

CHINA'S SHALE GAS: A GOLDEN OPPORTUNITY OR *HAI DI LAO YUE** FOR U.S. FIRMS?

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* 海底捞月 (pronounced *hǎi dǐ lāo yuè*) is a Chinese phrase meaning "a hopeless illusion; a wasted effort," or literally, "to try to fetch the moon from the bottom of the sea." *Haidilaoyue* (海底捞月), Xiaoma Cidian (小马词典), <http://bit.ly/1cM5K1x> (last visited Apr. 19, 2015).

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I. OVERVIEW

China, currently dependent on coal for almost 70% of its energy needs, has the world’s largest reserves of technically recoverable shale gas.¹ Many international players have expressed interest in studying, extracting, and marketing that shale gas. However, that process could be a nightmare for international oil companies (IOCs)—and, specifically, U.S. firms. Due to a combination of policy, regulatory, legal, contractual, and geological hurdles, China’s *technically* recoverable shale gas may not be *economically* recoverable for U.S. firms in the short term.

While China’s policy environment is favorable to IOCs involved in shale gas exploration, China’s cluttered energy regulatory network provides little guidance for IOCs. China also lacks a legal framework for shale gas exploration, and foreign firms must instead rely on contractual relationships to enter China’s shale gas market. Both the production-sharing agreement (PSA) and joint venture (JV) contractual modes have been employed in China, with varying degrees of success, and both agreements have respective advantages and disadvantages. China also offers little intellectual property protection for foreign hydraulic fracturing technologies. Finally, producers face technological and geological challenges in China, where shale gas reserves are located in water-scarce regions with complex geology that greatly increases drilling expense.

In sum, while current low gas prices and unclear contractual frameworks are unlikely to persuade U.S. firms to invest heavily in China’s shale gas in the near future, China needs foreign help to access its vast energy reserves and address its long-term energy needs. Some evidence indicates that JVs may be the key to China’s shale gas.

II. INTRODUCTION TO SHALE GAS IN CHINA

As China’s population and economy continue to grow at a rapid pace, China’s energy needs have increased exponentially. China’s immense

1. U.S. ENERGY INFO. ADMIN., U.S. DEP’T OF ENERGY, CHINA OVERVIEW 2 (2014) [hereinafter EIA CHINA OVERVIEW], available at <http://www.eia.gov/countries/analysisbriefs/China/china.pdf>.

population of 1.4 billion people currently depends on coal to satisfy 69% of its total energy consumption.² Comparatively, cleaner-burning natural gas accounted for only 4% of China's total energy mix in 2011.³ Heavy coal dependence, combined with poor enforcement of environmental protection controls in Chinese coal plants,⁴ has triggered extreme air pollution in northern Chinese cities, "accentuat[ing] the government's push to switch from coal to gas."⁵ For this reason, the Chinese government aims to "cap coal use to below 65% of total primary energy consumption by 2017"⁶ and "boost[] the share of natural gas as part of total energy consumption to around 8% by the end of 2015 and 10% by the end of 2020."⁷ To meet growing demand for natural gas, China is currently seeking additional natural gas sources through liquefied natural gas (LNG) imports, new and proposed import pipelines, and domestic reserves.⁸ Of these options, developing China's domestic shale gas could provide a promising new source of energy resources.

China has the largest technically recoverable shale gas reserves in the world.⁹ Unlike conventional natural gas, shale gas is natural gas trapped within the fine-grained, low-permeability sedimentary rocks that make up shale formations.¹⁰ According to the U.S. Energy Information Administration (EIA), as of January 2014, China has an estimated 1,115 trillion cubic feet (TCF) of natural gas of technically recoverable shale gas—the highest in the world—located in seven basins: Sichuan, Tarim, Junggar, Songliao, the Yangtze Platform, Jiangnan, and Subei.¹¹ Of this "technically recoverable" shale gas, at least 155 TCF is known,

2. *Id.*

3. *Id.*

4. See, e.g., Jennifer Duggan, *China's Largest Coal Power Plant Violating Air Pollution Levels Every Week*, THE GUARDIAN (Dec. 18, 2014), <http://www.theguardian.com/environment/2014/dec/18/chinas-largest-coal-power-plant-violating-air-pollution-levels-every-week>. China struggles to enforce environmental protection measures in its domestic coal plants. *Id.* While many Chinese coal plants are equipped with state-of-the-art pollution control mechanisms, plants have been known to turn off these controls in an effort to cut costs, even though doing so can raise levels of dangerous emissions to more than four times government standards. See Steven Mufson, *China Wrestles with Stubborn Air Polluters*, WASH. POST (May 10, 2013), http://www.washingtonpost.com/world/china-wrestles-with-stubborn-air-polluters/2013/05/09/627e9870-b13f-11e2-9fb1-62de9581c946_story.html.

5. Philip Andrews-Speed & Christopher Len, *The Legal and Commercial Determinants of Unconventional Gas Production in East Asia*, 7 J. WORLD ENERGY L. & BUS. 408, 416 (2014).

6. EIA CHINA OVERVIEW, *supra* note 1, at 2.

7. *Id.* at 17.

8. *Id.*

9. U.S. ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, TECHNICALY RECOVERABLE SHALE OIL AND SHALE GAS RESOURCES: AN ASSESSMENT OF 137 SHALE FORMATIONS IN 41 COUNTRIES OUTSIDE THE UNITED STATES 11 (2013) [hereinafter EIA SHALE ASSESSMENT], available at <http://www.eia.gov/analysis/studies/worldshalegas/>.

