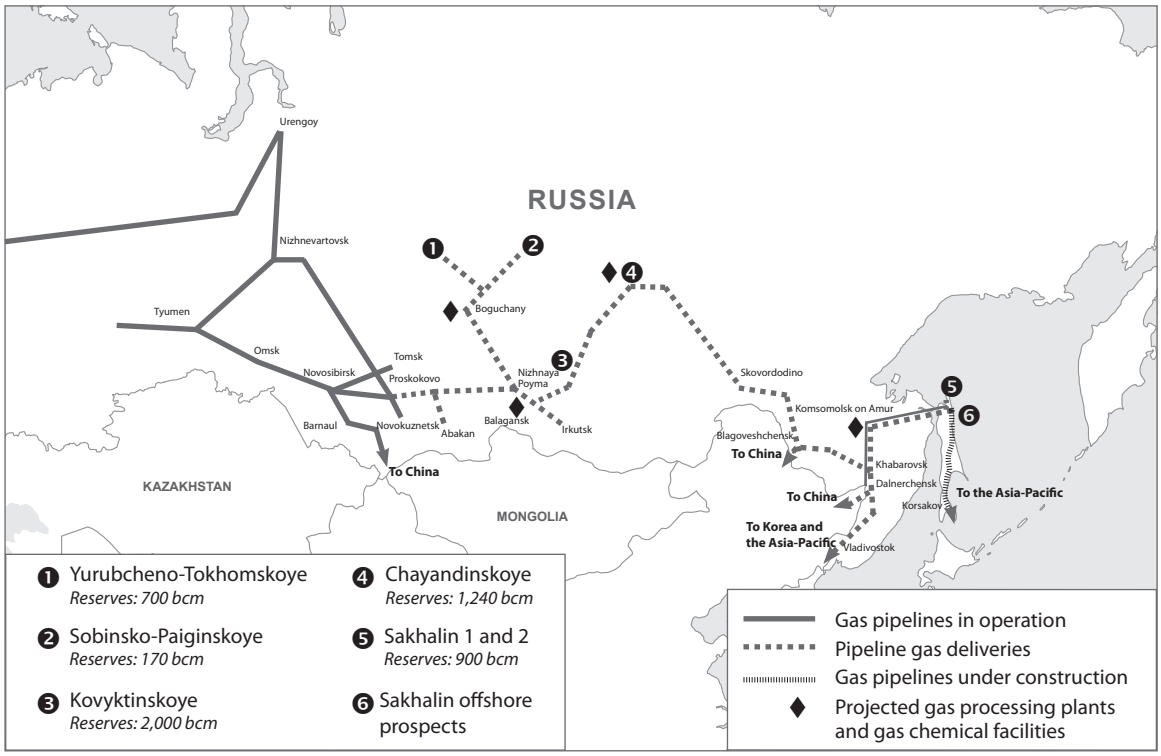
Gazprom in Russia's Energy Strategy: The Eastern Gas Program

As can be observed in the above cases, in recent years Gazprom has played a significant role in shaping Russian energy developments in Pacific Russia, either directly or indirectly, and ultimately it will continue to influence the development of future prospects. In 2002, Gazprom was tasked by the Russian government with creating an integrated gas extraction and transportation system in East Siberia and the Russian Far East. It was also given a monopoly over gas exports (the so-called single channel). At that time, the company did not control any of the gas reserves in the region. Yet that situation soon changed as Gazprom acquired resources, and in 2007 it announced its Eastern Gas Program, which took five years to produce and considered fifteen different variants (see **Figure 1**).

The Eastern Gas Program aims to develop new fields in East Siberia and the Russian Far East, promote the gasification of the region, and enable both pipeline exports to China and increased LNG exports to Asia as a whole. Gazprom acquired the rights to the Kovykta field in Irkutsk Oblast in East Siberia after BP was forced to either sell the field or face the prospect of losing its license. In 2011, Gazprom finally purchased the field for $770 million, after reneging on a deal initially made with BP in 2007. In April 2008, Gazprom was awarded the rights to the Chayandinskoye field in the Republic of Sakha (Yakutia), and in 2009 it was granted licenses for the Kirinsky, Ayashsky, and Vostochno-Odoptinsky fields, collectively known as Sakhalin-3, having previously been given the license for the Kirinsky gas condensate field in 2008. (These licenses previously belonged to Exxon and another Western consortium known as Pegastar, which included Mobil and Texaco.) Rosneft has a license for the Veninsky block of Sakhalin-3 and is developing it in partnership with China Petrochemical Corporation (Sinopec). Thus, in a short period of time, Gazprom has secured control over the resource base needed to implement the Eastern Gas Program; however, it now needs to secure export markets to help finance the project.

[11] For a more detailed assessment of the Sakhalin projects and the lessons learned, see Michael Bradshaw, "A New Energy Age in Pacific Russia: Lessons from the Sakhalin Oil and Gas Projects," *Eurasian Geography and Economics* 51, no. 3 (2010): 330–59.

FIGURE 1 Gazprom's Eastern Gas Program



SOURCE: Gazprom, http://www.gazprom.com/production/projects/east-program.

A pipeline deal with China is the cornerstone of the Eastern Gas Program and will have an impact on both Gazprom's ambitions specifically and Moscow's LNG ambitions more broadly. Discussions between China and Russia have been ongoing for decades and have focused on the possibility of a 68 bcm deal via two export corridors: a western variant through the Altai using established fields in West Siberia (30 bcm) and an eastern variant based on new fields in the Russian Far East (38 bcm).[12] The price that China is willing to pay for Russian gas has proved a major sticking point. Gazprom is clearly hoping to negotiate a price similar to that which it receives for exports to Europe, but that arrangement simply is not viable for China. There are also concerns about pipeline routes and what fields will supply the gas. Despite expectations in recent years that the two parties would sign a deal, no agreement has been reached. Meanwhile, China has secured pipeline gas and the necessary pipeline capacity from Central Asia and Myanmar. This means that it does not need to add more gas import capacity in the west. China has also constructed substantial LNG import capacity in the coastal regions and is looking to develop its domestic shale gas potential.

Thus, the market opportunity for Russian pipeline gas is now constrained to the eastern corridor and may fast be closing, as China appears more than willing to wait to get the deal that it wants.[13] Under the terms of the most recent negotiations, Gazprom would supply up to 38 bcm of pipeline gas to northeastern China from the Chayandinskoye field. Although a memorandum of agreement

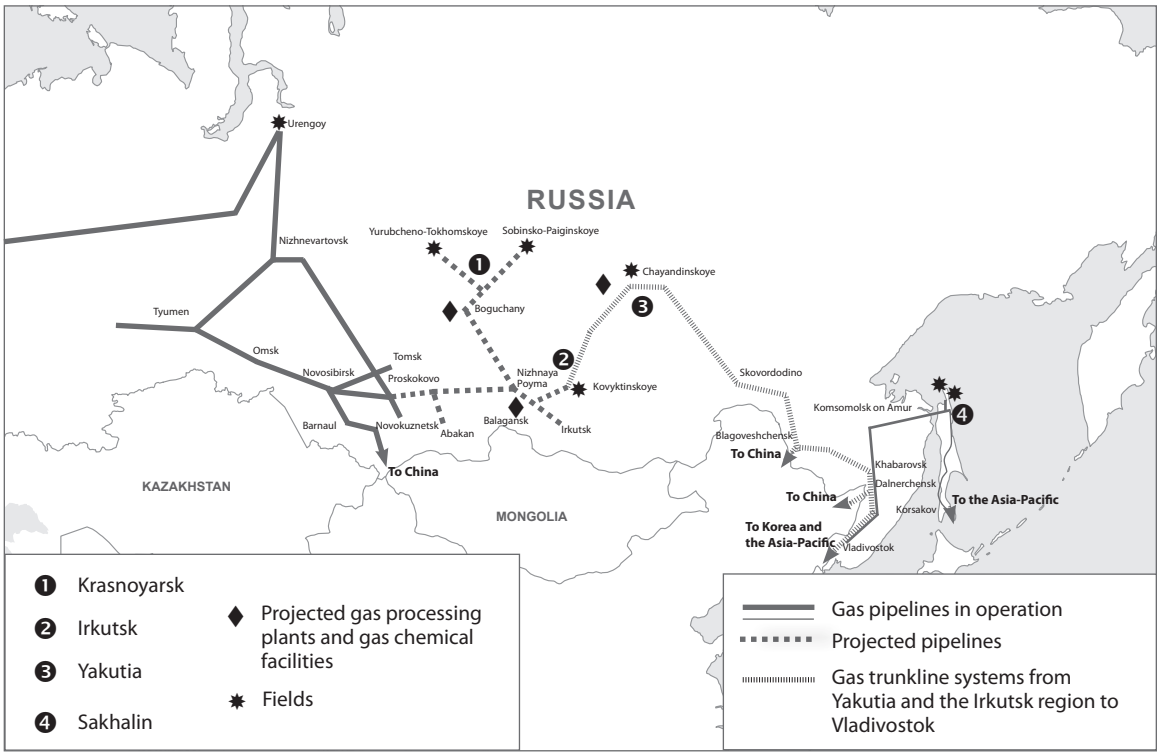
[12] For an encyclopedic analysis of the Russia-China energy relationship, see Keun-Wook Paik, *Sino-Russian Oil and Gas Cooperation: The Reality and Implications* (Oxford: Oxford University Press, 2012).

