

## The Geopolitics of Natural Gas

Natural Gas in the People's Republic of China

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JAMES A. BAKER III INSTITUTE FOR PUBLIC POLICY  
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NATURAL GAS IN THE  
PEOPLE'S REPUBLIC OF CHINA

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## ABOUT THE STUDY

Some of the most dramatic energy developments of recent years have been in the realm of natural gas. Huge quantities of unconventional U.S. shale gas are now commercially viable, changing the strategic picture for the United States by making it self-sufficient in natural gas for the foreseeable future. This development alone has reverberated throughout the globe, causing shifts in patterns of trade and leading other countries in Europe and Asia to explore their own shale gas potential. Such developments are putting pressure on longstanding arrangements, such as oil-linked gas contracts and the separate nature of North American, European, and Asian gas markets, and may lead to strategic shifts, such as the weakening of Russia's dominance in the European gas market.

Against this backdrop, the Center for Energy Studies of Rice University's Baker Institute and the Belfer Center for Science and International Affairs of Harvard University's Kennedy School launched a two-year study on the geopolitical implications of natural gas. The project brought together experts from academia and industry to explore the potential for new quantities of conventional and unconventional natural gas reaching global markets in the years ahead. The effort drew on more than 15 country experts of producer and consumer countries who assessed the prospects for gas consumption and production in the country in question, based on anticipated political, economic, and policy trends. Building on these case studies, the project formulates different scenarios and uses the Rice World Gas Trade Model to assess the cumulative impact of country-specific changes on the global gas market and geopolitics more broadly.

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## Introduction<sup>1</sup>

The People's Republic of China (PRC) is important in the global gas economy because it is tipped to become one of the largest importers of natural gas, and if it is successful in developing shale and other unconventional gas, it could become a major gas producer in its own right. Related, because China is a major adopter of new technologies, including energy efficient ones, if it makes strategic investments in new uses of natural gas—such as natural gas cars—it could become the vanguard market that facilitates the adoption of technologies that are beneficial for global markets. The Chinese economy is also important because of its influence on geopolitics: it is one of the largest destinations of natural gas piped from Central Asian countries that are constrained by geography and political competition in their ability to export to global markets, and it is a significant potential gas customer for Russia's Far East and for countries that are isolated by American and European policies on their ability to develop piped gas and LNG exports (such as Myanmar, Iran, and Venezuela). Finally, the natural gas industry of China is also important as a case study of how a country with a large, rapidly urbanizing population can attempt to meet its energy needs through engagement with the global gas industry. Here, it may teach us the most about the effects of decentralization, privatization, and one-party rule on the development of a globalized natural gas industry. Particularly worth noting up front is the importance of scale: China's local governments command populations and financial and technological resources that equal those of many small nations. Its largest municipalities (Shanghai has a population of 20 million and a GDP of US\$300 billion) and provinces are capable of making large investments in shale and unconventional gas in their regions of China, and they are also capable of working with subsidiaries of Chinese national oil companies to use their substantial resources to implement their own energy security policies and develop local ties to foreign supplies of natural gas. Or, in other words, there is not just one Chinese economy and one Chinese gas industry—there are multiple Chinas at work, and studying its natural gas

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<sup>1</sup> I would like to thank my colleagues on this project for invaluable advice, comments, and patience: Amy Jaffe, Ken Medlock, and Meghan O'Sullivan. I would also like to thank the numerous participants in conferences and scenario analysis sessions in Boston, Houston, and Washington, D.C., and in Beijing, Doha, Shanghai, and Tokyo, who commented on arguments made here. Special thanks are owed to Al Troner of Asia Pacific Energy Consulting for sharing his decades of experience in analyzing gas markets in Asia, and to my research assistant at Rice University, Ying Zhang, for her excellent work on surveying local government policies on developing natural gas in China.

industry may help us predict the growth of gas in other large, decentralized nations, such as India and Brazil.

Furthermore, because of the inherent opacity of one-party rule, and in particular the lack of an independent judiciary, China stands apart from the United States, Japan, and European nations in its ability to commit credibly to long-term development of its gas infrastructure. OECD nations are also capable of policy changes that greatly affect the long-term energy investments in their societies, but such changes must follow the popular will (via democratic institutions) and rule of law (via the independent judiciary). China does not currently have this level of institutional stability and predictability. Its successes and failures in developing a national natural gas economy will help us understand the costs and benefits of doing business in gas in a country with political and economic institutions unlike those of the OECD countries, but more like the future major gas-consuming countries of the developing world.

This study finds that major shifts in global gas markets can occur because of supply and demand changes in developing and rapidly urbanizing markets such as China, and not just in OECD countries. Furthermore, it shows that a planned economy and its national oil and gas companies need not be so inflexible and lethargic that it cannot respond to changes in opportunities created by more market-oriented societies. This study also opens up the possibility that the decentralization and partial privatization of China's energy industry may produce innovations and investments in alternative fuels that central actors may not otherwise make. In China's case in particular—but perhaps also in the future in India, Nigeria, Brazil, Indonesia, and other large, decentralized nations—a new industry, the shale gas industry, may develop primarily with local government support.

## **Background**

China needs more natural gas. According to the Energy Information Administration (EIA), China's total energy consumption in recent years has been heavily dependent on fossil fuels: coal (70%), oil (19%), hydroelectric (6%), natural gas (4%), nuclear (1%), and other renewables



(0.3%).<sup>2</sup> China's government leaders are actively working both to diversify the sources of energy and to find cleaner sources of energy. The 12th Five-Year Plan (FYP) (2011–2015) is the first in which China's central and local economic planners have confronted climate change, establishing national goals and metrics to shift from fossil fuels to renewable sources of energy, and among fossil fuels to transition from coal and oil to natural gas.<sup>3</sup> The 12th FYP calls for the reduction of energy consumption per unit of GDP by 16% and the cutting of CO<sub>2</sub> emissions per unit of GDP by 17%. Non-fossil fuels (currently around 7%) should account for 11.4% of total primary energy consumption by 2015. The central government also plans to set local energy conservation targets that must be met by local governments: “The central government will create energy control requirements for province-level governments and hold them accountable for fulfilling the requirements.”<sup>4</sup> During the 11th FYP, the central government implemented the Top 1,000 Enterprises Program, in which central government authorities were largely successful in forcing the largest energy-intensive industrial users to sign energy efficiency contracts—most likely because many of these enterprises were owned directly by the central government—and under the current FYP it plans to carry the program forward to the lower levels and crack down on local government enterprises that waste energy resources.

The central government has more than sticks to wield, however, as it has a track record of offering carrots to local enterprises and local government leaders who can help it achieve a strategic global advantage in manufacturing and technology. The 12th FYP and supporting documents and policies further detail strategic investments to be made by central and local governments to support “emerging strategic industries”: new generation information technology, energy-saving and environmental protection, new energy, biology, high-end equipment manufacturing, new materials, and new energy cars. Beijing not only plans to open up its coffers to support enterprises that can clean up its cities and conserve energy, but also it hopes to turn

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<sup>2</sup> US Energy Information Administration, “China Analysis,” <http://www.eia.gov/countries/cab.cfm?fips=CH> (accessed January 31, 2013).

<sup>3</sup> For an English summary, see [http://news.xinhuanet.com/english/2010/china/2011-03/05/c\\_13762230.htm](http://news.xinhuanet.com/english/2010/china/2011-03/05/c_13762230.htm) (accessed January 31, 2013) and for Chinese full text see [http://news.xinhuanet.com/politics/2011-03/16/c\\_121193916.htm](http://news.xinhuanet.com/politics/2011-03/16/c_121193916.htm) (accessed January 31, 2013).

<sup>4</sup> [http://news.xinhuanet.com/english/china/2013-01/24/c\\_132125842.htm](http://news.xinhuanet.com/english/china/2013-01/24/c_132125842.htm) (accessed January 31, 2013). For a useful analysis see “Energy and Climate Goals of China’s 12th Five-Year Plan” by Joanna Lewis of C2ES at <http://www.c2es.org/international/key-country-policies/china/energy-climate-goals-twelfth-five-year-plan> (accessed January 31, 2013).

them into central state enterprises that can go out and become global leaders, perhaps stealing a march on their slower Western competitors, as was the case with solar panel manufacturers.<sup>5</sup> This demonstrated capacity for the central government to support strategically, and even potentially raise to the level of central ownership, enterprises that succeed in global markets is a unique feature of China's decentralized planned economy, one that makes up for the inability of China's still-developing stock markets to direct domestic capital toward successful companies.