10. U.S. ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, *Energy in Brief, Shale in the United States* (September 4, 2014); see also Molly Wurzer, Note, *Taking Unconventional Gas to the International Arena*, 7 TEX. J. OIL GAS & ENERGY L. 357, 359 (2012).

11. EIA SHALE ASSESSMENT, *supra* note 9, at xx-2.

recoverable shale gas in the Sichuan and Tarim basins—the largest in the Asia-Pacific region.¹² Given the potential of these reserves, many U.S. firms are enthusiastic to replicate the success of the U.S. shale revolution in China.¹³

While China's massive shale reserves are attractive to investors on paper, *technically* recoverable reserves are not necessarily *economically* recoverable, and foreign firms' recovery and progress in China so far has been uninspiring. The following discussion will address why that is so, examining some of the regulatory, legal, contractual, and geological hurdles that U.S. operators face in developing China's shale gas. Even more fundamentally, foreign firms must deal with deficiencies in the basic rule of law in China,¹⁴ which can lead to inconsistent adjudication, contradictions in the law, and unclear legislation that is difficult or impossible to understand.¹⁵ Although these hurdles may appear insurmountable in the short term, at some point in the future China will develop its domestic shale gas. Foreign firms and technology will likely be integral components of China's long-term shale gas development; but first, China must clarify its preferred contractual structure for such arrangements.

To explore the various barriers that foreign companies—and specifically, U.S. companies interested in commercializing China's shale gas—must face, the following discussion will first examine the regulatory and policy framework surrounding China's shale gas industry. Next, the Note will analyze the legal and contractual issues facing foreign firms interested in China's shale gas, including a case study of Royal Dutch Shell's shale gas PSA. This analysis is followed by a brief overview of the assorted geological and technical barriers to shale gas exploration in

12. EIA CHINA OVERVIEW, *supra* note 1, at 17.

13. See Erica S. Downs, *Implications of the U.S. Shale Energy Revolution for China*, BROOKINGS INSTITUTION (November 8, 2013), <http://www.brookings.edu/blogs/up-front/posts/2013/11/07-shale-energy-revolution-china-downs>.

14. See Elizabeth C. Economy & Eleanor Albert, *Is China Committed to Rule of Law?*, COUNCIL ON FOREIGN RELATIONS (Oct. 29, 2014), <http://www.cfr.org/china/china-committed-rule-law/p33688>; Carl Minzer, *What Does China Mean by 'Rule of Law'?*, FOREIGN POLICY (Oct. 20, 2014), http://foreignpolicy.com/2014/10/20/what-does-china-mean-by-rule-of-law/?wp_login_redirect=0; Chunying Xin, *It's Time for the Rule of Law in China*, WORLD POST (Nov. 20, 2014), http://www.huffingtonpost.com/xin-chunying/china-rule-of-law_b_6178836.html. Remediating rule of law deficiencies is a hot topic in China right now. Economy & Albert, *supra*; Minzer, *supra*; Xin, *supra*. While central government efforts are underway to implement rule of law, change is unlikely to be immediate. Minzer, *supra*.

15. See RICHARD A. EPSTEIN, *DESIGN FOR LIBERTY: PRIVATE PROPERTY, PUBLIC ADMINISTRATION, AND THE RULE OF LAW* 17–19 (2011). The Western understanding of rule of law “means that government in all its actions is bound by rules fixed and announced beforehand—rules which make it possible to foresee with a fair degree of certainty how the authority will use its coercive powers in given circumstances, and to plan one's individual affairs on the basis of this knowledge.” *Id.* In the shale gas context, these shortcomings ultimately demand that foreign operators frame their ventures through contract, not through limited Chinese law. *Id.*

China. Finally, the Note's conclusion offers perspectives for China and partner U.S. firms going forward, taking into account the global energy market, possible solutions to the obstacles U.S. firms face, and the long-term, relativistic approach Chinese actors employ in policy decisions.

III. REGULATORY AND POLICY ISSUES

A. *The Energy Regulatory Framework in China*

China lacks a clear, central regulatory authority responsible for issues related to shale gas. At this time, China has at least seven different ministerial-level agencies in charge of energy-related issues, absent any clear division of responsibilities: the National Development and Reform Commission (NDRC), National Energy Administration (NEA), Ministry of Land Resources (MLR), Ministry of Commerce (MOC), Ministry of Finance (MOF), Ministry of Science and Technology, and Ministry of Environmental Protection.¹⁶ Under this setup, China's shale gas operations are mired in an unclear regulatory framework of agencies with overlapping responsibilities, none of which appear to govern shale gas in particular. Thus, IOCs must look outside of these regulatory bodies for guidance on shale gas. However, China's shale gas policies do not offer much more help.

B. *Chinese Energy Policies*

Traditionally, Chinese energy policy consisted of aggregates of targets for investment, production, and consumption for each individual industry.¹⁷ These targets tended to lack coherence, and were often subject to sudden changes.¹⁸ The current energy policy environment in China still centers on industry production targets, but appears relatively friendly to foreign investors, emphasizing Sino-foreign cooperation. Between the MOC's Foreign Investment and Industry Guidance Catalogue of 2011 (the Guidance Catalogue), the Twelfth Five-Year Plan for Natural Gas Development of 2011–2015 (the Five-Year Plan), and the NEA's Shale Gas Industry Policy (2013), the overall policy environment appears favorable to joint exploration between IOCs and China's state-owned enterprises (SOEs).

16. Paul Deemer & Nicholas Song, *China's 'Long March' to Shale Gas Production—Exciting Potential and Lost Opportunities*, 7 J. OF WORLD ENERGY L. AND BUS. 448, 456 (2014).