[13] Keun-Wook Paik, Glada Lahn, and Jens Hein, "Through the Dragon Gate? A Window of Opportunity for Northeast Asian Gas Security," Chatham House, Briefing Paper, December 2012.

has been signed for deliveries to start in 2018, the issue of price remains unresolved. At the group of twenty (G-20) meeting in St. Petersburg in September of this year, Gazprom and CNPC announced that an agreement had been reached on the start date and volume of gas deliveries, the take-or-pay level, the amount of guaranteed payments, and the gas transfer point. However, the companies did not specify the pricing mechanism. Gazprom stated that it expected the deal to be finalized by the beginning of 2014.[14]

Production from Chayandinskoye will be transported via the recently named Power of Siberia, or Yakutia-Khabarovsk-Vladivostok, pipeline, which will run a distance of 3,200 km (2,000 miles) and parallel the Eastern Siberia–Pacific Ocean and Sakhalin-Khabarovsk-Vladivostok pipelines (see **Figure 2**). The Power of Siberia pipeline is scheduled to be completed by late 2017, with an eventual capacity of 63 bcm. At a later date, it will be extended westward to Kovykta. Gazprom currently estimates that the pipeline alone will cost $8 million per km to build across challenging terrain (which could be an underestimate, given that the Sakhalin-Khabarovsk-Vladivostok pipeline cost $9 million per km). As the domestic market is negligible, both the pipeline agreement with China and the expansion of Gazprom's LNG export capacity in the Russian Far East are critical to generating income to finance the Eastern Gas Project. Gazprom's current estimates are that the combined cost of developing the Chayandinskoye field, building the pipeline, and constructing the LNG plant at Vladivostok will be $46.12 billion.

FIGURE 2 The Power of Siberia gas pipeline



SOURCE: Gazprom.

[14] "China, Russia Agree on Terms of Multi-Billion Dollar Gas Deal," RT, September 5, 2013, http://rt.com/business/china-russia-gas-deals-467.

Future Prospects for Russian LNG Exports to Asia

From the discussion above, it is possible to identify three potential sources of additional Russian LNG export capacity in the Russian Far East, all of which have implications for Russia-Asia trade: the expansion of the Sakhalin-2 plant at Prigorodnoye, the construction of Gazprom's Vladivostok LNG plant, and the construction of a Rosneft-ExxonMobil LNG plant based on the Sakhalin-1 project. **Table 3** pulls together what little public information exists on these projects to enable a comparison.

TABLE 3 Potential LNG projects in the Russian Far East

	Sakhalin-2 expansion	Vladivostok LNG	Sakhalin-1 LNG
Location	Prigorodnoye, Aniva Bay, Sakhalin Island	Lomonosov Peninsula south of Vladivostok in Amur Bay	Sakhalin Island in the south on the west coast
Capacity	Additional 5 mtpa	10-15 mtpa	5 mtpa?
Cost	$5–$7 billion	$7–$15 billion	$15 billion
Start-up year	2018	2018	2018
Lead companies	SEIC/Gazprom	Gazprom	Rosneft/ExxonMobil
Source gas	Sakhalin-2?	Sakhalin-3 and Chayandinskoye	Sakhalin-1's gas reserves

Expansion of the Sakhalin-2 Plant at Prigorodnoye

Expansion of Sakhalin-2 is the lowest-risk and lowest-cost option. The cost of an additional 5 mtpa through brownfield expansion is about 60% of the cost of equivalent capacity at a new project (which suggests that the cost of $7 billion for the Vladivostok LNG plant is for the initial phase only). The infrastructure is already in place and expansion was always planned, but if sufficient gas reserves are not available within Sakhalin-2, SEIC might need to source additional gas from Gazprom's other Sakhalin projects. Yet this may not be possible, particularly now that Sakhalin-1 gas is no longer available because ExxonMobil and Rosneft now have plans to build their own LNG plant. SEIC's shareholders hope to make a final decision on expansion by late 2013 to provide enough time to bring the additional LNG to market before 2018. Although the foreign partners—led by Shell—favor expansion, Gazprom has its eyes on another prize: the Vladivostok LNG plant. At the recent Sakhalin Oil and Gas Conference in Yuzhno-Sakhalinsk, Olivier Lazare, head of Shell's operations in Russia, stated: "I think if we go to the market now, this project will have very high credibility and if you go earlier…you can actually sell your gas in the market at an attractive price."[15] This suggests that delays could result in selling LNG into an over-supplied market with lower prices. Thus, as Sakhalin-2 expansion is the fastest and cheapest way to increase Russian LNG export capacity to Asia, from a purely commercial perspective at least, it should get priority.

[15] Denis Pinchuk, "Shell Warns Gazprom of Price Risks as LNG Expansion Delayed," Reuters, September 30, 2013, http://www.reuters.com/article/2013/09/30/us-russia-shell-lng-idUSBRE98T0HE20130930.

Construction of Gazprom's Vladivostok LNG Plant

The decision to invest in the Vladivostok LNG plant was made in February 2013, and Gazprom is now marketing the project and looking for potential investors. The company aims to sell 80% of its initial LNG production by mid-2014, and as much as 50% of the project could be made available to foreign investors, though Gazprom will still retain a controlling interest. A memorandum of understanding has already been signed with a consortium of Japanese companies known as the Japan Far East Gas Company (Mitsui and Mitsubishi, investors in Sakhalin-2, have also been linked to the project), and there is reportedly Indian interest as well. Plans to develop the project are supported by both the Russian and Japanese governments, so the project enjoys high-level political patronage.

It is anticipated that there will initially be two trains, each with 5 mtpa of capacity, and that production at the first train will start in 2018 and at the second train in mid-2020. In addition, there is the possibility of a third train expanding capacity to 15 mtpa by 2025.[16] The source of gas supply for the plant remains unclear, and some supply may initially need to come from Sakhalin-3 via the Sakhalin-Khabarovsk-Vladivostok pipeline (hence the ability to expand the capacity of the pipeline). The Sakhalin gas condensate field is due to start production by the end of 2013, but that alone will not be sufficient. As a result, gas may need to come from further development at Sakhalin-3. Given that initial deliveries of pipeline gas to China are also due in 2018, there are clearly questions about the timely completion of the project and the availability of gas for the LNG plant.

Construction of a Rosneft-ExxonMobil LNG Plant Based on the Sakhalin-1 Project

In April 2013, Rosneft and ExxonMobil announced that they were considering a $15 billion investment in an LNG project on Sakhalin Island. At the time, Gazprom's LNG-export monopoly was still intact, posing a likely roadblock for any such project. However, at the St. Petersburg International Economic Forum in June, President Putin announced the gradual end of Gazprom's monopoly on exports of natural gas, pledging to "lower restrictions gradually on liquefied natural gas exports."[17] At the same conference, Rosneft announced that it had agreed to sell 1.50 mtpa of LNG to SODECO (a partner in Sakhalin-1) and 1.25 mtpa to Marubeni. The Swiss oil trader Vitol has since signed a preliminary agreement to buy LNG from Rosneft.

The removal of Gazprom's monopoly is essential if non-Gazprom LNG projects are to attract project financing. The Russian Ministry of Energy is now drafting legislation that would liberalize LNG exports, but it has also been reported that the Novatek and Rosneft projects might only be allowed to export LNG to Asian markets in order to avoid competition with Gazprom in Europe.[18] Gazprom will also retain its monopoly over pipeline exports.

Gazprom is openly critical of Rosneft's LNG plans and maintains that the infrastructure is already in place to allow the less costly export of Sakhalin-1 gas. By this, it means that Sakhalin-1 should sell its gas to Gazprom, so that Gazprom can supply an expanded LNG plant at Prigorodnoye. This approach does make some sense, given that Rosneft's plans would require additional drilling, the construction of more gas-processing facilities, and a pipeline to the LNG plant in the south. Still, Rosneft will clearly not agree to forgo its own projects to sell gas to Gazprom now that Rosneft has its

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[16] Elena Burmistrova, "Gazprom in the Global LNG Industry" (presentation to the 17th International Conference and Exhibition on LNG, Houston, April 18, 2013).