Finally, in the year since the release of the 12th FYP, China's central leaders have made it clear they will continue to support the "going abroad" strategy of its large central-owned state enterprises, including the three national oil companies (NOCs)—China National Petroleum Corporation (CNPC), Sinopec, and China National Offshore Oil Corporation (CNOOC)—to obtain the necessary fossil fuels and the technology and management practices to produce and market them within China and abroad. Communist Party leaders reshuffled the top leaders of the three NOCs in 2011, largely to insure that the Politburo retained control over these immensely powerful organizational actors in China's energy economy, including their ability to use the NOCs to forge strategically important gas pipeline ties to Central Asian states, Myanmar, and Russia, and equally important LNG ties to Australia, Indonesia, Malaysia, Yemen, Iran, Trinidad, Nigeria, and Russia.<sup>6</sup> With increasingly interdependent trade and financial ties between China and the United States in recent years, all three Chinese NOCs have even negotiated their way past American political opposition to become partners in natural gas and shale gas projects in the American South and Midwest. Far from being the dinosaurs of the planned economy era, these very large central-owned enterprises have proven adept at adapting and innovating, largely through experiments created by their subsidiaries, and there is little call among the general public in China to continue privatization and make them majority private entities.

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<sup>5</sup> See Edward Steinfeld, *Playing Our Game: Why China's Rise Doesn't Threaten the West* (Oxford: Oxford University Press, 2010).

<sup>6</sup> On the 2011 reshuffle, see Erica Downs and Michael Meidan, "Business Politics in China: The Oil Executive Reshuffle of 2011," *China Security*, Issue 19 (2011): 3-21, available at [http://www.chinasecurity.us/index.php?option=com\\_content&view=article&id=489&Itemid=8](http://www.chinasecurity.us/index.php?option=com_content&view=article&id=489&Itemid=8) (accessed January 31, 2013). For a history of the NOCs, see Steven W. Lewis, "Chinese NOCs and World Energy Markets: CNPC, Sinopec and CNOOC," Baker Institute Energy Forum, 2007, at [http://www.bakerinstitute.org/programs/energy-forum/publications/energy-studies/docs/NOCs/Papers/NOC\\_CNOOC\\_Lewis.pdf](http://www.bakerinstitute.org/programs/energy-forum/publications/energy-studies/docs/NOCs/Papers/NOC_CNOOC_Lewis.pdf) (accessed January 31, 2013). For an analysis of the current political role of the NOCs, see Steven W. Lewis, "Carbon Management in China: The Effects of Decentralization and Privatization," Baker Institute Energy Forum, December 2011.

Although currently providing only 4% of China's primary energy consumption, natural gas is tipped to become the fuel of choice for China's localities, growing from the current consumption of around 5 Tcf/y (trillion cubic feet per year) at 5% per year to reach nearly 12 Tcf/y by 2013, according to the EIA.<sup>7</sup> Historically, China's gas sector grew much as its petroleum sector grew: according to local geological and economic factors, and by the state-owned petroleum and gas enterprises. Except for the Sichuan oil field Administration in southwest China, which created an extensive local ring of pipelines in the 1950s to supply gas to local enterprises and cities, most of China's gas infrastructure was initially developed to handle associated gas in the major petroleum-producing centers of northeast China (Daqing, Shengli, and Liaohe oil fields). And when it became apparent in the late 1990s that the increasing cost to the central government of moving coal by train and boat from the north to the resource-poor and yet economically prosperous southern and eastern provinces could imperil these export engine localities, these areas and CNPC began to build the first cross-country pipelines, connecting the gas fields of western China's Xinjiang Autonomous Region (and later Kazakhstan, Turkmenistan, and Uzbekistan) to Shanghai and some ten provinces in between. The second east–west gas pipeline opened in 2011; work on the third has started and is expected to be completed in 2015, with plans to run from west China to south and southeast China and the areas around Hong Kong, Guangdong, and Fujian. The first west–east pipeline carries 430 Bcf/y (billion cubic feet per year), the second 1.1 Tcf/y, and the third is designed to carry 1.1 Tcf/y. The third line, which is partially financed by private investors, finds an East China market for the Central Asia Gas Pipeline (CAGP) network that China has built connecting neighboring Kazakhstan, Turkmenistan, and Uzbekistan. The pipeline has a capacity of 1.4 Tcf/y, and some 530 Bcf/y came through in 2011, with China signing deals with Turkmenistan to expand to 1.1 Tcf/y and, through additional extensions, an extra 360 Bcf/y each from Kazakhstan and Uzbekistan to enter China after 2015.<sup>8</sup> Overall, China is expected to double its 27,000 miles of gas pipelines to 51,000 miles in 2015, and there are plans to increase its notoriously low storage capacity of 70 Bcf to 1,010 Bcf by the end of the 12th FYP. CNPC owns most of the cross-country trunk

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<sup>7</sup> US Energy Information Administration, "China Analysis," <http://www.eia.gov/countries/cab.cfm?fips=CH> (accessed January 31, 2013).

<sup>8</sup> Ibid.

pipelines, with Sinopec recently adding one from southwestern Sichuan to Shanghai in the East, and local distribution companies own the transmission lines in urban areas.<sup>9</sup>

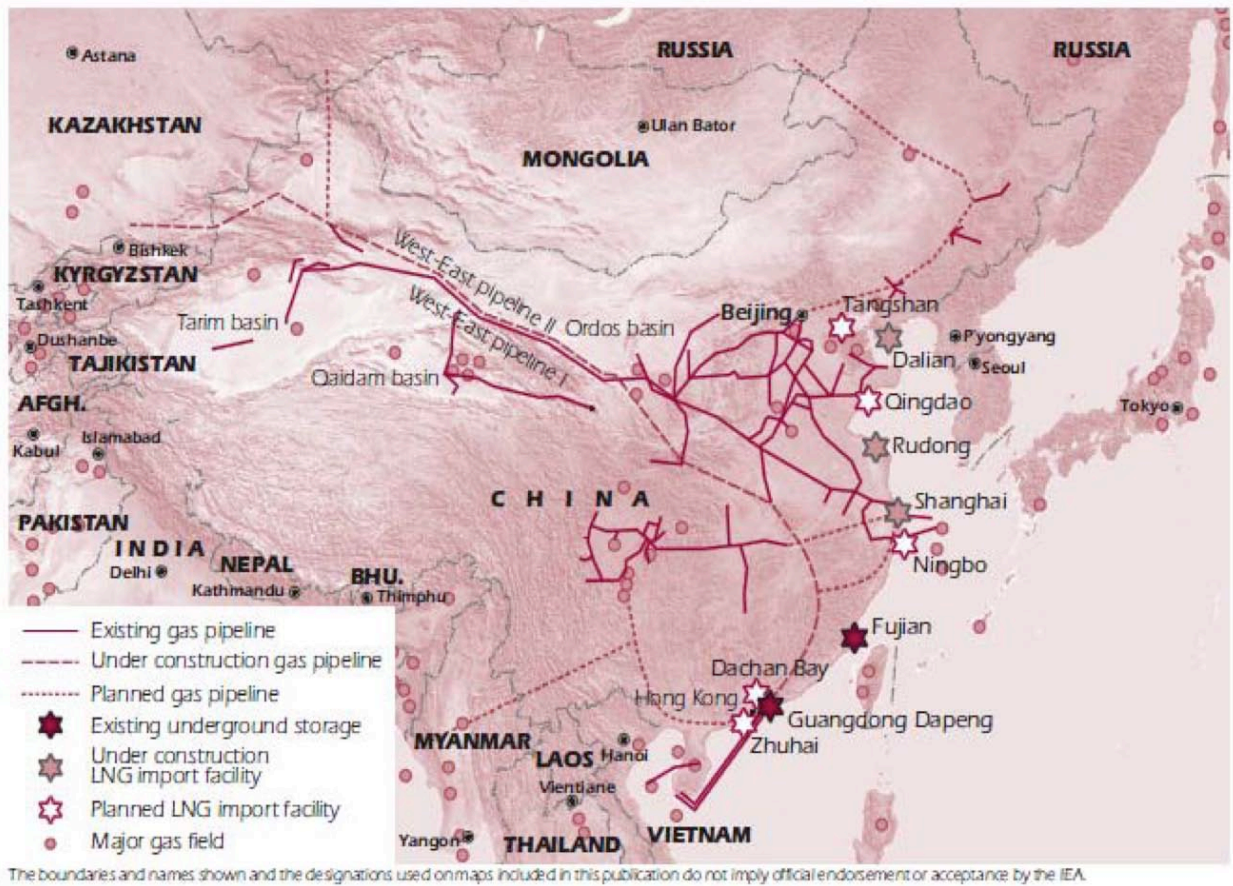
Meanwhile, gas from Myanmar will soon tie into southwest China's Yunnan Province through a 1,100 mile, 430 Bcf/y pipeline, and Russian Far East gas is expected to enter China through either the northwest Xinjiang region and a 1–1.4 Tcf/y pipeline, or following oil pipelines from Siberia into the rust belt economies of the Northeast through a 1.1–1.4 Tcf/y pipeline that connects China to gas from eastern Siberia and Sakhalin Island. China gets little gas from offshore, despite the overheated claims that much offshore gas and oil exist in the East China and South China Seas, both areas where China contests the ownership of islands with Japan, the Republic of China on Taiwan, Vietnam, Malaysia, Brunei, and the Philippines. A small amount of gas flows from offshore into Shanghai and from the South China Sea into Hainan Province, necessitating the planned siting of nuclear power plants, LNG terminals, and gas power plants in the thriving coastal areas of south, east and northeast China. China became a net importer of natural gas only in 2007, with LNG and pipelines in the Northwest, rapidly expanding imports today. There are currently five LNG regasification terminals operating in coastal China, joint-ventures between CNPC and CNOOC and such foreign partners as BP, QatarGas, Malaysia's Petronas, Australia, and Iran, in which some 586 Bcf/y comprised half of China's gas imports in 2011. Four more terminals are under construction, and six more are planned, with the next regasification capacity doubling from 1 Tcf/y today to 2 Tcf/y by 2015.<sup>10</sup> Overall, as seen in the accompanying IEA map, China does indeed have a large gas pipeline and LNG terminal infrastructure, but it is designed to feed Chinese coastal cities directly from overseas, with only a few longer pipelines connecting the far West and Central Asia to the East, and smaller denser webs of pipelines in the northern areas around Beijing, and then a more developed ring network in the Sichuan basin of southwest China.