17. PHILIP ANDREWS-SPEED, ENERGY POLICY AND REGULATION IN THE PEOPLE'S REPUBLIC OF CHINA, CHAPTER 16: THE FOREIGN INVESTMENT REGIME FOR UPSTREAM OIL AND GAS (2004).

18. *Id.*

1. China's Twelfth Five-Year Plan for Natural Gas Development

China's Five-Year Plan set ambitious shale gas production targets for coming years.¹⁹ At the time the Five-Year Plan was promulgated, China aimed to produce 6.5 billion cubic meters (bcm) of shale gas annually by 2015, and 60–100 bcm annually by 2020.²⁰ For China to reach the ambitious production target of 60–100 bcm annually by 2020, and to sustain or enhance the current level of production, “thousands of wells will have to be drilled each year and the standard of reservoir management will have to be high.”²¹ Doing so will necessitate “greater involvement of foreign oil companies and service providers.”²² As a result, and in keeping with the mercurial nature of Chinese energy policy statements, China has already lowered its 2020 production targets.²³ In August 2014, Wu Xinxiong, head of China's NEA, announced that China will only pump 30 bcm of shale gas annually by 2020, instead of the earlier goal of 60–100 bcm annually.²⁴

2. The 2011 Foreign Investment and Industry Guidance Catalogue

China's state policy generally encourages private IOCs to invest in its shale gas. According to the Guidance Catalogue (enacted on December 24, 2011 and effective January 30, 2012), China classifies industries into three categories for foreign investment: “encouraged, restricted, or prohibited.”²⁵ Unclassified industries are categorized as “permitted.”²⁶ Foreign investment in shale gas projects, *in conjunction with Chinese partners*, is in the “encouraged” category of investment, indicating favorable tax incentives and administrative treatment.²⁷ With this classification, China appears to encourage partnered foreign investment in its shale gas.

19. Guojia Nengyuan Ju (国家能源局) [National Energy Administration], Tianranqi Fazhan “Shi'erwu” Guihua (天然气发展“十二五”规划) [Twelfth Five-Year Plan for Natural Gas Development] (2012) [hereinafter TWELFTH FIVE-YEAR PLAN FOR NATURAL GAS DEVELOPMENT], available at <http://zfxgk.nea.gov.cn/auto86/201212/W020121203312244945303.pdf>.

20. *Id.*

21. Andrews-Speed & Len, *supra* note 5, at 418.

22. *Id.*

23. *Id.*

24. Chen Aizhu et al., *China Finds Shale Gas Challenging, Halves 2020 Output Target*, REUTERS (Aug. 7, 2014), <http://www.reuters.com/article/2014/08/07/us-china-shale-target-idUSKBN0G70GS20140807>.

25. Deemer & Song, *supra* note 16, at 456 (internal quotation marks omitted).

26. *Id.*

27. Zhongguo Shangwubu Lianhe (中国商务部联合) [Ministry of Commerce, People's Republic of China], Waishang Touzi Chanye Zhidao Mulu (2011 Nian Xiuding) (外商投资产业指导目录 (2011年修订)) [Foreign Investment and Industry Guidance Catalogue (2011 Amendment)], §2.9 (2011) [hereinafter FOREIGN INVESTMENT AND INDUSTRY GUIDANCE CATALOGUE], available at <http://wzs.mofcom.gov.cn/article/n/201112/20111207907751.shtml>, translated at <http://english.mofcom.gov.cn/article/policyrelease/aaa/201203/20120308027837.shtml>.

Still, the exact language of the Guidance Catalogue merits further analysis and could reveal some of the Chinese government's intentions in Sino-foreign shale gas contracts: "Prospecting and exploitation of unconventional natural gas resources such as shale gas and submarine natural gas hydrate (*limited to equity joint venture and contractual joint venture*)."²⁸ The Guidance Catalogue's favorable investment-treatment designation appears limited to only the JV contractual structure, while the alternative PSA structure is conspicuously absent. Regardless, the general tone of China's recent shale gas policies appears to welcome foreign investment, and, by extension, U.S. firms.

3. NEA Shale Gas Industry Policy

On October 22, 2013, China's NEA issued its first-ever Shale Gas Industry Policy (the Policy).²⁹ The Policy sets out promising proposals for the future development of shale gas in China. According to the Policy, China will: follow the Shale Gas Development Plan of 2011–15;³⁰ encourage diversified investors (including private companies) to invest in shale gas exploration and development;³¹ require *market pricing* of shale gas;³² encourage Chinese companies engaged in shale gas development to cooperate with "foreign entities with *advanced shale gas technologies*" to bring those shale gas exploration and development technologies to China;³³ and classify shale gas as a "national strategic new industry," calling for more fiscal support of exploration and development of shale gas.³⁴

The Policy is promising for its market-friendly focus and welcoming language toward foreign entities. The policy language surrounding advanced shale gas technologies also echoes a 2009 U.S. statement regarding U.S.–China commercial cooperation in shale gas development: "The United States is a leader in shale gas technology Bringing this

28. *See id.* at §2.9 (original Chinese text: "页岩气、海底天然气水合物等非常规天然气资源勘探、开发 (限于合资、合作)") (emphasis added).

29. Guojia Nengyuan Ju (国家能源局) [National Energy Administration], Yeyanqi Chanye Zhengce (页岩气产业政策) [Shale Gas Industry Policy] (2013) [hereinafter SHALE GAS INDUSTRY POLICY], available at http://zfxgk.nea.gov.cn/auto86/201310/t20131030_1715.htm; see also BAKER & MCKENZIE INTERNATIONAL, SHALE GAS, AN INTERNATIONAL GUIDE 62 (Jan. 23, 2014), available at http://f.datasrv.com/fr1/314/48797/Shale_Gas_an_International_Guide_v3.pdf.