[17] "Update 1—Putin Signals End to Gazprom's Russian Gas Export Monopoly," Reuters, June 21, 2013. http://uk.reuters.com/article/2013/06/21/putin-gas-exports-idUKL5N0EX1WJ20130621.

[18] "Proposal on LNG Export Liberalization Drafted," *Moscow Times*, September 11, 2013, http://www.themoscowtimes.com/business/article/proposal-on-lng-export-liberalization-drafted/485836.html.

own ambitions to develop a natural gas business. In late August 2013, a Rosneft press release stated that the initial capacity of its LNG project will be 5 mtpa (6.8 bcm), subject to further expansion, and that the plant will be located on Sakhalin Island. Two sites on the west coast are under consideration, with a planned start-up in 2018.[19]

Project Potential Beyond the Russian Far East: Novatek's Yamal LNG Project

Besides the three projects discussed above, there is a project outside the Russian Far East that could export Russian LNG to Asia. Located on the Yamal Peninsula above the Arctic Circle, this project—led by Novatek and also including Total and CNPC—aims to supply Asian markets in the summer months via the eastern sector of the Northern Sea Route. In the winter, however, it would only be able to deliver LNG via the western sector into Europe and beyond, which has raised concerns about competition with Gazprom. Still, there is great interest from Asia in this project. In early September 2013, it was announced that Novatek had secured financing from leading Chinese banks. There are also reports of Indian interest in securing the remaining 10% of the project and taking up to 5 mtpa of LNG. The $20 billion project is still in the early stages of development, and a final investment decision is not expected until the end of 2013.

The Yamal LNG project is very ambitious, aiming to bring LNG to market by 2016. It is clearly a competitor for the projects in the Russian Far East, but it faces a number of challenges. To begin with, the Yamal LNG project's partners are untested in delivering such a large investment in extreme conditions. In addition, like Rosneft's project, it remains hostage to the implementation of legislation to liberalize exports—any clause that would require export via a third party (Gazprom) or restrict market access would jeopardize project financing. Although the project will be the beneficiary of tax incentives to develop Arctic resources, which will improve its economics, delays seem inevitable, and it remains to be seen just how much of the project's LNG will physically make its way eastward to Asian markets before the end of the decade.

The Race Is On

At present, despite falling demand in Europe and the United States, global LNG supplies are tight as a result of a lull in the commissioning of new liquefaction capacity, a surge in demand following the Fukushima disaster in Japan (at the time of writing all of Japan's reactors remain shut down), and demand growth in places such as China and India. However, in mid-2013 there were 30 new LNG trains under construction with a total capacity of 110.1 mtpa (nearly 150 bcm) that could provide new supplies by 2018–20.[20] There will be new market openings as existing contracts expire and new LNG importers emerge, but the competition will be fierce. Thus, the Russian LNG projects will be in competition not only with one another but also with new projects and brownfield expansions in Australia, the United States, western Canada, and the east coast of Africa. The low cost of gas in the United States—as a result of the shale gas revolution—has made Asian buyers wary of the high cost of the LNG supply chain, and they are placing pressure on new suppliers to offer more competitive prices. Japan hopes that this effort could reduce the price it pays for LNG by as much as

[19] "Rosneft and ExxonMobil Proceed with LNG Project Implementation," Rosneft, Press Release, August 21, 2013, http://www.rosneft.com/news/pressrelease/21082013.html.

[20] International Gas Union, "World LNG Report—2013 Edition," 2013, 7.

30%.[21] Thus, the price of Russian LNG will be the critical factor in determining its competitiveness in Asian markets.

No detailed figures are publicly available to work out the cost of Vladivostok LNG. While it is close to potential customers, the project is sourcing its gas from considerable distance—particularly in the case of the Chayandinskoye field and the Kovykta field, which is even farther from the plant. But the Vladivostok plant is part of the wider Eastern Gas Project, and its viability is also linked to a pipeline deal with China that would help cover the infrastructure costs. Moreover, as noted at the outset, the project is more than just a commercial undertaking. The Russian government has been willing to subsidize the transit costs of the Eastern Siberia–Pacific Ocean pipeline to stimulate oil development in East Siberia, and it may be that similar subsidies are provided to make the Vladivostok LNG plant viable in order to promote the economic development of the region.[22] This suggests that it would be unwise to focus too much on the commercial viability of the project; after all, Gazprom built the Sakhalin-Khabarovsk-Vladivostok pipeline without any gas to put in it and without an established market at the other end. We may yet see Sakhalin's gas being transported to Vladivostok and exported as LNG rather than an existing plant being expanded on the island.

Perhaps the bigger problem for Russia is that Gazprom cannot continue to invest in what Anders Åslund has called "superfluous projects" that do not add value for either its shareholders or the Russian state.[23] Of course, such overinvestment is a well-established "rent distribution" mechanism that has become part of Gazprom's business model, but it may yet prove the company's downfall. In contrast, the involvement of international oil companies in the other two LNG projects in the Russian Far East, as well as in the Yamal LNG project, will ensure that their development is driven by commercial logic, as they will have to deliver value to their shareholders and financiers. Even in these cases, however, it is hard to separate out commercial and economic motivations, given that some may see the Rosneft-ExxonMobil project as politically motivated to establish Rosneft's gas credentials. Yet regardless of the interpretation here, Gazprom's influence will continue to be felt in the development of LNG projects. The company's Vladivostok gaze, for instance, is already serving as a barrier to the timely expansion of the Sakhalin-2 project, and its actions also have significantly delayed Sakhalin-1's gas phase.

Conclusion

To conclude, the current developments around LNG exports in Pacific Russia are the result of at least three interrelated drivers: first, the need to promote the economic development of the region for geostrategic reasons; second, the need for Gazprom to develop new export markets in Asia to counter a loss of market share in Europe; and third, the Russian government's desire to expand the country's share of the global LNG market. However, if Moscow's intention had ever been to maximize the commercial opportunity to export Russian gas to Asia, then the expansion of the Sakhalin-2 project would already be well underway and the Sakhalin-1 project would have been allowed to develop its gas phase, either via a pipeline to China or through the construction of its own LNG

[21] Toshimitsu Motegi (keynote address at the Second LNG Producer-Consumer Conference, September 10, 2013, Tokyo), http://www.meti.go.jp/english/speeches/20130910.html.

[22] Miroslav Mareš and Martin Laryš, "Oil and Natural Gas in Russia's Eastern Strategy: Dream or Reality?" *Energy Policy* 50 (2012): 436–48; and Ivetta Gerasimchuk, "Fossil Fuels—At What Cost? Government Support for Upstream Oil and Gas Activities in Russia," International Institute for Sustainable Development, 2012.

[23] Åslund, "Gazprom's Demise Could Topple Putin."

plant. Instead, the expansion of Russian LNG exports to Asia has been held hostage to Gazprom's grand plans in the service of the state's geopolitical interests. The recent decision to liberalize LNG exports is clearly a step in the right direction. But in the face of fierce competition for Asian gas markets, it may prove to be too little too late in relation to market opportunities at the end of this decade, both because the current pace of progress in Russia means that the country may miss this market opening and because there will be significant competition from other producers. Thus, while Russia is well positioned to become a significant player in Asian gas markets over the longer term, its interim progress remains uncertain.

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How the Shale Revolution Will Transform U.S. Policy

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EXECUTIVE SUMMARY

This essay examines how the rapid growth of oil and natural gas production from unconventional shale resources in North America will transform global energy markets and assesses the implications of this transformation for the U.S. position as a global power.

MAIN ARGUMENT

The rapid growth of oil and natural gas production from unconventional shale resources in North America will transform global energy markets and enhance U.S. strategic and economic power. The U.S. will become a stable, competitive choice for supplies of refined products, natural gas, and potentially oil exports to other major economies, thereby reducing the geopolitical influence of oil exporters such as Russia and member states of the Organization of the Petroleum Exporting Countries (OPEC). Rather than driving the U.S. into a more isolationist posture, energy abundance could lead Washington toward an even more assertive foreign policy. By contrast, China's dependence on oil and gas from the Middle East will grow exponentially in the coming years, just at the time when U.S. oil imports from the region are declining rapidly. Asian economies such as China and Japan, rather than the U.S., will thus be most exposed to oil-supply disruptions. This development will change the balance in U.S.-China bilateral relations regarding the protection of the free flow of oil from the Middle East and possibly require China to adjust its policies.