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<sup>9</sup> Ibid.

<sup>10</sup> See US Energy Information Administration, "China Analysis," <http://www.eia.gov/countries/cab.cfm?fips=CH> (accessed January 31, 2013) for US data and analysis, and for Japanese data and analysis, see Yoshikazu Kobayashi, "Natural Gas Situation and LNG Supply/Demand Trends in Asia Pacific and Atlantic Markets," 2010, <http://www.eneken.ieej.or.jp/data/2940.pdf> (accessed January 31, 2013).

Figure 1. Gas Pipelines and LNG Terminals in China



Source: IEA

Worth noting is that the first west–east gas pipeline took more than a decade to build, requiring the creation of an informal “leadership small group” at the highest levels of the Communist Party to coordinate and eliminate obstacles for its development, with the first LNG regasification terminals necessitating similar extraordinary organizational measures. More recent pipelines and terminals have still faced considerable red tape problems in their development, but China appears to have worked out a political and organizational model to coordinate the at times competing interests of central government, central enterprise (NOCs), local governments, and local enterprises, and then in recent years to bring on board domestic private investors as well. It is telling that many cities, provinces, and counties in China’s shale gas regions, for example, are forming “页岩气经济发展领导小组” (shale gas economic development leadership small

groups), a sure sign that they are mobilizing senior cadres into ad hoc task forces capable of overcoming bureaucratic and political obstacles to develop this potentially important fuel.<sup>11</sup>

Most recently China's central planners have turned their eyes toward developing unconventional gas. Pointing to an estimated 10.2 Tcf of proven coal bed methane (CBM) reserves in 2011, with an estimated 350 Tcf of recoverable CBM reserves, the central government sanctioned the formation of China United Coalbed Methane Corporate (CUCMC) in 1996 by CNPC and China Coal Energy Corporation to develop reserves in the North, Southwest, and West—China's major coal-producing areas. According to the EIA and FACTS Global Energy, CBM production was estimated to be 315 Bcf/y in 2010, and the Chinese government expects that to rise to 1,060 Bcf/y by the end of the 12th FYP in 2015.<sup>12</sup> There is currently one CBM pipeline that connects the Qinshui Basin in north China to the West–East Gas Pipeline, and the company and local governments are building several more. In a move presaging later actions to accelerate the development of shale gas, the National Energy Administration in Beijing in 2007 opened up CUCMC's monopoly on the formation of technical joint ventures with foreign partners, ushering in CNPC working on its own, Sinopec, and most recently CNOOC. It also began to provide the company with production subsidies. CUCMC, now half-owned by CNOOC, in 2012 signed an agreement with CNOOC to spend US\$1.56 billion developing CBM over the next 30 years.<sup>13</sup> Most CBM in China is liquefied and sent by truck to local areas for residential use, but FACTS

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<sup>11</sup> Provincial and lower level authorities have set up leadership small groups to work with enterprises, other local governments, and the central government to develop unconventional gas and oil, and their names reflect the diversity of their duties: on Chongqing Municipality establishing a shale gas development leadership small group, see [http://www.mlr.gov.cn/xwdt/dfd/201207/t20120726\\_1125207.htm](http://www.mlr.gov.cn/xwdt/dfd/201207/t20120726_1125207.htm) (accessed October 15, 2013); on Guizhou Province establishing a shale gas development leadership small group, see [http://www.mlr.gov.cn/kczygl/kckc/201203/t20120321\\_1075691.htm](http://www.mlr.gov.cn/kczygl/kckc/201203/t20120321_1075691.htm) (accessed October 15, 2013); on Neijiang City in Sichuan Province establishing a shale gas development leadership small group, see <http://fgw.neijiang.gov.cn/008510160/show?id=656490> (accessed October 15, 2013); on Shandong Province establishing a shale oil leadership small group, see [http://www.mlr.gov.cn/xwdt/dfd/201212/t20121210\\_1163943.htm](http://www.mlr.gov.cn/xwdt/dfd/201212/t20121210_1163943.htm) (accessed October 15, 2013); and on Jilin Province establishing a mineral resources “rectification” leadership small group, see [http://www.mlr.gov.cn/tzdt/zxgz/zdhgfkcykfx/gzjz/200806/t20080627\\_677120.htm](http://www.mlr.gov.cn/tzdt/zxgz/zdhgfkcykfx/gzjz/200806/t20080627_677120.htm) (accessed October 15, 2013).

<sup>12</sup> For EIA, see <http://www.eia.gov/countries/cab.cfm?fips=CH> (accessed January 31, 2013), and for FACTS Global Energy, see Alexis Aik and Christopher Gascoyne, “Unconventional Gas and Implications for the Global LNG Market,” at National Bureau of Asian Research 2011 Pacific Energy Summit, [http://nbr.org/downloads/pdfs/eta/PES\\_2011\\_Facts\\_Global\\_Energy.pdf](http://nbr.org/downloads/pdfs/eta/PES_2011_Facts_Global_Energy.pdf) (accessed January 31, 2013).

<sup>13</sup> See Reuters, “CNOOC Signs 1.56 bln Domestic Coalbed Methane Deal,” August 5, 2012, <http://www.reuters.com/article/2012/08/06/cnooc-coalseam-idUSL4E8J603Q20120806>.

Global Energy estimates that with more pipelines being built by CNPC's PetroChina, it will increasingly be used for power and may rise to 2 Tcf/y by 2020.