30. *See generally* Guojia Nengyuan Ju (国家能源局) [National Energy Administration], Yeyanqi Fazhan Guihua (2011–15) (页岩气发展规划 (2011–2015年)) [Shale Gas Development Plan (2011–15)] (2012), available at <http://zfxgk.nea.gov.cn/auto86/201203/P020120316383507834234.pdf>.

31. SHALE GAS INDUSTRY POLICY, *supra* note 29, art. 1.4.

32. *Id.* art. 5.21 (emphasis added).

33. *Id.* art. 2.9 (emphasis added).

34. *Id.* art. 7.30.

expertise to China will provide economic opportunities for both the U.S. and China, while improving energy security for both countries”³⁵

C. *The Role of the State in China’s Shale Gas Development*

China’s National Oil Companies (NOCs), or SOEs, are responsible for onshore oil and gas exploration and production in China. The largest and most active of these SOEs are the Chinese National Offshore Oil Corporation (CNOOC), China National Petroleum Corporation (CNPC) (including its subsidiary PetroChina), and Sinopec. Some Chinese scholars have suggested that NOCs working alone, rather than in conjunction with foreign firms, are better suited to develop China’s nascent shale gas industry.³⁶ These scholars argue that China’s NOCs, in contrast to IOCs or the independent developers that launched the U.S. shale revolution, “enjoy overwhelming advantages over new entrants in terms of technology, experience, financial resources, and policy.”³⁷

Generally, China does not allow independent companies to explore, develop, or bid on shale gas reserves, unlike the U.S. model. China’s inflexible state-controlled oil and gas industry can hamper efforts by non-state actors to exploit reserves, and the structure forces interested IOCs to instead work out a contractual relationship with a Chinese partner. Although the recently promulgated Shale Gas Industry Policy sounds nice to foreign companies, the Policy offers no legal protection for independent operators.³⁸ According to Melanie Hart of the Center for American Progress, “[i]n the U.S., it was not the oil and gas majors that started the shale boom but rather small wildcat operators willing to accept a high-risk, high-reward proposition.”³⁹

Furthermore, unlike in the United States, “[a]ll petroleum resources within the People’s Republic of China are property of the state.”⁴⁰ State ownership of mineral resources centralizes decision making about energy exploration with the State, whereas decentralization and encouraging private enterprise could maximize efficiency and reward risk-taking in shale gas exploration, leading to greater returns. However, the People’s

35. Press Release, The White House: Office of the Press Secretary, Fact Sheet: U.S.-China Shale Gas Resource Initiative (Nov. 17, 2009), available at http://www.chinafaqs.org/files/chinainfo/US-China_Fact_Sheet_Shale_Gas.pdf.

36. Lei Tian et al., *Stimulating Shale Gas Development in China: A Comparison with the US Experience*, RESOURCES FOR THE FUTURE, at 1 (July 2014), available at <http://www.rff.org/RFF/Documents/RFF-DP-14-18.pdf>.

37. *Id.*

38. See generally SHALE GAS INDUSTRY POLICY, *supra* note 29.

39. Christina Larson, *China’s Shale-Gas Potential and Peril*, BLOOMBERG BUSINESSWEEK (Apr. 18, 2013), <http://www.businessweek.com/articles/2013-04-18/chinas-shale-gas-potential-and-peril> (internal quotation marks omitted).

40. DAVID BLUMENTHAL ET AL., UPSTREAM OIL AND GAS IN CHINA, V. INDUSTRY SECTOR REPORTS § 3.02(2)(a) (2009), available at <http://www.velaw.com/uploadedfiles/vesite/resources/20-vol3secvch3upstreamoilandgas.pdf>.

Republic of China (PRC) is unlikely to alter its property-ownership structure in the near future, and foreign firms interested in shale gas production must instead rely on contractual relationships with China's SOEs.

IV. LEGAL AND CONTRACTUAL ISSUES

A. *Legal Issues*

China's legal regime for foreign onshore oil and gas exploration is based more in contract than legislation.⁴¹ China has many energy-related policies, but no real laws.⁴² The legal framework for China's oil and gas industry lacks an "overarching Petroleum Law governing exploration, development, production and sales."⁴³ Existing laws in China that tangentially relate to energy include the following: the 1995 Electricity Law, 1996 Coal Law, 1997 Energy Conservation Law, and 2005 Renewable Energy Promotion Law.⁴⁴ None of these laws deal specifically with shale gas or its surrounding issues.⁴⁵ Therefore, much of the debate for foreign firms interested in China's shale gas centers on the structure and terms of contracts between the foreign firm and a Chinese SOE.

B. *Contractual Issues*

Foreign companies are not permitted to invest in onshore exploration and development in the PRC on their own but instead must partner with a Chinese "major."⁴⁶ For this reason, and because China's energy industry legal framework is based more in contract than in law, clear contractual relationships are necessary for foreign firms interested in exploring China's natural resources. Joint shale gas operations, which are not covered by a legal framework in China, also operate under contract.

China lacks a government-approved model shale gas agreement for foreign firms to copy. Contract negotiation has therefore been limited to expanded versions of existing conventional natural gas and petroleum agreements. This section discusses commonly encountered terms in conventional natural gas agreements, major contractual issues faced by

41. PHILIP ANDREWS-SPEED, ENERGY POLICY AND REGULATION IN THE PEOPLE'S REPUBLIC OF CHINA (2004) [hereinafter ANDREWS-SPEED, ENERGY POLICY AND REGULATION].