POLICY IMPLICATIONS

In light of these dramatic shifts in world energy markets, the U.S. should consider the following policy responses that address the market and geopolitical opportunities presented by the shale revolution:

- Embrace exports of liquefied natural gas and someday possibly oil as a means to guarantee open markets for energy
- Work to elevate communication between the U.S. and Chinese militaries to include strategic communications on conflict resolution in the Middle East
- Re-evaluate the goals and operations of the U.S. Strategic Petroleum Reserve in light of falling crude-oil import requirements

The rapid growth of oil and natural gas production from unconventional shale resources in the United States and Canada is dramatically changing the U.S. posture in the Middle East and Asia, creating the potential for surprising outcomes that are not yet well understood. A United States that is more self-sufficient in energy matters will have greater freedom of movement in a host of global policies, ranging from conflict resolution to human rights and from democratization to climate change. The United States will also have the luxury to consider how it might use its newfound oil bounty to influence the dynamics of the global energy trade, including how to utilize oil and gas exports to garner closer ties to allies and friendly countries and to enhance market-driven, competitive energy pricing across the global economy. The decline of U.S. import dependence will open up the possibility that creative leadership on the use of strategic stockpiles in times of crisis can be leveraged both to strengthen U.S. energy assistance for allies and to prevent oil producers from cutting off energy to achieve financial or geopolitical goals. Washington will no longer have to beg allies to support its security choices in the Middle East and beyond, despite the potential negative consequences to global energy supply and prices. Instead, the United States will be able to offer its own energy abundance as a means to advance buy-in to its global vision. The domestic oil and gas boom will also return the United States to a stronger economic footing, possibly restoring some of the financial sway that previously allowed the country to dominate the global arena.

For all these reasons, it is quite possible that the United States will assume an even more assertive foreign policy. To the extent that rising domestic energy supplies help the United States regain some of its financial muscle, fiscal and budgetary constraints that currently prevent Washington from taking on too many international endeavors will be removed. This will not only give the U.S. military more sway with the American public when it feels intervention abroad is necessary or simply strategically advantageous; U.S. energy abundance will also diminish the influence of oil-related geopolitical considerations, which currently loom high on the list of factors that inhibit U.S. freedom of movement on the world stage today.

This essay will argue that rather than driving the United States into a more isolationist posture, the shale revolution will remove historical impediments to U.S. freedom of movement. It will be important to the national dialogue on foreign policy to recognize this possibility and consider the value to national security of maintaining close historical ties to allies around the world. Demonstrating the U.S. commitment to free trade and the global economy by green-lighting energy exports from the United States could be one important and constructive foreign policy response to U.S. energy abundance.

The expected change in the U.S. energy balance and its positive impact on national power comes at a time when the American electorate is weary from successive military forays of dubious effectiveness in the Middle East. The combination of these two influences on U.S. foreign policy is likely to alter historical affinities to oil and gas strategic partnerships in the Persian Gulf, with substantial implications for U.S. relations with important geostrategic powers in Asia. China's recent appeals to the United States to abandon its values-driven pursuit of democratization in the Middle East in favor of Chinese-defined notions of "peace and stability" are likely to fall on deaf ears in Washington. To Beijing, the United States is over time likely to seem increasingly reckless in its interventions abroad. Ironically, the national economy that is most likely to suffer from U.S. mistakes in the volatile Persian Gulf will be China, whose dependence on Middle East oil and gas supply is expected to grow exponentially just at the time when U.S. oil requirements from the region are declining rapidly.

This geopolitical shift has left Beijing in a quandary: Does it try to become a key strategic counterpoint for status-quo dictators in the Middle East and run the risk of alienating future generations on whom its energy security will depend (similar diplomatic problems exist in Sudan and Libya)? Or should China dramatically accelerate its domestic energy development, possibly through a broader opening to U.S. oil companies? The choices that Beijing makes to respond to this new energy reality will have wide-ranging implications for global geopolitics in the decades to come.

This essay will begin with a discussion of the implications of the shale revolution for U.S. energy self-sufficiency. The effects of the United States' changing energy balance on the Organization of the Petroleum Exporting Countries (OPEC) and oil geopolitics will then be laid out, followed by an analysis of the implications for China and U.S.-China bilateral relations. The conclusion will then discuss the U.S. policy implications of this transformation of global energy markets.

The U.S. Shale Revolution and Conservation: Is Energy Independence Achievable?

For decades, U.S. politicians have declared the aspiration that the United States achieve energy independence. President Barack Obama, in the week following his inauguration in 2009, urged the nation to pursue this goal:

> President Nixon promised to make...our nation energy independent by the end of the 1970s. When he spoke, we imported about a third of our oil, and we now import more than half…It falls on us to choose whether to risk the peril that comes with our current course or to seize the promise of energy independence. And for the sake of our security, our economy and our planet, we must have the courage and commitment to change.... Today I'm announcing the first steps on our journey toward energy independence, as we develop new energy, set new fuel efficiency standards and address greenhouse gas emissions.[1]

Ironically, the U.S. president may get his wish, but partly by being in the right place at the right time. Exceedingly high oil prices in the 2000s have invited massive investment by private capital both in oil exploration outside of the member states of OPEC, particularly in unconventional resources in North America, and in alternative sources of energy. At the same time, the financial pressure of rising oil import bills has similarly triggered major consuming countries to reregulate energy markets to include targets or incentives for energy efficiency, which will significantly reduce the growth in future oil demand.

In the case of the United States, the combination of both trends has been nothing short of stunning. The so-called shale revolution has unleashed an enormous amount of oil and gas activity in the United States, with shale gas production increasing from virtually nothing in 2000 to more than 2.5 trillion cubic feet this past summer, a record high. This production could more than quadruple by 2040 and account for well over 50% of total U.S. natural gas production over the next two decades.[2] In addition, tight oil (that is, unconventional oil from shale structures) is developing at an extraordinarily rapid rate in the United States. This growth has enabled the country to add

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[1] "Obama Announces Plans to Achieve Energy Independence," *Washington Post*, January 26, 2009, http://www.washingtonpost.com/wp-dyn/content/article/2009/01/26/AR2009012601147_pf.html.

[2] For more on predictions regarding gas production, see Kenneth B. Medlock III, Amy Myers Jaffe, and Peter R. Hartley, "Shale Gas and U.S. National Security," James A. Baker III Institute for Public Policy, Rice University, Working Paper, July 2011.

2.3 million barrels per day (mbd) to its overall production levels since the beginning of 2011—a trend that is expected to continue.[3]

U.S. analysts are now projecting that U.S. oil production could rise significantly over the next decade as increased drilling in shale formations and deepwater areas of the Gulf of Mexico translates into higher domestic output. Estimates for the increase in production of oil and natural gas liquids from shale range from 3 mbd to 10 mbd by 2020, with some analysts projecting that the United States could become an exporter of natural gas liquids over time.[4] Citibank, for example, estimates that U.S. deepwater production could hit 3.8 mbd by 2020, up from 1.3 mbd in 2011. The United States has also mandated a doubling of biofuel production over the same period. While it is unclear whether the rate of drilling in the United States will be sufficient to eliminate completely the need for oil imports from outside North America, the Obama administration's combined approach that includes both continued drilling for shale and accelerated timelines for raising average fuel-efficiency standards for vehicles to 54.5 miles per gallon by 2025 could truly leverage the potential to eliminate the roughly 8.5 mbd of crude oil imported into the United States at present. The new efficiency standard for cars should reduce oil import requirements by 4–6 mbd in the next decade or two. If one also considers the development of the Canadian oil sands, which has the capacity to continue to grow for at least a decade, if not two decades, at a steady pace of about 200,000 barrels per day annually (or at a rate of 2 mbd more in this decade), continued U.S. dependence on imports from the Middle East or on OPEC oil appears highly doubtful.

The prospects of rapidly expanding domestic natural gas supplies have led to forecasts of inexpensive U.S. natural gas for the foreseeable future. In North America, break-even prices for wells drilled in some of the more prolific shales are currently estimated to be as low as $2–$3 per million cubic feet (mcf), with a large majority of the resources accessible at below $6 mcf. Ten years ago, costs were significantly higher. As firms continue to make cost-reducing innovations, greater quantities of the shale resources will likely become both technically and economically viable. U.S. shale gas has already played a key role in weakening Russia's ability to wield an "energy weapon" over its European customers by displacement. By significantly reducing U.S. requirements for imported liquefied natural gas (LNG), rising shale gas production in the United States has increased alternative LNG supplies to Europe in the form of LNG displaced from the U.S. market. Thus, the geopolitical role of U.S. natural gas surpluses in constraining Russia's ability to use its status as an energy supplier to create a wedge between the United States and its European allies could further weaken over time, to the extent that the administration stays the course with approvals of U.S. LNG export terminals.[5] LNG exports from the U.S. Gulf Coast to Europe could be an important strategic alternative to shaky Russian gas supplies that potentially have political strings attached.[6] This is very similar to the way that the United States served as a swing oil producer in the 1960s, rendering an Arab

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[3] U.S. Energy Information Administration (EIA), "Annual Energy Outlook 2013 Early Release Overview," December 5, 2012, http://www.eia.gov/forecasts/aeo/er/executive_summary.cfm.