Shale gas is widely expected to be even more influential than CBM in China's future gas industry. The recent assessment of global shale gas by ARI (2011), sponsored by the US Department of Energy, places China's technically recoverable shale gas resource at over 1,200 Tcf. China's Ministry of Land and Resources puts domestic shale gas resources at 917 Tcf and is targeting the development of 10–15 “experimental shale development regions” by 2015.<sup>14</sup> Facing initial “foot dragging” by the NOCs, who consider shale gas to be yet another potentially costly burden that cuts into their profits (much as their recent efforts to invest in costly pipelines to Central Asia and long-term contracts and terminals for LNG), the central government has once again goaded the NOCs by letting more competitors come sit around the policymaking table. With the development of the 15 experimental shale gas development zones, the central government raises the possibility that it will directly step in and appoint local leaders in shale-producing regions. Furthermore, with the government's declaration in 2011 that shale gas will be priced separately from oil and conventional gas and that it will support it with price subsidies, the central planners are essentially daring the NOCs to ignore a potential resource that has not only economic value but also political value for energy industry cadres. Historically, whenever the central government makes a major investment in an energy project, it raises the nomenklatura ranking within the Communist Party of its leaders. CNPC and Sinopec in particular understand the political threat implicit in Beijing's creation of shale gas development zones: the future leaders of such zones may have competitive party ranking to the leaders of their own major oil fields and refineries, potentially giving them less comparative party clout in central government policymaking. Shale gas is thus far a union of central planners who are attracted to its energy security implications, and ambitious local leaders who see it as a potential “helicopter ride” to Beijing. Adding to the general atmosphere of enthusiasm for shale gas within China is a broader feeling among East Asian governments that there is a tightening of LNG and gas supplies in the

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<sup>14</sup> ARI, *World Shale Gas Resources: An Initial Assessment of 14 Regions Outside the United States*, <http://www.eia.gov/analysis/studies/worldshalegas/> (accessed January 31, 2013).

region (especially after Fukushima), with resulting energy security concerns.<sup>15</sup> Additionally, major Western investment banks and energy investment consultancies are whipping up enthusiasm among foreign investors and working with Chinese entrepreneurs and speculators to host shale gas information seminars and conferences throughout China and in the increasingly privatized, economic, state-owned media.<sup>16</sup>

Shale gas is still an unexplored resource in China, and regardless of the assessment of *technically* recoverable resource, there is tremendous uncertainty around the *economically* recoverable shale resource. But even as China's mega-firms are moving somewhat slowly on shale investment, the National Energy Administration incorporated shale gas into its "National Energy Strategies Toward 2030," assigning targets for shale gas development in the 12th FYP, and its parent National Reform and Development Commission indicated that it saw price reform as an ultimate necessity.<sup>17</sup> To promote rapid development of shale gas, domestic prices must be structured to incentivize large investments. China's shale resources are thought to be relatively expensive to develop compared to the US and other regions. There are also several other barriers besides pricing to rapid development that must be overcome. These include long distances between shale-rich regions and major end-use markets and a lack of existing pipeline infrastructure, in addition to water constraints in many potentially prolific areas (see Figure 2).

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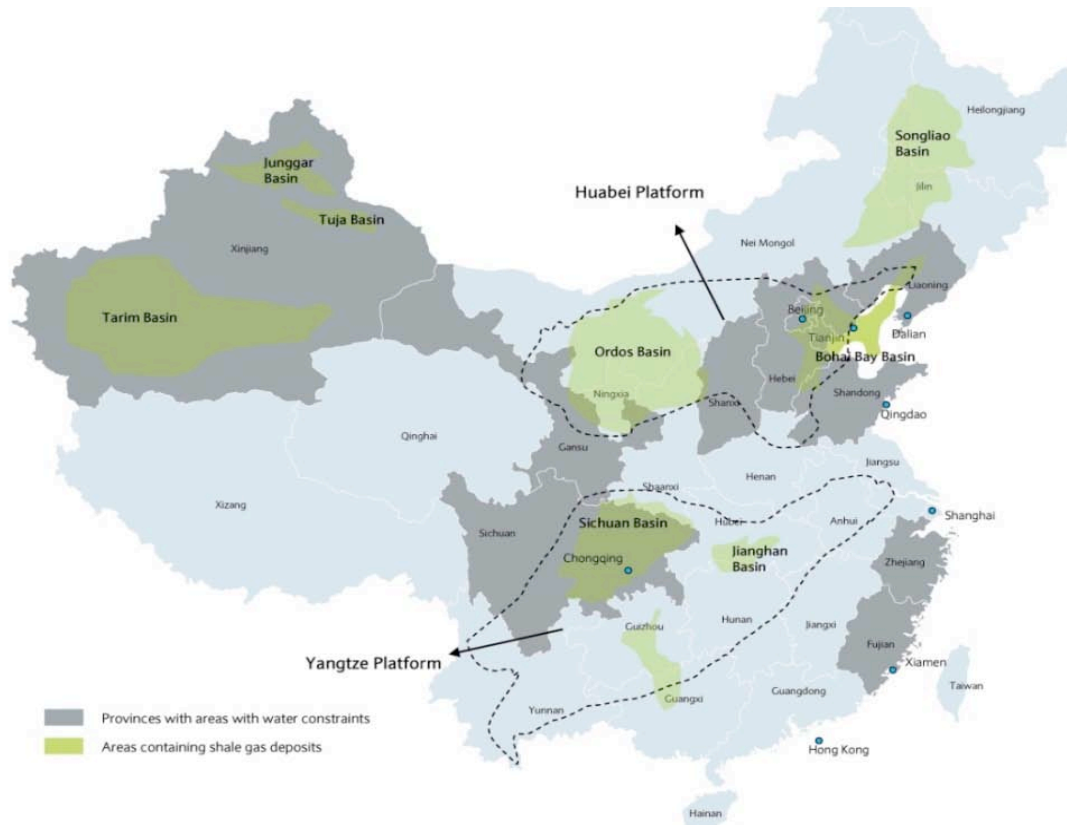
<sup>15</sup> See National Bureau of Asian Research, *Oil and Gas for Asia: Geopolitical Implications of Asia's Rising Demand*, NBR Special Report #41, September 2012, available at <http://www.nbr.org/publications/issue.aspx?id=269> (accessed January 31, 2013).

<sup>16</sup> See, e.g., Bank of America/Merrill Lynch, "Oil Industry," August 20, 2012, and Goldman Sachs, "Asia Pacific: Energy," August 21, 2012.

<sup>17</sup> See National Energy Administration website and "□□□□□□□□2011-2015 □)" at <http://www.nea.gov.cn/zwhd/wszb20120316/index.htm> (accessed January 31, 2013).



**Figure 2. Major Shale Deposits and Areas With Water Constraints in China**



Source: Barclays Capital, “Natural Gas Weekly Kaleidoscope,” Barclay’s Capital Commodities Research, November 16, 2010.

American and European companies are also trying to engage in the development of unconventional gas in China. For the most part, Chevron has been focusing on its Chuangdongbei project, the first large-volume sour gas development in China, although it is interested in shale opportunities. While the first commercial output from Chuangdongbei has been delayed by complex geography, Chevron has found recoverable and proved gas reserves of 6.2 Tcf, which will yield about 4 Tcf of marketable gas. Initial output is planned at 740 mmcf/d from two large-scale cleaning plants but will only be achieved late in 2012. A second phase would double output by 2016, but timing and volume will be dependent upon the operating experience gained in initial sustained production. The US firm has considerable experience in handling gas with large volumes of inerts as well as hydrogen sulfide, a gas that is both corrosive and explosive. Chevron hopes to be the partner of choice for developing technically challenging gas finds. Shell has pledged \$5 billion to explore the Jingqui and Fushun-Yangchuan shale

blocks with CNPC. BP, Statoil, Hess, and ExxonMobil are also pursuing opportunities in Chinese shale.

Still, whatever the appeal of domestic unconventional gas, coal remains a stalwart of power generation in China, holding a share of 67.7% in 2030. While this is down from 88.5% in 2010, it is still much higher than many in the environmental community would care to see. China's leaders, both regional and national, are being forced to consider policies that reduce the use of coal to improve air quality in major urban areas and to demonstrate cooperation in global forums regarding climate change. This has led some provinces to pursue a more aggressive natural gas policy.