42. Deemer & Song, *supra* note 16, at 456.

43. BLUMENTHAL ET AL., *supra* note 40, § 3.02(2).

44. Xin Qiu & Honglin Li, *Energy Regulation and Legislation in China*, 42 ENVTL. L. REPORTER 10678, 10680 (2012).

45. *Id.*

46. BLUMENTHAL ET AL., *supra* note 40, § 3.02(3)(a).

parties contracting for petroleum exploration in China, and the different contractual structures that foreign firms could employ.

1. Common Contractual Terms

In conventional onshore oil and gas contracts for traditional exploration, the following terms are common: (1) a choice of law provision designating Chinese law; and (2) an arbitration clause, often designating either (a) arbitration by the China International Economic and Trade Arbitration Commission (CIETAC), or (b) arbitration by an ad hoc tribunal of three under United Nations Commission on International Trade Law (UNCITRAL) rules.⁴⁷ The NEA provides a Model Purchase and Sale Contract for regular onshore natural gas on its website, offering similar terms: a choice of law clause designating Chinese law, and a neutral arbitration clause.⁴⁸ While the NEA contract appears to only govern conventional, domestic gas purchases, it provides a good example of Chinese contractual terms governing natural resources.

The Chinese choice-of-law provision is significant because in China, contracts concerning natural resources are always governed under Chinese law.⁴⁹ In addition, Article 5 of the Chinese Choice of Law Statute provides that regardless of what parties to an international transaction agree on paper, Chinese law will still apply “where the application of foreign law will be prejudicial to the social and public interest of [China].”⁵⁰ Thus, it is crucial that natural resource contracts between Chinese and foreign parties include a neutral arbitration clause, since international arbitration forums are generally less concerned with “the social and public interests of [China],”⁵¹ and are less likely to automatically favor Chinese SOEs. Chinese courts also tend to enforce neutral arbitration clauses in international transactional agreements.⁵²

Arbitration is the preferred dispute resolution mechanism for international transactions, particularly in countries, like China, that will not enforce a U.S. judgment.⁵³ Such arbitration aims to ensure an

47. See ANDREWS-SPEED, ENERGY POLICY AND REGULATION, *supra* note 41.

48. See Guojia Nengyuan Ju (国家能源局) [National Energy Administration], Tianranqi Gouxiao Hetong (天然气购销合同) [Natural Gas Purchase and Sale Contract] (2014), available at http://zfxgk.nea.gov.cn/auto92/201403/t20140304_1777.htm.

49. Mark Phelps, *Choice of Law Clauses in China—Not Necessarily So*, DESH INT’L & BUS. LAW. (Apr. 2, 2014), <http://www.deshlaw.com/choice-of-law-clauses-in-china-not-necessarily-so/>.

50. Zhonghua Renmin Gongheguo Shewai Minshi Guanxi Falu Shiyong Fa (中华人民共和国涉外民事关系法律适用法) [Law of the People’s Republic of China on the Laws Applicable to Foreign-Related Civil Relations] (Oct. 28, 2010), translated at <http://conflictoflaws.net/News/2011/01/PIL-China.pdf>.

51. See *id.*

52. Phelps, *supra* note 49.

53. BAKER & MCKENZIE, CHOICE OF LAW AND VENUE IN CROSS-BORDER CONTRACT DRAFTING 19 (Mar. 28, 2013), available at http://www.acc.com/chapters/sfbay/upload/internationalprez_3-27-13_baker.pdf.

enforceable award and minimize the risk of state interference.⁵⁴ Parties to an international transaction contract need to make sure their arbitration clauses (1) are sufficiently broad to capture all potential disputes; and (2) designate a seat and language for arbitration.⁵⁵ A carefully worded and negotiated arbitration clause can prevent a foreign company from being forced to resolve disputes within China's unreliable and SOE-favoring court system.

2. Common Contractual Concerns: Threat of Government Intervention, Fear of Bribery and Corruption, and Expropriation

Two of the greatest threats for U.S. firms negotiating contracts with energy-sector SOEs in China and other developing countries are the threat of government intervention and fear of bribery and corruption.⁵⁶ Legitimate government intervention often takes the form of restrictions on assignment, changes in control of the project, one-sided contractual provisions, and SOE-friendly preemption rights.⁵⁷ In countering these concerns, risk mitigation in contractual negotiations is key. To prevent potential government interference, the U.S. party negotiating with a Chinese SOE should do the following: (1) clarify any uncertainties in the drafting prior to executing documents; (2) agree on a dispute-resolution mechanism that is not automatically likely to favor the SOE; and (3) prior to marketing or selling the product, structure the sale to reduce the effect of any identified risk and apportion that risk in the sale contract.⁵⁸

Bribery and corruption concerns are also an important issue in any Chinese natural resource contract.⁵⁹ The U.S. party to a Chinese natural resource contract must keep in mind that thorough due diligence is necessary, including "specific integrity due diligence" into how any questionable asset came into the possession of the granting authority.⁶⁰ Clients should look for "specific contractual anticorruption undertakings, representations and warranties" and should implement rigorous compliance policies and procedures to avoid violating the U.S. Foreign Corrupt Practices Act (FCPA).⁶¹

A parallel concern for IOCs negotiating energy contracts in developing countries is minimizing expropriation risk. To prevent the state from expropriating, or taking, a project without compensating the IOC, contracts should incorporate "an integrated structure that will take

54. *International Energy Insight*, 50 HOUSTON LAWYER 28, at *29 (Hous. Bar Ass'n 2012).

55. *Id.*

56. *Id.* at *33.