[4] Michael Levi, "Think Again: The American Energy Boom," *Foreign Policy*, July/August 2012, http://www.ourenergypolicy.org/wp-content/uploads/2012/08/0_New_14413.pdf. Natural gas liquids are liquid hydrocarbons suspended as particles in natural gas, under conditions of subterranean pressure and temperature. They include propane, butane, and isobutane, as well as condensates. Liquefied natural gas is natural gas that is converted to a liquid by lowering its temperature.

[5] Edward L. Morse and Adam J. Robinson argue that Moscow has used energy as a means to pull European states away from close alliances with the United States by brief demonstrations that the reliability of their energy supply could be subject to geopolitical considerations. Russian energy "diplomacy" is mentioned in EU discussions as a factor in slowing the eastward expansion of NATO to Ukraine and elsewhere. See Edward L. Morse and Adam J. Robinson, "Growing Pains: Russia's New Muscle," *Aspenia* 32, no. 4 (2007): 110–19.

[6] Many forecasters anticipate that the United States will become an exporter of natural gas, and some, including the EIA, anticipate that the country will also become an oil exporter in the coming decades.

oil boycott during the 1967 Arab-Israeli War infeasible.[7] U.S. allies in Asia (i.e., Japan and South Korea) also are seeking flexible LNG contracts from the U.S. Gulf Coast for reasons of economic and geopolitical leverage.

As U.S. shale production expands from natural gas to oil, the geopolitical fallout will spread, and the United States' vulnerability to economic blackmail by oil producers will disappear. The upshot of the shale oil revolution will be to reverse the course of history and roll back the clock to the situation that existed before 1973, when an abundance of oil in Texas allowed the United States to increase production to respond to shortfalls in global markets. Oil-producing states will no longer be able to use the lever of a possible supply cutoff to pressure Washington to adjust its foreign policy. Depending on energy demand trends and attitudes in the United States, the country could eventually even become a net oil exporter. In 2012, the director of the U.S. Energy Information Administration, Adam Sieminski, stated at a conference in Washington, D.C., that the idea of crude exports "should not automatically be taken off the table."[8]

Even if crude oil exports never come to fruition, a more self-sufficient United States will have more flexibility in how it manages the roughly 700 million barrels in the Strategic Petroleum Reserve (SPR). Although many think of the SPR as a wartime stash, it was in fact created to be a tool of statecraft. The SPR was intended to be used both to redress the bargaining imbalance, thereby allowing the United States as a major oil importer greater maneuverability in its foreign policy, and to prevent global economic damage from undue manipulation of oil markets. The size of the SPR was determined by the premise that the United States would need to replace some or all of its oil imports during a crisis. But if the United States has no imports to replace, then it will have more discretion on when to use the SPR to either loan oil to other countries for geopolitical purposes or provide extra oil to the market in order to influence global prices, should they be negatively affecting the global economy. At a minimum, over time Washington will need to review its SPR policy, which already lacks a clear mandate for when a release is triggered.[9]

OPEC Policy and China

The possibility that the United States will see its oil and gas imports decline over time coincides with rising demand in Asia for these resources. Unlike in the 1980s and 1990s, when rising oil demand in the United States drew a large share of the marginal export increases from OPEC, large oil and gas producers will increasingly be focusing on cultivating access to Asian markets as the key destination for sales. This shift in oil and gas trade flows is already changing the geopolitics of energy. The Asia-Pacific accounted for 56% of the increase in demand for global primary oil from 2000 to 2010, and forecasts predict that the region will account for 70% of the growth in global oil demand from 2010 to 2020. China and India are key to this expected growth in energy use, with China alone being forecast to represent about 48% of the growth in global oil demand through 2020.

These demand trends portend a substantial shift in global energy flows, which will have significant geopolitical implications. China's involvement in oil-producing countries is already on the rise and

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[7] For a detailed account of the United States' historical role as a swing producer, see Daniel Yergin, *The Prize: The Epic Quest for Oil, Money, and Power* (New York: Simon and Schuster, 1991), chap. 27–28.

[8] Margaret Ryan, "U.S. Crude Exports Could Make Sense Says EIA Head," Breaking Energy, June 28, 2012, http://breakingenergy.com/2012/06/28/us-crude-oil-exports-could-make-sense-says-eia-head.

[9] For more discussion about the problems of the SPR trigger mechanism, see Amy Myers Jaffe, "America's Real Strategic Petroleum Reserve," *Foreign Policy*, August 24, 2012, http://www.foreignpolicy.com/articles/2012/08/24/Saudi_Arabia_Strategic_Petroleum_Reserve.

could eventually rival that of the United States and Europe. As oil and gas flows from the Middle East move increasingly eastward, this shift will alter the politics of using oil as a weapon in international discourse. Producer cutoffs of supply may affect Asia's rising powers more than they do the United States, United Kingdom, France, and Germany, with different implications for the potential strategic power and reach of oil-producing states.

It remains unclear what geopolitical benefits OPEC would gain from cutoffs of supply when its "oil weapon" would unleash more pain on China (and perhaps someday India) than on the United States. The answer to that question will partly rely on how China's foreign and strategic policy develops over time and whether Middle Eastern or Russian oil exporters will find elements of China's foreign policy that they would like to influence. One could imagine that China's extensive arms sales might become a target of petro-power ire in the future, just as U.S. military aid to Israel conflicted with Arab interests in the 1970s. That said, China's projection of naval force will likely be limited for at least two decades, leaving less to counterbalance through an energy weapon.

Ironically, greater U.S. energy self-sufficiency will lessen the United States' importance to exactly the same petro-states that its current energy vulnerability serves. Until recently, the U.S. market had been a giant and growing destination for sales of petroleum, and it was thus important to oil producers to have access to U.S. consumers. Between 1990 and 2000, the growth in U.S. oil demand represented close to 60% of the rise in OPEC's traded oil production.[10] The importance of the U.S. market meant that U.S.-led oil sanctions against a country had real and economically biting consequences. For example, Libya's Muammar el-Qaddafi, it is said, turned over his WMDs because he considered access to the U.S. market and oil and gas equipment increasingly important to the possibility of an LNG industry. Over time, oil sanctions might become a less effective tool of U.S. statecraft as more and more production is sold eastward to the emerging economies of Asia. These countries are already less inclined to follow U.S. leadership, but this will increasingly be the case where their energy supplies are concerned. This problem was already apparent, for example, in Washington's difficulties in persuading Asian countries to support its bid to tighten oil sanctions on Iran in summer 2012.

On the positive side, China has become more vested in a well-functioning global market. Daniel Yergin, Dennis Eklof, and Jefferson Edwards argue that this change will "reduce the chances of conflict" through market integration.[11] However, Asian powers' rising vulnerability to OPEC and heightened insecurity about oil supplies have led them to focus increasingly on building blue water navies, thereby elevating the risk of greater military competition in Asia.[12] Increased tension involving naval units from China, South Korea, and Vietnam in the South and East China seas is but one manifestation of the problem. Down the road, concerns about oil security could also aggravate any tendency toward friction between China and India as the two powers increasingly compete in the sea lanes of the Indian Ocean.[13]

Although the focus of the so-called U.S. pivot toward Asia is not energy related, tensions over shipping lanes in the South and East China seas have drawn increasing attention from the

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[10] Author's calculation based on data from the Energy Intelligence Group's Oil Market Intelligence Data Source.

[11] Daniel Yergin, Dennis Eklof, and Jefferson Edwards, "Fueling Asia's Recovery," *Foreign Affairs* 77, no. 2 (1998): 34–50.

[12] Walter Russell Mead warns that "a world with half a dozen great powers dueling for influence in the Middle East, with each power possessing the will and the ability to intervene with military force in this explosive region, would be a less safe and less happy world than the one we now live in, and not only for Americans." See Walter Russell Mead, *Power, Terror, Peace, and War: America's Grand Strategy in a World at Risk* (New York: Vintage, 2004), 43.