Shale gas developments require fracture stimulation for wells to flow enough to justify commercial development. Generally, this requires a high volume of water. In regions where water scarcity is an issue, this can render shale gas development at odds with other water uses. In China in particular, water availability for hydraulic fracturing may considerably diminish the potential for domestic shale development in certain regions. Such constraints will raise costs and may even outright restrict the shale gas potential of the Tarim Basin in western China and perhaps in the Sichuan Basin in south central China to a lesser extent. In contrast, China has already awarded acreage to Chinese firms for shale development in Chongqing, Guizhou, and Hunan provinces, so the shale gas resources in those regions may prove to be commercial. According to a report by Gleick et al (2008),<sup>18</sup> China faces some of the most severe water challenges in the world due to overallocation, inefficient usage, and widespread pollution, as well as a fairly weak regulatory body. Moreover, the response to issues of scarcity from Beijing and central water agencies has typically been one involving proposals for massive new infrastructure to divert water from one region to another rather than new approaches to management. One such massive project is the South-to-North Water Transfer Project, which will funnel 45 bcm of water to the northern part of the country through the Yangtze River basin but will not be completed for several decades at the earliest. There are also plans for investment in

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<sup>18</sup> For text of P.H. Gleick, "China and Water," in the Pacific Institute, *The World's Water 2008-2009*, see [www.worldwater.org/data20082009/ch05.pdf](http://www.worldwater.org/data20082009/ch05.pdf) (accessed January 31, 2013).

water-distribution systems and the construction of over 1000 water and wastewater treatment facilities. Plans for coastal water desalination are also in their early stages.

### **Political Trends**

As the 18th Communist Party Congress in Beijing in November 2012 demonstrated, China's political system does indeed have predictable and peaceful mechanisms for the transfer of power. Unlike the 1970s and 1980s, when the individual leaders who ruled the party since before the 1949 revolution had lifetime tenure within top party organs, this Congress followed reforms implemented in recent decades that forced most leaders to retire before the age of 65 or 68 and recruited to the Central Committee many local government and enterprise leaders with a demonstrated ability to manage local economies. And as the crackdown on political dissidents, the increased disruption of email and internet, and the tidal wave of state media coverage during the 18th Party Congress also demonstrates, China is a one-party authoritarian system that is very much concerned about both organized political opposition and spontaneous collective protests. The downsizing of the Politburo Standing Committee from nine to seven senior leaders who have de facto veto power over major policy initiatives also reflects an increasing concern that the party must speak more often with a collective voice. The purging from the Politburo of flamboyant and popular Chongqing Party Secretary Bo Xilai in 2012 for corruption and covering up a murder committed by his wife and the subsequent appointment to the Politburo Standing Committee of relatively "faceless" stalwarts and technocrats also suggests an increasing interest in maintaining the traditional cohesion and non-charismatic, collective leadership common in the post-Mao era.

One artifact of the Congress of unknown importance is the role of former Party General Secretary Jiang Zemin (1989–2002) in appointing almost all of the members of the Politburo Standing Committee, and the relative failure of outgoing Party General Secretary Hu Jintao and Premier Wen Jiabao (2002–2012) to put their successors into positions of power. Such a move by Jiang introduces a greater degree of long-term uncertainty in top decision-making within the party, as all five of the senior leaders he put on the Politburo Standing Committee must retire at the 19th Party Congress in 2017. Or, in other words, current Party General Secretary Hu Jintao

and his future Premier Li Keqiang have much hard work to do within the party if they are to formally seize the reins with the next Politburo. Jiang's uncertain health and advanced age (reports state that he is over 90) suggest that there will be much maneuvering and speculation inside the party over the next five years.

Overall, however, the 2012 transition and the new leadership demonstrate a firm commitment to existing economic and energy policies. The fact that many of the new Central Committee members are from localities, and that all seven of the Politburo Standing Committee members have served as party leaders in multiple localities, confirms that China will remain a decentralized planned economy, one in which the central government must negotiate with local governments on the implementation of national economic goals. In the run up to the 18th Party Congress, the movement of NOC leaders from one company to another, and then outside of the NOCs altogether and into top leadership positions in localities also confirms that the top party leadership will continue to use the nomenklatura system and leadership appointments in order to maintain the competitive relationship among the three NOCs. As in the past, senior leaders with experience working with the NOCs or energy-related enterprises (i.e., chemical and petrochemical) maintain disproportionately high representation on the current Politburo, compared to two of the 23 non-military members of the 17th Politburo who served in NOCs, two in chemical industries affiliated to the NOCs, and one in the power sector. The 18th Politburo has fewer members who served in state enterprises (6/23) than the 17th (13/23), but one Politburo Standing Committee member, Zhang Gaoli, previously worked for Sinopec at the Maoming refinery in South China, and there are two additional members of the Politburo with chemical and petrochemical industry experience, Han Zheng and Liu Yandong.<sup>19</sup>

Public opinion and emerging civil society in the form of “weibo” or microblogs are posing unique challenges for the undisputed policy leadership of the Communist Party.<sup>20</sup> The party seems to be pursuing a strategy of encouraging citizens' online participation on a small set of public affairs—nonviolent nationalistic protests and boycotts against Japan, most recently, but

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<sup>19</sup> For an analysis of the current political role of the NOCs, see Steven W. Lewis, “Carbon Management in China: The Effects of Decentralization and Privatization,” Baker Institute Energy Forum, December 2011.

<sup>20</sup> See Guobin Yang, *The Power of the Internet in China: Citizen Activism Online* (New York: Columbia University Press, 2011).

also exposure of corruption by local (but not top central) officials—and then largely cracking down on Internet citizenship during sensitive political events (Party Congress, National People's Congress, the Olympics, and the World's Fair, in recent years) and by individuals and organizations who become so popular that they attract more than one million followers on microblogs. At the same time, the Chinese government at all levels conducts extensive public opinion polling on the performance of local (but not central) leaders and governments. Some results are published—local leaders are expected to be “popular” with their citizens in order to be promoted to higher levels—but many are not. Reporters at China's state-owned publications and broadcast agencies have informally protested news blackouts and censorship with temporary walkouts in recent months, and it is likely this trend will continue as these privatizing media compete with other state media at all levels, and also with online media, for advertising revenue.

An additional complicating factor for China's government censors is the fact that China's relatively developed stock markets and financial system require real-time economic media capable of integrating seamlessly and instantly with global economic media, and that most of the hundreds of millions of Chinese who own personal stocks view them as opportunities for individual speculation with personal retirement resources. In such a context, rumors about enterprises listed on the Chinese exchanges—including most energy companies and the NOCs—fly fast and furious, and largely beyond the immediate control of Internet censors. It also means that there is increased potential for both domestic and foreign investors to manipulate the market made up of so many individual investors through spreading rumors and misinformation. For the first time since before the revolution, China's Communist leaders must contend with economic actors manipulating news of political events for profit, and not for political purposes. Finally, because of restrictions on the number of companies that can list on the stock markets during any given period, there is an incentive for companies that have been granted permission to list to claim to be engaging in trendy, topical sectors such as “shale gas” and “alternative energy,” even if they are not in fact actors in the energy industry. The situation seems analogous to the Internet boom in the late 1990s in the United States and Europe.

In the energy sector, the new power of online citizenship and citizen activism has resulted in the blocking or closure of polluting oil and gas and chemical projects in many localities in China.

China has allowed in international energy and environmental NGOs but constrains the number and actions of their staff, and it also routinely cracks down on domestic NGOs who run afoul of both local and central economic planners. The net result is to increase the amount of popular knowledge about energy and environmental issues, including safety issues, and to allow for the temporary mobilization of local populations adversely affected by energy infrastructure projects. However, delayed but inevitable censorship makes it hard to sustain such protests or to coordinate them across localities. China's civil society is thus emerging but heavily constrained.

### **Consequences of Political Trends for Future Development**

Both international and domestic political trends are likely to affect the development of China's natural gas industry in the future. On the international side, China's strategy of piggy-backing energy security diversification of sources with traditional strategies of building economic ties with bordering states means that its natural gas industry will be greatly affected by political affairs in Kazakhstan, Turkmenistan, and Uzbekistan, countries that are widely viewed to be suffering from the resource curse and underdevelopment of modern, participatory political institutions.<sup>21</sup> Myanmar's economy is more well-rounded than the Central Asian ones, but like those countries, its ties to China are very important for its economy. China's ties to Russia are more complicated and problematic. Russia might be wise to bring China into long-term pipeline gas contracts now, rather than risk being replaced by domestic shale gas in China or increasing LNG ties to the Middle East, Africa, Southeast Asia, and Australia, but internally it is difficult for Moscow to support energy projects that develop the Far East, and especially ones that might require the relocation of hundreds of thousands of Chinese inside Russia to build and maintain pipelines, as well as gas projects at significant discounts to what Russia charges its European customers.