57. *Id.*

58. *Id.*

59. *Id.*

60. *Id.*

61. *Id.*

account of the protection available and afforded by international law, treaties and conventions.”⁶² Foreign investors should seek appropriate covenants and assurances from the Chinese party, and should thoroughly clarify any unclear or vague terms.⁶³ Finally, any expropriation risk should be factored into the investment model and structure.⁶⁴ The prospect of state seizure could be a significant deterrent to business in China, but it is one that applies across industry lines and is not specific to energy investment. Furthermore, some research indicates that expropriation risk has largely disappeared in the international energy market, specifically due to stronger international laws and lower global tolerance for violating international norms.⁶⁵ Indeed, “the symbiotic nature of growth in emerging and developed economies reduced asset seizures to nearly zero during the 1980s.”⁶⁶

C. Possible Agreement Structures: Joint Venture and Production-Sharing Agreement

Foreign companies operating in China must partner with a Chinese SOE, and in doing so may choose one of the following contractual structures to enter the shale gas market: a JV or PSA. A third structure, the joint-study agreement (JSA), may precede either the JV or PSA. The following section will examine each of these contractual forms in detail, weighing the relevant agreement’s structure, advantages, and disadvantages in China.

1. Joint Venture

The JV is an open-ended agreement between an IOC and a host government represented by a NOC⁶⁷—in China’s case, one of its SOEs like CNPC, PetroChina, or Sinopec. In a JV, one or more foreign parties and a SOE together form a Chinese JV partnership that will carry out any shale gas operations.⁶⁸ Under the JV, the IOC and the host government must conduct all operations jointly, and the host government maintains a high degree of control and input on the modes and methods of research,

62. Jeffrey Barratt & Philip Roche, *Expropriation - Investment Protection and Mitigating the Risks*, NORTON ROSE FULBRIGHT (Sept. 2010), <http://www.nortonrosefulbright.com/knowledge/publications/30459/expropriation-investment-protection-and-mitigating-the-risks>.

63. *Id.*

64. *Id.*

65. Witold J. Henisz & Bennet A. Zelner, *The Hidden Risks in Emerging Markets*, HARV. BUS. REV. (Apr. 2010), available at <https://hbr.org/2010/04/the-hidden-risks-in-emerging-markets/ar/1>.

66. *Id.*

67. See Jenik Radon, *The ABCs of Petroleum Contracts: License-Concession Agreements, Joint Ventures, and Production-Sharing Agreements*, COVERING OIL: A REPORTER’S GUIDE TO ENERGY DEVELOPMENT, at 66 (2005), available at <http://www.gmec-ee.com/wp-content/uploads/2013/08/The-ABCs-of-Petroleum-ContractsFalsepdf>.

68. *See id.*

exploration, and production.⁶⁹ Because the parties must work jointly, the JV has been compared to a “modern-day marriage”⁷⁰:

Parties to a joint venture need to know and understand each other's goals, interests and ways of doing business. Without such understanding, it is impossible to draft a workable prenuptial agreement (i.e., the joint venture agreements) The low success rate of modern-day marriage applies equally to corporate joint ventures.⁷¹

Such a structure often results in marital strife between contracting parties. In a JV agreement, both parties share all costs and liabilities.⁷² Disagreements are therefore common and negotiations must be painstaking to carefully set expectations.

Despite its inherent ambiguity and conflict potential, the JV structure has certain advantages in China. For instance, in China, all mining operations are normally carried out under a JV model.⁷³ The mining distinction is significant because on December 31, 2011, the Chinese State Council changed the classification of shale gas from a “natural resource to an independent mining resource . . . subject to the Mineral Resources Law.”⁷⁴ This change might indicate a preference for the JV structure, at least as of the end of 2011. Also, the language of China's Guidance Catalogue may indicate that favorable classification and tax treatment for foreign shale gas investment is limited only to JVs.⁷⁵ The PSA structure is not listed in the Guidance Catalogue,⁷⁶ which could indicate that the Chinese Communist Party (CCP) wishes to incentivize JVs instead of PSAs. In addition, the CCP and the MLR have indicated preference for JVs in areas that have not previously been allocated to major SOEs, and would prefer to award those areas through a JV bid round process rather than award them directly to an SOE.⁷⁷

However, the inherently ambiguous nature of the JV agreement and its tendency to elicit disagreement are major drawbacks to choosing this structure. One main problem with the JV structure is that it follows no general, commonly accepted format.⁷⁸ An ambiguous agreement requires extensive negotiation, where both parties must invest in expert

69. *See id.*

70. *Id.* at 65.

71. *Id.*

72. *Id.* at 67.

73. Deemer & Song, *supra* note 16, at 453.

74. King & Wood Mallesons, *Before You Invest in China's Shale Gas Assets*, CHINA LAW INSIGHT (Mar. 26, 2014), <http://www.chinalawinsight.com/2014/03/articles/energy-resource/before-you-invest-in-chinas-shale-gas-assets/> (internal quotation marks omitted).