[13] Joshy M. Paul, "The Role of Energy Security in China's Foreign Policy: A Maritime Perspective," *Maritime Affairs* 6, no. 2 (2010): 49–71.

United States.[14] In addition, oil supply fears in Beijing and New Delhi are driving more negative reactions to U.S. policies toward the Middle East.[15] The new energy equation of rising Asian oil dependence on the Persian Gulf will make it more difficult for the United States to find support for its policies toward the Middle East, as is already evident in Washington's failure to mobilize a concrete, unified response to the Arab Spring or Iran's nuclear aspirations. But the United States, as an energy exporter, may be able to tap Asian interest in its liquid market for LNG exports (and possibly oil and condensate someday) to build greater cooperation.

As Washington seeks to engage Asia's great powers on energy issues, the question of burden-sharing is bound to become more prominent. As the United States ceases to be a major oil importer, its political will to finance single-handedly the protection of sea lanes from the Persian Gulf will almost certainly be reduced. Such a scenario would very likely alter the dynamics of the Sino-U.S. dialogue regarding the Middle East and possibly change U.S. attitudes toward Chinese "free riding" off the United States' expensive commitment to guarantee the free flow of oil from the Persian Gulf to Asia. The United States has already set in motion the precedent to scale back expectations that it will act alone where oil supply risk is concerned. Washington's approach to promoting joint operations in Libya in 2011, with NATO taking the lead, is a case in point, and joint antipiracy operations in Africa and Asia are another example. A stop in Beijing by senior U.S. military brass might be increasingly necessary as the American public becomes less inclined to spend money to protect China's oil supply. But it remains to be seen if Beijing will take this as an opportunity for more consultative coordination on energy-security matters or whether this policy shift will encourage the country's current inclination to globalize its military reach.

Chinese strategists are beginning to worry about U.S. foreign policy shifts as the United States becomes less dependent on oil imports. China's "going abroad" policy of FDI in oil production in places like Sudan, Libya, Iran, and Venezuela has mired Beijing in conflicts it might have preferred to avoid. The shortcomings of this strategy have demonstrated that a strong international commodities presence brings with it military requirements. Regardless of the nationalistic elements of the Chinese public, Chinese leaders must face the fact that the country does not have the naval resources to become actively involved in defending the producers who are its main crude oil suppliers. Traditionally, China has devoted its military resources to protecting its interests in its own backyard, including the South China Sea and Taiwan Strait, and has largely relied on the U.S. military to protect Chinese interests farther abroad, particularly in the Middle East.[16]

As China becomes a more engaged stakeholder in the international arena, the United States must prepare itself for increased global power-sharing. China's far-flung involvement in unstable regions will also motivate the country to develop troops to guard its foreign oil and gas installations and naval craft to undertake evacuations in emergencies. This increase in China's international military profile will require greater consultation with the United States, first, to avoid potentially dangerous misunderstandings and, second, to create the groundwork for cooperation during possible crises.

To help manage China's growing dependence on oil imports and the influence it will have on Beijing's military buildup, Washington should fine-tune the messaging of its diplomacy with Beijing

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[14] Amy Myers Jaffe and Steven W. Lewis, "Beijing's Oil Diplomacy," *Survival* 44, no. 1 (2002): 115–34.

[15] As Michael Wesley has written, "Asian powers have begun to worry whether by acquiescing to the U.S. energy security umbrella, they are leaving themselves vulnerable to collateral damage arising from Arab anger at U.S. policies." See Michael Wesley, *Energy Security in Asia* (New York: Routledge, 2007), 6–7.

[16] Jon B. Alterman, "The Vital Triangle" (paper presented at the Woodrow Wilson International Center for Scholars, conference on China and the Persian Gulf, Washington, D.C., July 12, 2010), http://aic-background.conflix.org/images/5/57/Securedownload_%281%29.pdf.

to include the discussion of a roadmap to elevate communications between the U.S. and Chinese militaries. The nature of conflicts in the Middle East and Asia calls for a more proactive, high-level strategic dialogue between the two militaries. At present, this dialogue is more tactical in nature. Even at the height of the Cold War, such consultative lines of communication between top U.S. and Russian military leaders were critical to avoiding the escalation of conflicts in the Middle East and the dire global consequences. The same mechanism would be beneficial in the Sino-U.S. relationship. The existence of sharply different perspectives on even the vocabulary of "stability" in the Chinese and American cultural lexicons raises the risk of unintended misunderstandings that could thwart better cooperation in the Middle East, even when Chinese and U.S. strategic interests are aligned. And where the two countries' interests are not aligned, the risks of misinterpretation and miscommunication are high and carry potentially serious consequences.

Conclusion

Forty years have passed since the Arab oil embargo was triggered on October 16, 1973. The embargo was possible because strong economic growth throughout the 1960s effectively reduced the margin of spare oil productive capacity in the United States and globally, leaving Middle East oil producers with undue monopoly power. A similarly razor-thin extra productive capacity left markets highly vulnerable in 2006–7 when OPEC made contra-seasonal cuts in output to increase oil prices instead of considering the impact on global economic growth. But as oil and gas production from North American shale formations rises, the ability of oil producers like Russia or members of OPEC to use their resources as an energy weapon to blackmail Western consuming countries is diminishing. Rising U.S. unconventional oil and gas production is enabling Washington to take the lead in changing the way energy is bought and sold, not just in the United States but globally, allowing market-driven, competitive pricing to transform the global energy market. By green-lighting U.S. energy exports and thereby allowing ready alternatives to politicized supplies from OPEC and Russia, the United States can use its influence to democratize global energy markets, much the same way that smartphone and social-media technologies have ended the lock on global information and communications. The United States can utilize oil and gas exports to garner closer ties to allies and trading partners and provide a strategic alternative to petro-state oil and gas supplies that potentially have political strings attached.

The United States will be able to use its energy abundance as a means to promote its global vision. Rising oil and gas production and falling imports of foreign oil and gas will return the United States to strong economic footing, giving Washington more flexibility on the international stage and possibly driving a more assertive foreign policy. The expected change in the U.S. energy balance could alter American historical affinities for the oil producers of the Persian Gulf, just at the time when Chinese dependence on these countries will be accelerating. Beijing will need to fashion a response to this changing reality and consider its own energy future. China's involvement in oil-producing countries is already on the rise and could someday overtake that of the United States and Europe. As oil and gas flows from the Middle East move increasingly eastward, this shift will have strategic consequences for both the United States and China.

The United States needs to carefully consider these changes to its energy balance and their implications for foreign and strategic policy. As discussed in this essay, the United States can gain significant benefits from exporting its oil and gas where available at competitive,

market-responsive pricing. But it also must consider how its changed energy situation will influence China's military calculus. As China becomes a more engaged stakeholder in the stability of the Middle East and other oil-producing regions, the United States will need to prepare itself for increased global power-sharing. Greater Chinese involvement in oil-producing regions will motivate Beijing to develop military capabilities to guard its oil and gas installations and undertake evacuations of personnel in emergencies. This increase in China's international military profile will require higher-level and more frequent consultations between the U.S. and Chinese militaries. It will also argue for greater communication and joint diplomatic efforts on conflict resolution in the Middle East and Africa between the United States, as the world's naval superpower, and China, as a rising military and economic power with increasing requirements for oil and gas.

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Asia's Uncertain LNG Future: Conclusions and Implications for the United States and Asia

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The essays, discussion, and analysis that emerged from NBR's 2013 Energy Security Program provide a powerful vision of Asia's future liquefied natural gas (LNG) markets and the range of major uncertainties emanating from both the rapid market changes and the geopolitical dimensions of LNG supply and demand. It is clear that demand will grow strongly and gas will become an increasingly important fuel for Asia in terms of energy security but also for environmental reasons. The potential for new LNG supply seems promising from the perspective of importers but is subject to major cost pressures and uncertainty over future pricing arrangements. The geography and geopolitics of Asian LNG are changing dramatically as new suppliers like the United States enter the market and as demand growth shifts from Japan and South Korea toward developing Asia, most importantly China. In addition, Japan's continuing nuclear difficulties seem likely to add an enormous layer of uncertainty over the marketplace for many more years.