China's strategy of diversifying both pipeline and LNG imports of natural gas makes especially salient its dispute with all of the regions and nations surrounding the South China Sea and its dispute with Japan over islands in the East China Sea. China has not had a major land border

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<sup>21</sup> See Paula Jones Luong and Erika Weintal, *Oil Is Not a Curse: Ownership Structure and Institutions in Soviet Successor States* (Cambridge: Cambridge University Press, 2010).

conflict in more than 40 years, but if it is seen as a belligerent power by its neighbor on the seas, how will Myanmar, Kazakhstan, Turkmenistan, Uzbekistan, and Russia react? This is likely if the Chinese government, its state-controlled media, and the Chinese netizens expressing themselves on microblogs continue to maintain that the disputes in the East China Sea and the South China Sea are fundamentally a battle over oil and gas resources. Although China does indeed have offshore oil fields and gas fields bordering Vietnam and Japan for a small part of the East China Sea, the vast claims of oil and gas resources are likely based on the claim made by the Chinese Ministry of Foreign Affairs that it owns the entire South China Sea up to a few miles off of Vietnam, Malaysia, Brunei, the Philippines, and the Republic of China on Taiwan. Foreign oil and gas industry experts—including some who surveyed the South China and East China Sea for the Chinese government—privately state that there are likely few oil and gas resources in most of the areas within several hundred miles of China's mainland shoreline. The net result is that China's relations with its neighbors to the southwest, northwest, and north are peaceful and not prone to popular or elite expressions of resource nationalism, but these are potentially imperiled by an openly contentious relationship with Japan and its South China Sea neighbors that is built upon claims of resource nationalism that are of dubious authenticity. As the 2010 US Geological Survey reports indicate,<sup>22</sup> the oil and gas in the South China and East China Seas are very likely not large enough to create an incentive for armed conflict, for any actor that militarized these seas would face long-term enmity from the aggrieved nations surrounding them. The math of the resources in these seas suggests that even if Beijing were to adopt a militaristic strategy and seize the entire South China and East China Seas, it would at most buy itself a few years of oil supply, and perhaps a decade of natural gas supply. After that, what would keep the lights running in the economic dynamos of South and East China? If China were to militarize these seas it would imperil the free flow of oil and gas in the future, something it cannot afford to do in order to maintain its own economic growth.<sup>23</sup>

China's domestic politics, especially as they relate to resources and decentralization of ownership and regulation of the oil and gas sector, will likely also play a large role in the

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<sup>22</sup> See US Geological Survey, "Assessment of Undiscovered Oil and Gas Resources of Southeast Asia, 2010," [pubs.usgs.gov/fs/2012/3042/fs2012-3042.pdf](http://pubs.usgs.gov/fs/2012/3042/fs2012-3042.pdf) (accessed March 28, 2013).

<sup>23</sup> Steven W. Lewis, "Testimony Before the US-China Economic Security Review Commission—China's Maritime Disputes in the East and South China Seas," April 4, 2013, <http://bakerinstitute.org/research/chinas-maritime-disputes/> (accessed October 15, 2013).

development of China's natural gas industry. The Chinese central government seems to be pursuing a complex strategy that delicately balances centralization with decentralization, privatization with semi-privatization. Here, the central government is openly encouraging competition with its own NOCs from both local governments and private enterprises in order to develop shale gas and CBM, and yet at the same time it protects them from the legal consequences of their actions. In recent years industrial accidents by the NOCs have forced millions of residents of some of China's largest cities to switch temporarily to bottled water for safety reasons, with one case even causing Russian border towns to follow similar measures. Although in recent years the central government has been unsuccessfully trying to force the NOCs to set up an insurance fund to pay for lawsuits from citizens and localities, at the same time it has been working with the NOCs to block lawsuits from Chinese (and Russian) citizens. Conventional gas and oil thus face a greater potential for political conflict coming from popular protest when local governments do not benefit from oil and gas projects. China's local governments do not receive substantial royalties from natural resources such as oil and gas, nor do the citizens who live above or around them, creating an unofficial premium for the development of conventional gas projects in the form of side-payment development projects (roads, bridges, telecommunications, schools, etc.). CBM and shale gas projects, because they involve local governments as full partners, are more likely to enjoy popular support if they can compensate local citizens for the costs they bear for their development. On the other hand, shale gas projects in particular are likely to face substantial local opposition if they divert scarce water resources away from traditional local agriculture or industry.

It is also not clear for how long the central government will continue to invite local governments and private enterprises and foreign partners into unconventional gas projects. International oil companies (IOCs) were major investors in the West–East Gas Pipeline during its initial stages, but withdrew later when it became clear it did not afford them entry into China's domestic gas market. Moreover, the motives and strategies of China's local governments are themselves evolving and varied. An analysis of 12th FYP plans by provincial and municipal leaders in China's 26 localities reveals widely varying responses to the central government's call to develop shale gas. The Chongqing municipality and Sichuan province, where the initial wells are producing small amounts of shale gas, seem motivated to aggressively push for shale gas



exploration and development to support their rapidly growing cities far from coastal areas and thus LNG or nuclear power. Near the north, Shaanxi and Shanxi are developing province-level companies to develop shale gas and in doing so “gasify” their economies, moving away from the coal that currently dominates them. Far Western China’s autonomous region of Xinjiang rarely mentions shale gas at all, emphasizing water constraints and ample conventional gas and gas from Central Asia, and nearby the Gansu province is committed to pursuing renewables instead of natural gas, with no mention of support for shale gas. China’s southwestern province of Guizhou and the central provinces of Hubei and Hunan are also actively forming enterprises to develop shale gas, mainly because they lack alternatives, including even substantial coal. China’s eastern and southern provinces are also likely to develop any shale gas resources they have: their only alternatives are LNG imports, pipelines from the NOCs to western China, or more coal shipped in from northern China and overseas. In east and south China local governments also seem to be using shale gas to try to bring in more of the NOCs. Those with an existing small oil field owned by Sinopec, for example, seem to be turning to CNOOC or CNPC to develop shale gas resources, and vice versa.

Finally, China’s northeastern localities, including the old oil field areas of Shandong, Liaoning, Jilin, and Heilongjiang, rarely mention shale gas in their development plans, instead working closely with the NOCs to push for the development of shale oil. In such areas, perhaps as in the American case, shale gas will emerge as a by-product of the development of shale oil. In sum, the actions of the central government have brought many local governments and some private actors to the table. It remains to be seen, however, if the geological and technological factors affecting shale gas development will embolden these actors to develop such gas for their own use even in the absence of central government research subsidies and price supports. If the local shale plays are capable of producing constant and substantial amounts, however, it may even be possible that local governments will be innovative and make major investments in transportation technology and infrastructure to support its widespread use. China’s automobile industry is uniquely decentralized among central planned economies, and if there is an ample supply of natural gas nearby, and the local car company has the ability to develop low-cost compressed natural gas cars, then perhaps Japanese gas carmakers will face new competition. At that point, central government planners may jump in to move to the national-level ownership of such a

successful alternative gas vehicle, or at least support them with capital and trade incentives in the hopes of making this a key sunrise industry for China (as with solar panels).