75. FOREIGN INVESTMENT AND INDUSTRY GUIDANCE CATALOGUE, *supra* note 27, at § 2.9.

76. *See id.*

77. Deemer & Song, *supra* note 16, at 454.

78. Radon, *supra* note 67, at 65.

legal advice to develop terms.⁷⁹ In addition, the joint relationship between the IOC and NOC could leave the IOC with less freedom to pursue extraction independently, since all profits must be split and work must be done jointly with an NOC possessing majority ownership in the JV. Finally, even though China has many energy regulatory bodies, there are no specific Chinese regulations that say which government bodies are responsible for shale gas JVs.⁸⁰

2. Joint-Study Agreement

The JSA is an unclear arrangement for a limited time period—usually no more than two to three years—during which a foreign company and a Chinese SOE conduct a joint study of shale conditions in an area to determine the existence, quantity, and quality of shale gas reserves.⁸¹ The JSA is viewed as a precursor agreement that could later lead to a more formal JV or PSA.⁸² JSAs often include similar contractual terms to a PSA, but entail less commitment: neither party is locked into negotiating a full JV or PSA and both are subject to less pressure to go forward with development if the results of the joint study are unfavorable.⁸³ Still, the Chinese authorities offer little guidance as to whether JSAs (1) are legally recognizable phenomena at all, and (2) require the foreign operator to register a Chinese branch office.⁸⁴

3. Production-Sharing Agreement

The PSA developed in Indonesia in 1966 and has grown in popularity in resource-rich developing countries.⁸⁵ PSAs recognize state ownership of any mineral resources under the host country's soil.⁸⁶ As such, the PSA does not vest any property interest in belowground mineral resources in the IOC, but is drafted in such a way as to permit an IOC to extract and develop those resources on the government's behalf.⁸⁷ Under a PSA, the IOC carries most if not all of the financial and operational risk.⁸⁸ The PSA is characterized by exploration at the risk of the foreign contractor, and cost recovery and production splits with which international oil and gas companies (and Chinese SOEs) are familiar.⁸⁹ Under these familiar cost-splitting mechanisms, the IOC is entitled to

79. *Id.* at 66.

80. Deemer & Song, *supra* note 16, at 453.

81. *Id.* at 455.

82. *Id.*

83. *Id.*

84. *Id.*

85. Radon, *supra* note 67, at 68.

86. *Id.*

87. *Id.*

88. *Id.*

89. Deemer & Song, *supra* note 16, at 455.

cost recovery for operating expenses and all capital investment.⁹⁰ After the IOC has repaid itself out of the annual earnings, the remainder of annual earnings is shared pursuant to an agreed-upon percentage division with the host government.⁹¹

The PSA for shale gas in China is usually a negotiated “petroleum contract similar to the petroleum contracts or [PSAs] for *conventional* petroleum resources, which are used in Chinese offshore and onshore oil and gas ventures.”⁹² Where the PSA model is used for a shale gas JV, the parties generally follow “procedures which are used for conventional oil and gas projects.”⁹³

Advantages of the PSA arise from the agreement’s contractual nature. Under a PSA, the IOC is more independent and has greater control over the carrying out of drilling operations than in a JV. In addition, the PSA’s complexity is determined by the “soundness of the legal infrastructure of a state.”⁹⁴ As such, if a country lacks basic legal rules concerning a particular type of petroleum operation, carefully drafted terms in the PSA can address those shortcomings in the host country’s legal system.⁹⁵ Finally, because the PSA’s contractual terms serve as a proxy for missing elements in the host country’s legal system, any breach of the agreement would be of contract—not of law—and subject to the remedy of contractual damages rather than criminal penalties under host-country laws.⁹⁶

Disadvantages of the PSA in China are characterized mainly by a lack of direction on the basic permissibility of the PSA structures. First, China lacks a model PSA. While the Columbia SIPA Center on Global Energy Policy has proposed a Model PSA for shale gas exploration and production in China,⁹⁷ the Chinese government has sanctioned no such model agreement. Second, with increased independence under a PSA comes increased financial liability. Not only is the IOC responsible for all financial and operational risk, but poorly negotiated contractual terms could also allow host countries to back off, withdraw, or even award the PSA to another company.⁹⁸ For this reason, a PSA requires professional legal advice and carefully drafted contractual terms.

90. Radon, *supra* note 67, at 68.

91. *Id.* at 69.

92. Deemer & Song, *supra* note 16, at 453 (emphasis added) (internal quotation marks omitted).

93. *Id.*

94. Radon, *supra* note 67, at 69.

95. *Id.*

96. *Id.* at 71.

97. David Sandalow et al., *Meeting China’s Shale Gas Goals 57–74* (Columbia SIPA Ctr. on Global Energy Policy, Working Draft for Public Release, Sept. 2014), available at http://energypolicy.columbia.edu/sites/default/files/energy/China%20Shale%20Gas_WORKING%20DRAFT_Sept%2011_0.pdf.

98. Radon, *supra* note 67, at 69–70.

4. Royal Dutch Shell Case Study

International firms have struggled to land government-approved PSAs in China. As of November 2014, Royal Dutch Shell and Hess Corporation were the only two foreign firms that had landed such government-approved PSAs, for shale gas (Shell) and shale oil (Hess), respectively.⁹⁹ Other foreign firms, including ExxonMobil and BP, have “barely progressed beyond the preliminary stage of studying [shale] blocks” under JSAs, and lack government approval for further activities.¹⁰⁰

In March 2012, Shell signed Mainland China’s first government-approved shale gas PSA in a JV with CNPC subsidiary, PetroChina, to explore, develop, and produce shale gas in Sichuan Province.¹⁰¹ This arrangement was conducted outside of the normal shale gas bidding process.¹⁰² Details of the Shell contract were not specified, which is significant because previous efforts to tap shale gas reserves were hindered by “the lack of a template showing how production-sharing contracts between foreign and local companies would work.”¹⁰³ Indeed, China has not drawn up specific investment policies to guide international energy companies on developing unconventional oil and gas resources. Assuming that Shell followed the existing practice in China for conventional oil and gas development, the following terms were probably included: a contract lasting thirty years (as is normal for oil and gas exploration), with the foreign party bearing all the cost of exploration and the Chinese firm having the right to back in with a maximum 51% interest during the production stage.¹⁰⁴

However, two years into the PSA, Shell is backing off, and low gas prices and difficulties in production likely play a role. Simon Henry, Shell’s CFO, told investors on September 5, 2014 that Shell would trim its investment in its joint exploration project with PetroChina in Sichuan Province: “In Sichuan, progress has been slower and more difficult than we might have hoped: partly for geological reasons, partly due to

99. Aizhu et al., *supra* note 24.

100. *Id.*

101. Natalie Rodriguez, *Shell Scores China’s First Shale Gas Sharing Deal*, LAW 360 (Mar. 21, 2012), <http://www.law360.com/articles/321613/shell-scores-china-s-first-shale-gas-sharing-deal>.