The program discussions converged on a number of core themes that will drive the development of Asia's future LNG market and energy geopolitics. First, the region's LNG growth is strongly rooted in the transition to cleaner energy that will transform the energy market in Asia. Natural gas is a favored fuel for expansion across Asia, and thus gas demand is expected to double by 2030. Imported LNG, much of it from outside the region, will meet a large part of that growth. As Nikos Tsafos points out, 90% of Asia's LNG in 1988 came from inside the region, mainly Indonesia and Malaysia. By 2012, however, Asia sourced only 29% of its LNG from inside the region. So in energy-security terms, Asia is rapidly becoming dependent on more distant supply sources and long and sometimes contested sea lanes for its LNG. Nevertheless, at the same time, its sources are becoming much more diversified. By 2017, Australia will surpass Qatar as the world's largest LNG seller, and Japan, China, India, and other countries have already signed up for huge volumes. But this is likely to be high-cost LNG due to the big rise in Australia's project costs. To meet demand, Asian buyers will be searching for other options. Although potential U.S. and Canadian LNG projects can help fill the gap, new Russian supplies will also be needed, and other supplies should be available from offshore East Africa after 2020. Nonetheless, across these various sources, LNG prices seem likely to remain high due to the cost of these projects. U.S. supplies may be somewhat less expensive in early years, but as the gas market in the United States strengthens, U.S. LNG prices over the longer term are unlikely to be substantially lower than other sources. Yet despite the fact that Asia's LNG pricing problems are likely to remain, the region's energy security will still benefit from the emergence of major "Western" supplies from the United States, Australia, and Canada, which can balance dependence on potentially less stable supplies from the Middle East and Africa.

Another core theme that emerged from the discussions reflected the persistent uncertainty about Asia's LNG demand and price outlook, especially for the pivotal importers China and Japan. While Japan is the largest LNG importer in the world, China will be the biggest potential swing factor in Asia's LNG demand outlook. China sees natural gas as a critical "bridge fuel" to help reduce its reliance on coal, which is highly polluting, and has very aggressive plans to more than triple gas use by 2020. The country has many supply options, such as rapidly increasing domestic production (including large shale gas resources); importing pipeline gas from Central Asia, Myanmar, and potentially Russia; and developing LNG along the booming eastern coastal region. Beijing already depends on imports for roughly 30% of its gas needs and is likely headed for 50% import dependence by 2020. Consequently, for energy-security reasons, Beijing is seeking to diversify its sources of gas and will pursue all the above supply options. LNG imports are thus likely to rise dramatically over the next decade. Chinese national oil companies are investing heavily in Asian, Canadian, and many

other LNG projects around the world, along with signing large supply contracts for a wide range of projects. This strategy will draw China closer to Australia, Middle East suppliers, Canada, and potentially Russia. But geopolitically, Chinese buyers seem reluctant to rely on U.S. LNG supplies. They are apparently concerned about U.S. domestic opposition to Chinese energy investments as well as afraid that the United States might try to use LNG exports as diplomatic leverage.

Japan faces continuing challenges to rebuilding it nuclear energy industry, and LNG has been a key lifeline to generate electricity to replace lost nuclear capacity. LNG imports have jumped 25% since the Fukushima disaster, while prices have risen by 20% and produced the country's first trade deficits in twenty years. The Japanese government is developing an entirely new energy plan and working with large LNG buyers and state energy companies to secure LNG supplies and find ways to lower costs. Tokyo sees potential U.S. LNG supplies as a huge opportunity to diversify its supply base and gain access to lower-cost, hub-based priced LNG. It is working hard in Washington to encourage LNG export permits for countries without free trade agreements (FTA) with the United States, while at the same time Japanese companies are investing in many U.S. projects. Because Japan is the world's largest LNG importer, the pace and scale of the return of nuclear power to the country will have a huge impact on the Asian LNG market and prices. Enormous uncertainty persists about whether Japan's LNG needs will remain high or decline toward historical levels with the potential return of nuclear capacity.

A third central theme of the program discussions focused on critical uncertainties in the LNG supply-side outlook for Asia—in particular, the enigmatic outlook for Russia and the complicated politics of obtaining LNG export permits from the United States. Northeast Asian countries are hoping that Russia, already a modest LNG supplier to Asia from the Sakhalin-2 project, will expand its LNG supplies to help further diversify the region's import sources and provide more sources of nearby, secure LNG. However, both Gazprom and the Kremlin have been slow to move forward on new projects in the Russian Far East due to their fixation on defending Russia's European market position and reticence to make the very large investments needed. Negotiations for a large gas pipeline to China, which would underpin Gazprom's Eastern Gas Program, remain deadlocked. This has undermined the company's incentives to invest in developing the vast gas resources in Far East Russia that would be part of an integrated plan. The consensus seems to be that one or two new Russian LNG projects will move forward in the next decade from among three possibilities: one planned by ExxonMobil and Rosneft based on Sakhalin-1 gas, an extremely expensive noncommercial project at Vladivostok sponsored by Gazprom and the Kremlin, and a low-cost third option that would involve expanding the Sakhalin-2 LNG project. Unfortunately, from Asia's perspective, it remains problematic to rely very heavily on these supplies given the opacity and unpredictability of Kremlin energy politics.

On the other hand, discussion of the prospects for new U.S. LNG supplies going to Asia suggested that, despite the complicated domestic politics surrounding U.S. LNG exports, projects would be approved gradually and exports to Asia probably will commence sometime around 2015–16. A number of large gas-consuming companies and industries in the United States have coalesced to try to prevent or delay LNG exports in the hope of keeping U.S. gas prices as low as possible. There is also resistance among some environmental groups that claim that LNG exports would encourage more gas development via "fracking," which they believe is environmentally damaging. The Obama administration, however, recognizes the important economic benefits from LNG exports; moreover, the United States has consistently argued to other producer countries that markets, not political or

economic leverage, should determine the direction of energy trade. Consequently, the U.S. Energy Department and the Obama administration are being very deliberate and even painstakingly slow in approving new projects that could export LNG to non-FTA countries, such as Japan or members of the European Union. The discussion at the workshop suggested that more projects, beyond the four that have already been approved, would be permitted, likely leading to substantial growth in U.S. LNG exports to Asia after 2015.

Finally, a fourth theme that emerged from the program discussions centered on how the new shale gas and tight oil revolution in the United States may affect U.S. energy diplomacy and the country's historically deep engagement in the Middle East and Persian Gulf. Some have argued that the trend toward energy self-sufficiency, combined with the war-weariness of the American public, cuts in the defense budget, and the "pivot" to Asia, may lead the United States to reduce its geopolitical footprint in the Middle East. This decision would have important implications for Asia, since much of its imported oil and LNG comes from the Middle East and is secured by U.S. power in the region and protection of sea lanes from the Middle East to Asia. However, the discussion suggested that the United States' new independence from the need to placate energy exporters will give Washington greater freedom of movement and allow it to pursue a much more assertive and active role in global energy diplomacy. Moreover, new energy exports from the United States will allow it to strengthen partners such as Japan and the EU and potentially use its supplies to punish U.S. foes. For example, rising U.S. oil production has reduced oil imports, which has in turn reduced pressure on available global oil supplies and helped prevent the spike in oil prices that many expected from reduced Iranian oil exports. The United States has the opportunity to potentially use its large, and now excess, Strategic Petroleum Reserve to benefit allies in times of supply emergencies. However, the question remains whether Washington will be willing to use this new foreign policy latitude in an era of increased focus on domestic challenges and public opposition to overseas involvement, especially given how dramatically the Middle East has changed in the wake of the Arab Spring.

Overall, the 2013 Energy Security Program presented an outlook for Asian LNG that appears to be increasingly promising. Asia seeks to bolster its energy security through the expanding use of natural gas and LNG, while improving its energy mix to reduce the impact on the environment. It is vital for regional states, especially China, to reduce their coal use both to address air pollution and health issues and to lower the region's carbon emissions, and LNG can be a bridge fuel in that effort. There are no doubt energy-security challenges looming in the LNG market, including the uncertain prospects for Russian LNG supplies, Japan's continuing nuclear crisis, and questions about how the rise of U.S. LNG exports may affect regional alliances. But the current energy outlook for Asia promises a better supplied and much more diversified LNG market in the future, even though LNG is unlikely to ever be a low-cost fuel for the region.

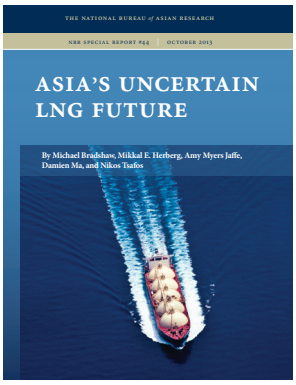
ENERGY SECURITY PROGRAM

Now in its ninth year, NBR's Energy Security Program convenes top energy and geopolitical experts from industry, research, and policy for an assessment of the developments taking place in Asian energy markets and their implications for geopolitics. To inform and strengthen the public policy dialogue, experts share insights and recommendations through a number of channels, including an invitation-only spring workshop, NBR's annual Energy Security Report, and a public fall launch event.