Last, but certainly not least, it is worth noting the potential influence of corruption on the development of China's gas industry, particularly in the context of Xi Jinping's emphasis on fighting corruption among central-level leaders and in state enterprises. The campaign has a populist element to it, as it encourages citizens to report rumors of abuse of power and misuse of government funds, and in spring 2013 such popular reports over the internet brought down Liu Tienan, deputy head of the NDRC, the planning agency, and the manager of the State Energy Commission.<sup>24</sup>

More recent investigations, however, suggest that there may be an effort to purge the party leadership of the influence of any "petroleum clique" of former NOC officials. In September 2013 the party announced that former chief of CNPC Jiang Jiemin—who had recently been named to head the State Asset Supervision Commission (SASAC), which oversees government shares in all central-owned enterprises—was being investigated for corruption. This was followed by an announcement that several heads of CNPC and Petrochina with ties to Jiang were also being investigated, causing journalists to speculate that the entire network of Zhou Yongkang, former politburo member and CNPC head, was being investigated.<sup>25</sup> Because Zhou is seen as a supporter of ousted fellow politburo member Bo Xilai—now in prison for abuse of power and corruption—pundits are also speculating that it is part of a broader purge of a dense network of officials with ties as yet unknown to the general public. Without critical knowledge of the goals of these investigations, it is impossible to predict the outcome, nor its effect on China's energy policies, although it is unlikely that any investigations will do more than preoccupy officials until the implicated ones are replaced. If top party leaders choose to replace the NOC officials in question with ones who will not drag their feet on shale gas, for example, it may accelerate development of unconventional resources, but it is very unlikely to lead to the removal or replacement of the NOCs themselves. Nevertheless, historically, such probes that are

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<sup>24</sup> Reuters, "Senior Chinese Planning Official Sacked in Corruption Case," May 14, 2013, <http://www.reuters.com/article/2013/05/14/us-china-corruption-idUSBRE94D06820130514>.

<sup>25</sup> Wall Street Journal, "Powerful Oil Clique at Center of Chinese Probes," September 6, 2013, <http://stream.wsj.com/story/latest-headlines/SS-2-63399/SS-2-318090/>.

announced publicly result in intensive ongoing investigations into corporations and localities that supported the accused officials, sometimes taking several years, as in the case of Bo Xilai's ouster. Central Discipline Investigation Commission teams not only investigated his most recent post, Chongqing, but they were also dispatched to Liaoning and other previous postings. This means that the State Energy Commission, the National Development Reform Commission, CNPC, and Petrochina headquarters will be preoccupied for at least the near future with responding to central party and government investigations. It is also likely in particular that the influential Shengli oil field where Jiang Jiemin and the other accused officials served with Zhou Yongkang will face intense scrutiny and have to host multiple investigation teams from Party Central, thereby delaying its own development plans.

### **Economic and Legal Factors**

Price reform is perhaps the most substantial obstacle to the development of China's natural gas industry, especially shale gas.<sup>26</sup> China initially responded to rising prices in Asian LNG markets and mounting losses for its national oil companies in 2011 by initiating a pilot program for domestic natural gas price reform in two major LNG-importing provinces—Guangdong and Guangxi. The pilot program linked city-gate prices in those provinces away from highly subsidized cost-plus basis pricing to netback style prices referenced to Shanghai city-gate price basis for imported fuel oil and LPG.<sup>27</sup> The limited price reform program was seen at the time as evidence that China intends eventually to move to nation-wide pricing reforms. Such reforms are needed if China is going to encourage large-scale development of domestic unconventional gas resources. The NRDC gas pricing announcement of December 26, 2011, stipulated that prices of shale gas, coal bed methane, and coal-to-gas are not regulated and will be open to market competition. Then in 2012 the NRDC issued its second Natural Gas Policy, creating a framework

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<sup>26</sup> For a comprehensive survey of China's gas pricing policies and problems, see International Energy Agency, *Gas Pricing and Regulation: China's Challenges and IEA Experience*, September 2012, [http://www.iea.org/publications/freepublications/publication/name\\_31222.en.html](http://www.iea.org/publications/freepublications/publication/name_31222.en.html) (accessed October 15, 2013).

<sup>27</sup> The new gas price cap formula is based on 60% imported fuel oil and 40% LPG CIF prices adjusted for heat equivalent/calorific value and a 10% discount to encourage natural gas use plus or minus transportation tariffs, taking into account flow direction. Initially, prices will be based on last year's average (RMB 2.74/CM for Guangdong and RMB 2.57/CM for Guangxi) but may shift to quarterly adjustments over time. While the new system could bring China closer to gas-on-gas international competition levels, with expansion nationwide by 2014 to 2015, similar pilot programs, notably the Sichuan World Bank sponsored experiment, failed to take hold.

for price reform in gas: “2012 Gas Policy: further deepen the pricing reform of natural gas and improve the pricing mechanism; expedite the establishment of price linkage between natural gas price and the prices of alternative fuels; establish and improve the price linkage from upstream to downstream; encourage the study and implementation of differential pricing policies including seasonal price and interruptible price in regions with large fluctuation in gas demand; provide guidance on the reasonable consumption of natural gas, increase the utilization of natural gas and support an innovative trading system in connection with natural gas.”<sup>28</sup>

China's central government ruled that shale would be exempted into a separate regulatory category, distinct from oil or traditional natural gas classification. This special status in practice gives localities more freedom to develop shale gas using their own business networks and independent financial entities. As described in the previous section, the new policy has led some gas-rich provinces to take matters into their own hands and create a gas-oriented economic development plan. In combination with moves in the rest of the world to move to gas-on-gas pricing, it also leads to the potential for the development of a Shanghai hub price for natural gas, something that conversations with Shanghai's energy economic planners reveal would be highly desirable for the city's leaders, who see it as important in the development of Shanghai as a global services and financial center.

Supply-side trends in the Chinese natural gas market are fairly clear. China will continue to diversify the sources and forms of imports, even if shale gas should prove to be successful in the near term. It will continue to develop gas pipelines with Central Asia and Myanmar and actively pursue pipelines from Russia as well. Except for the Russian pipelines, these projects are well underway, and here Russia is likely to feel pressure to bring China into a gas relationship earlier rather than later. The same is true for many of the ten LNG terminal projects. Even if shale gas should prove economically viable in the interior, it seems very unlikely that it could grow fast enough in the next five years in the coastal areas to warrant the shuttering of LNG terminal projects, as in the US. Long-term, shale gas could affect conventional gas development plans if it proves to be geologically and technologically feasible. Here, local governments in China's east,

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<sup>28</sup> For a description of the evolution of national gas policy as it affects classes of users and pricing, see Vinson & Elkins China Practice Update E-Communication, “China Issues New Natural Gas Utilization Policy,” January 17, 2013, <http://www.velaw.com/resources/ChinaIssuesNewNaturalGasUtilizationPolicy.aspx>.

south, and southwest regions are likely to push to develop it strategically because they will seek to minimize their dependence on LNG imports or pipeline gas from Central Asia. Governments in China's northwest and central areas will push to develop shale gas in order to move away from coal. Northeast China's shale gas potential is heavily determined by the strategies of the three NOCs, as their governments have no plans to develop shale gas, but rather wait to see what gas may come out of shale oil developments in these traditional oil and gas field regions. Supply of shale gas in the future in most of China will also depend on the availability of scarce water or innovative uses of other materials, and also the continued resolution of environmental concerns and compensations.

On the demand side, it also seems likely most of China will increasingly desire natural gas, especially as a cleaner alternative fuel. Some local governments—as with China's Gansu province, and perhaps with its most cosmopolitan urban centers—will likely continue to prefer renewables over natural gas. Here, Beijing and north China's continued reliance on coal just does not seem viable at the personal level: its cities are some of the most polluted in the world. The January 2013 smog in Beijing has been estimated at 40 times recommended safety levels.<sup>29</sup> It seems likely that even if the central government does not begin to employ its new regulatory tools to shutter polluting industry and power generation, local governments will themselves do so, as with the Great Smog of London in the 1950s. Currently, the Chinese government and its NOC's unwillingness to renegotiate prices for natural gas more favorable to NOC interests is holding back conventional gas development. This is likely to change in the future, much as Chinese leaders in the past have done in order to overcome institutional obstacles at lower levels. Historically, Chinese NOCs are not able to drag their feet for many years.

China's conflicts with its East China and South China Sea neighbors have the potential to break out into more virulent resource nationalism, and in doing so potentially threaten the otherwise stable pipeline relations with Central Asia, Myanmar, and Russia. The East China Sea dispute with Japan in particular could also harm relations with the United States, which in turn may shift Chinese leader's view of the value of LNG imports from the Middle East, Africa, and Australia,

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<sup>29</sup> "China's Toxic Sky," *The Atlantic*, January 30, 2013, <http://www.theatlantic.com/infocus/2013/01/chinas-toxic-sky/100449/>.

which must cross oceans dominated by a rival superpower. Related, a border dispute (unlikely) with India could also affect the Chinese leader's calculations of the wisdom of importing LNG from the Middle East and Africa through the Indian Ocean. It should also be noted that China's increasing reliance on LNG from Malaysia, Indonesia, and Australia in particular make strong arguments for the resolution of South China Sea territory disputes: why should they export to an emerging, hostile superpower?

### Specific Scenario Analysis

#### *Scenario One: Domestic factors Spur China to Move Aggressively to Develop Its Domestic Unconventional Gas*

The clearest reason why China might decide to move aggressively to develop its domestic unconventional gas is to deal with the increasingly toxic air quality of China's major cities, especially its capital. With levels of ozone and particulates frequently exceeding what most OECD countries would allow in metropolitan areas by 10 to 20 times, China's local governments are being given broad mandates and resources to improve air quality as rapidly as possible. After a deadly smog incapacitated much of the capital's population—and shut down its airport—in January 2013, the Beijing Municipal Government has moved aggressively to clean up major polluters, announcing emergency investments of some US\$7 billion to phase out all coal power plants by the end of 2014 and replace them with natural gas plants.<sup>30</sup> And after years of banning social media and state media from reporting on the air quality in Beijing, and criticizing the United States Embassy for providing real online data from its own air monitoring station, the government has done an about-face and is starting a new system of air pollution warnings that effectively let citizens know when it is hazardous to their health to go outdoors.<sup>31</sup>

Another reason China may move aggressively to develop natural gas is decreasing subsidization of the movement of low-cost coal from domestic and foreign suppliers to power supplies. China has been discussing the privatization of its railways—which predominantly carry coal as cargo—

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<sup>30</sup> Platts, "China's Beijing City to Abolish all Coal-Fired Plants by End of 2014," October 7, 2013, <http://www.platts.com/latest-news/electric-power/singapore/chinas-beijing-city-to-abolish-coal-fired-power-27490804>.

<sup>31</sup> See Xinhua, "China to Issue Air Pollution Warnings in Beijing, Tianjin," October 2, 2013, at <http://www.ecns.cn/2013/10-02/83001.shtml>.

for more than a decade now, and although officials deny they will completely privatize the railways, they have moved into domestic and Hong Kong capital markets to make up for shortfalls in finance from state-owned banks.<sup>32</sup> Uncertainty in the central government subsidization of coal transportation for their power plants is no doubt already forcing China's provincial planners to do what they did in the 1980s, when the central government faced big budget shortfalls, there were no developed stock or bond markets for the ministry to access, and the ministry of railways was not expanding capacity to meet the demand for coal shipments. In such a context, local governments rapidly expanded their own coal exploration, and domestic coal supplies from non-traditional suppliers in the north and northeast grew rapidly. If there is more uncertainty about the subsidization of coal shipments on central-owned railways, there will be more pressure on local governments to push natural gas projects, particularly unconventional gas ones, in order to meet their own power supply needs.

Finally, if there were breakthroughs in the development of low-cost technologies to increase fracking in arid regions, shale gas development in China could take off quickly, as the lack of water in most of its potential shale-bearing regions is a major obstacle. Carbon sequestration from coal-burning plants is one option for a non-water-based fracking shale gas program, but the technology for implementing such a system is not likely to appear in the near future.<sup>33</sup>

*Scenario Two: International Factors Spur China to Move Aggressively to Develop Its Domestic Unconventional Gas*

As mentioned before, there are any number of international political conflicts that could seriously disrupt China's piped gas and LNG development plans. The autocracies of Central Asia, especially Kazakhstan, could rapidly change in a "Central Asian Spring" case, where new, perhaps more democratic governments seek to end or renegotiate China's extensive gas pipeline projects bringing gas from the region through Xinjiang and then to north China and east China, with future pipelines carrying it all the way to Hong Kong in the south. Relations with Russia could easily take a turn for the worse if there is political reform in Russia that leads to a new

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<sup>32</sup> See Wall Street Journal, "China Railway Materials Plan Shanghai, Hong Kong IPO," July 9, 2012, <http://online.wsj.com/news/articles/SB10001424052702303567704577515891772281840>.

<sup>33</sup> See MIT Technology Review, "Skipping the Water in Fracking," March 22, 2013, <http://www.technologyreview.com/news/512656/skipping-the-water-in-fracking/>.

government that wishes to end the strategy of offering lower-cost natural gas to China via pipeline. Chinese and Russian leaders have recently signed contracts, but apparently left the pricing elements for future negotiation. If Putin were replaced, it is easy to see how new leaders may wish to renegotiate gas contracts with China, if only to bring them in line with what Russia is selling to Europe. In such a situation, Chinese leaders may not be able to persuade Russian leaders to keep the gas flowing while prices are negotiated.

Disruption in LNG supplies from the Middle East and western Australia is also a possibility, especially if there is armed conflict in the South China Sea. Such a scenario would invariably involve the United States, however, as it would affect the oil and gas supplies from the Middle East to its military allies in East Asia, Japan, and South Korea. Conflict between China and Japan over the Diaoyu/Senkaku Islands, however, might only disrupt the sea lanes that carry the oil and gas to eastern China and Korea. Japan's economy may not be as affected by such conflict. China has had naval incidents with the Philippines and Vietnam in recent years, and if one of these were to lead unintentionally to a larger conflict, then China's local and central leaders may come to question their increasing reliance on LNG passing through the South China Sea.

Finally, even a minor military conflict with a South China Sea neighbor over an economically worthless island in the middle of the South China Sea, and then a conflict with the Japanese Navy over the equally unimportant Senkaku/Diaoyu Islands, followed by political unrest in Kazakhstan, would instantly present Chinese geopolitical strategists with a threat to China's gas supplies from both land and sea. In such a situation, it is not hard to believe they would work even more closely and vigorously with local governments to develop unconventional gas in China.

*Scenario Three: Multiple Factors Leave China as a Laggard in Gas Development*

There are multiple very plausible and very realistic reasons why China might lag in gas development. Water is the biggest obstacle. China's plans to develop shale gas are predicated on the assumption that central and local government will be able to pry away from agricultural interests—most people living above shale-producing regions are peasants—enough water to do



the necessary fracking. And since fracking is in its infancy in China, it would only take a few publicized accidents involving ground water pollution or earthquake activity to cause many localities to think twice about developing shale gas. The Environmental Protection Ministry has recently fined both CNPC and Sinopec for their inability to control air and water pollutants coming from their facilities, and it seems to be moving in the direction of more, rather than less, regulation and fines for accidents in the oil and gas industry. Worth noting here is that Sichuan province, home to many of the shale gas projects, is a land riven by fault lines—it is the location of the earthquake in 2008 that killed tens of thousands and devastated many counties. The people there are almost certainly very sensitive to any perceived danger from earthquakes, especially ones that might be considered man-made.

There could also be a political realignment in Beijing that does not favor the NOCs—perhaps because of systemic corruption, as is talked about in the newspapers today—and thus these companies may be forced to scale back new projects. Similarly, an economic downturn—especially in the context of a global slowdown in the world economy—would also deprive both local and central planners of the hundreds of billions of dollars in funding that will be needed to fully develop China's unconventional gas. Ironically, if America decides to export LNG to China, it might remove the cost incentive to develop domestic unconventional gas, and it might also stabilize China's international gas supply concerns by bringing in American gas to diversify away from LNG in the south and piped gas from Central Asia and Russia in the north. Likewise, if Japan is capable of rapidly accelerating commercial development of methane hydrates, it would surely increase interest in China doing so in its own neighboring ocean territories, and thereby also diminish the attractiveness of onshore unconventional gas projects. Related, if Japan reopens its nuclear power plants, it would also leave more LNG on the market that could go to China instead of Japan. All of the above developments would help keep China's domestic gas development down.

## **Conclusion**

Major changes in global gas markets can occur because of supply and demand changes in developing and rapidly urbanizing markets such as China, and not just OECD countries. A

planned economy and its competing national oil and gas companies need not be so inflexible and lethargic that they cannot respond to changes in opportunities created by more market-oriented societies. The discussion here also suggests that decentralization and partial privatization of China's energy industry may produce innovations and investments in alternative fuels that central actors may not otherwise make. China may be leading the way for India, Nigeria, Brazil, Indonesia, and other populous, decentralized, yet urbanizing nations to build a shale gas industry primarily using local government and enterprises.