PROGRAM THEMES

- **"Asia's Uncertain LNG Future"** (2013) explores how and to what extent countries in the Asia-Pacific are integrating liquefied natural gas into their energy security strategies and the key geopolitical and market implications for both the United States and Asia.
- **"Oil and Gas for Asia: Geopolitical Implications of Asia's Rising Demand"** (2012) explored how Asia's rising energy demand, coupled with angst over prices and the reliability of future oil and LNG supplies, is shaping the strategic and economic agendas of Asia's major powers.
- **"Asia's Rising Energy and Resource Nationalism"** (2011) examined if there is a connection between energy insecurity and state efforts to control major sea lanes, the impact of Asia's national oil companies on the global industry, and the emergence of rare earth elements as an arena for national competition.
- **"Pipeline Politics in Asia: The Intersection of Demand, Energy Markets, and Supply Routes"** (2010) analyzed the growth in overland pipelines in industrializing Asia and the resulting implications for Asian regional politics and energy security geopolitics.
- **"The New Energy Silk Road: The Growing Asia–Middle East Energy Nexus"** (2009) assessed the likely evolution of Asia's involvement in Middle East oil and gas development, including how Asia may affect future oil and gas supply development and the implications for U.S. policy.
- **"Opportunities and Constraints: Prospects for Russian Oil and Gas Supply to Asia"** (2008) examined the role of energy in Russia's strategic vision, regional perspectives on Russia as a reliable energy supplier, and implications for U.S. policy in the region.
- **"The Rise of Asia's National Oil Companies"** (2007) assessed the strategic and competitive implications of the rise of Asia's national oil companies (NOC), examining the internal structures of Asia's NOCs, their relationships with home governments, and geopolitical impacts for the United States and the region.
- **"China's Search for Energy Security"** (2005–06) focused on China's global search for energy security, drawing implications for U.S. global energy and security interests and offering recommendations for policies that would allow the United States to respond more effectively.

2013 ENERGY SECURITY REPORT



The 2013 Energy Security Report and all reports from past years are available for download at: www.nbr.org.

NBR would like to thank the Asian Development Bank, Chevron, ConocoPhillips, and ExxonMobil for their generous support of the 2013 Energy Security Program.

For more information on NBR's Energy Security Program, please contact Clara Gillispie at eta@nbr.org or 202-347-9767.

PACIFIC ENERGY SUMMIT

Building economic and environmental security through innovative energy solutions

MISSION

The Pacific Energy Summit aims to foster economic and energy security in the Asia-Pacific by developing practical solutions to the dual challenges of rising energy demand and climate change.

A REGIONAL GATHERING

The Pacific Energy Summit is an invitation-only event that convenes high-level policymakers, industry leaders, and experts to articulate regional energy needs and opportunities. We explore market-based policy solutions, coordinate efforts to effectively use available technology and limited resources, and foster public-private partnerships.

RESEARCH AND RESULTS

To inform sessions and prompt thought-provoking discussion, the Summit organizers commission policy papers from top experts in the field. The policy papers, along with a final report, summarizing the Summit discussion and findings, are distributed to key stakeholders in the Asia-Pacific region after the Summit.

All Summit reports and papers are available at **<www.nbr.org>.**

2013 • Vancouver, Canada

Forging Trans-Pacific Cooperation for a New Energy Era

The 2013 Pacific Energy Summit explored what is needed to realize the full potential for more integrated energy trade and investment between Asia and North America. The Summit focused on the best practices and solutions for successfully meeting Asia's energy needs and promoting environmental stewardship. Participants discussed broad shifts underway in world energy markets, the urgency of addressing climate change, and the role Asia–North America ties could play in boosting energy and environmental security.

2013 Summit Papers

Energy-Efficiency Policies in the Asia-Pacific: Can We Do Better?

Tilak K. Doshi and Nahim Bin Zahur, *Energy Studies Institute, National University of Singapore*

Implications of North American LNG Exports for Asia's Pricing Regime

Shahriar Fesharaki, *FACTS Global Energy*

Forging a New Trans-Pacific Energy Trade: Opportunities and Challenges

Mikkal Herberg, *The National Bureau of Asian Research and University of California, San Diego*

The U.S.-Canada Energy Relationship and the Growing Role for Asia

James Slutz, *Global Energy Strategies LLC*

Social License to Operate: How to Get It, and How to Keep It

Brian F. Yates, *SNC Lavalin Environment*

Celesa L. Horvath, *Ventus Development Services Inc.*

2013 Co-host, Partner, Lead Sponsor, and Supporters

Asia Pacific Foundation of Canada; Asian Development Bank (ADB); Chevron; Alberta, Canada; British Columbia, Canada; Cenovus Energy; Citi; ExxonMobil; Husky Energy; Nexen; Shell; Spectra Energy

2012 • Hanoi, Vietnam

Innovative Generation: Powering a Prosperous Asia

The Summit explored best practices and policy solutions to help meet Asia's rising electricity demand, sustain economic growth, and address the concurrent environmental impacts, featuring participants such as Under Secretary of State Robert D. Hormats (United States), Secretary Jose Rene Almendras (Philippines), and other global leaders.

2012 Summit Lead Sponsors, Partners, and Collaborating Institutions

Chevron; ExxonMobil; Asian Development Bank (ADB); Japan Bank for International Cooperation (JBIC); Duane Morris LLC; Institute of Energy, Vietnam; Vietnam Chamber of Commerce and Industry (VCCI); and the Diplomatic Academy of Vietnam

2011 • Jakarta, Indonesia

Unlocking the Potential of Natural Gas in the Asia-Pacific

Discussions focused on the growing role that natural gas can play in accelerating the transition to a low-carbon economy and supporting economic growth. Panel topics included the role of natural gas in climate change policies, the incorporation of natural gas in the power sector, and the future of unconventional gas, featuring participants such as Fatih Birol (International Energy Agency) and Minister Dato' Sri Peter Chin Fah Kui (Malaysia).

2011 Summit Lead Sponsors, Partners, and Collaborating Institutions

Chevron, ExxonMobil, Japan Bank for International Cooperation (JBIC), Pertamina, Star Energy, and the Indonesian Institute for Energy Economics

2009 • Tokyo, Japan

Energy Security and Economic Growth in the Asia-Pacific: Innovations, Markets, and Smart Policies for a Low-Carbon Future

Summit delegates participated in sessions on developing a roadmap for action on efficient and clean energy technologies, the various mechanisms to promote implementation of these technologies, and the related uncertainties and challenges that countries such as China, India, Japan, and the United States face.

For more information on the Pacific Energy Summit, including sponsorship opportunities, please contact Clare Richardson-Barlow at **202-347-9767** *or* **<nbrpes@nbr.org>.**

ADAPTING TO A NEW ENERGY ERA

A NEW STRATEGY FOR U.S., JAPANESE, AND ASIAN ENERGY SECURITY

About the Project

World energy markets have undergone a seismic shift in the past ten years, driven by the unexpected boom in U.S. and Canadian production of shale gas, tight oil, and heavy oil. These changes have accelerated an already steady decline in U.S. imports of Middle East oil and gas, while China, Japan, and the rest of Asia have emerged as major importers of oil and natural gas from the Persian Gulf. As the United States continues its rebalancing to Asia, broad changes in both energy markets and global strategic priorities suggest that there is an urgent need for the United States and Asia to revamp their energy-security strategies and approaches to stabilizing the Gulf.

Project Activities

Through a range of activities—including field research, commissioned papers, workshops, and dialogues with key stakeholders—"Adapting to a New Energy Era" aims to provide in-depth and academically rigorous research into how the United States, Japan, South Korea, China, and others can craft stronger diplomatic, strategic, and economic tools to support common energy security interests. Year one of this initiative (2013–14) will feature major workshops in both Washington, D.C., and Japan.

Japanese Research Fellows

Energy security is an emerging yet rapidly evolving field, with significant, long-term implications for the geopolitical, economic, and environmental health for the Asia-Pacific. With this in mind, this initiative includes an explicit effort to engage young Japanese researchers whose research will play a vital role in informing and shaping a new generation of energy policy research in the region.

Project Sponsor

This initiative is made possible by the generous support of the Sasakawa Peace Foundation.

THE SASAKAWA PEACE FOUNDATION

For more information on this initiative, please contact Clara Gillispie at eta@nbr.org or 202-347-9767.

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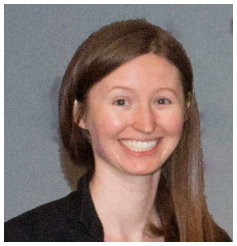

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