102. Deemer & Song, *supra* note 16, at 453.

103. Wayne Ma, *Shell Reaches Chinese Shale-Gas Deal*, WALL ST. J. (Mar. 21, 2012), <http://online.wsj.com/articles/SB10001424052702304724404577294613154232818>.

104. Chen Aizhu & Judy Hua, *Hess, PetroChina Sign China’s First Shale Oil Deal*, REUTERS (July 24, 2013), <http://www.reuters.com/article/2013/07/24/us-cnpc-hess-shale-idUSBRE96N0EL20130724>.

challenges operating in the highly populated agricultural region It's likely it will be smaller than originally envisaged."¹⁰⁵

5. China's State-Owned Enterprises Still Attempt to "Go It Alone"

Despite Shell's lack of success in its PSA venture, China's SOEs have pressed ahead with some measurable effect. For example, Sinopec in Sichuan sold small amounts of Fuling shale gas to local markets beginning in 2013.¹⁰⁶ Although the Fuling field under Sinopec has shown initial success, costs at early wells have been high. According to one estimate, Sinopec and CNPC's short-term losses from shale gas drilling through the end of 2013 were close to \$1 billion.¹⁰⁷ These losses likely stem from underestimated geological difficulties.

6. FTS International Joint Venture

In contrast to the tempered success of Shell's PSA in Sichuan, in June 2014 a U.S. company contemplated a different approach. In June 2014, FTS International (FTSI), a Fort Worth-based well completion company, entered into a 15-year JV agreement with Chinese NOC Sinopec.¹⁰⁸ The JV aims to "bring FTSI's hydraulic stimulation capabilities and expertise to China."¹⁰⁹ FTSI owns 45% of the new Beijing-incorporated JV—SinoFTS Petroleum Services Ltd—while Sinopec owns 55%.¹¹⁰ This JV is "the first oilfield services collaboration of its kind between a non-Chinese well completion company and a Chinese national oil company."¹¹¹ While little is publicly known about the contractual terms backing the FTSI–Sinopec JV, the arrangement seems promising. FTSI should benefit from favorable tax incentives under China's Guidance Catalogue, and Sinopec's involvement may indicate Chinese government preference for the JV structure as opposed to the PSA. On the other hand, the Chinese SOE maintains majority ownership of the JV, which will likely translate to greater control over the JV's day-to-day operations, and perhaps greater access to FTSI's patented hydraulic fracturing technologies.

105. Eric Ng, *China Shale Gas Ambition Faces Reality Check*, SOUTH CHINA MORNING POST (Oct. 6, 2014), <http://www.scmp.com/business/commodities/article/1610301/china-shale-gas-ambition-faces-reality-check>.

106. Andrews-Speed & Len, *supra* note 5, at 418.

107. Lei Tian et al., *supra* note 36, at 4.

108. *FTS International Enters Chinese Market with 15-year Joint Venture Company with Sinopec*, FTS INT'L (June 10, 2014), <http://www.ftsi.com/news/Pages/FTS-International-Enters-Chinese-Market-with-15-year-Joint-Venture-Company-with-Sinopec.aspx>.

109. *Id.*

110. *Id.*

111. *Id.*

Whether the “low success rate of modern-day marriage”¹¹² will apply to this JV remains to be seen.

V. TECHNOLOGICAL AND GEOLOGICAL ISSUES

A. Intellectual Property Concerns

One issue for U.S. companies involved in Sino-foreign JVs is protecting sensitive technology from intellectual property theft. Much of the U.S. software and technology related to hydraulic fracturing (necessary for developing shale gas) is patented or regarded as a trade secret.¹¹³ Similarly, U.S. companies have historically guarded the precise chemical composition of their fracking fluids.¹¹⁴ Federal laws also limit sharing of intellectual property with China: “While nascent disclosure obligations will open up some of this information within the United States, including through chemical disclosure registry FracFocus.org, major fracking players likely remain concerned that their role in a Chinese partnership could be limited to sharing technical know-how and to early-stage rather than long-term joint development.”¹¹⁵ While China’s Shale Gas Industry Policy encourages advanced technology sharing between IOCs and SOEs, the Policy guarantees no intellectual property protection for foreign advanced technologies.¹¹⁶ Lack of intellectual property protection is a serious barrier to U.S. involvement in China’s shale gas, and contracts should include clear terms indicating the extent and limitations of permissible technology transfers. Developers should also carefully monitor all drilling projects, taking special care to ensure Chinese compliance with technology-transfer protections.

B. Geological Concerns

On a geological level, the locations and reservoirs of China’s shale gas are much more complicated than those in the United States. Due to

112. Radon, *supra* note 67, at 65.

113. Jennifer Tomsen & Marc Davies, *Shale Gas in Asia: Significant Reserves, Substantial Challenges*, BLOOMBERG BNA (Nov. 1, 2013), <http://www.bna.com/shale-gas-in-asia-significant-reserves-substantial-challenges/>.

114. *Id.*

115. *Id.*

116. China’s Shale Gas Industry Policy makes only one oblique reference to intellectual property rights, one that appears to apply only in the context of domestic research and development. See SHALE GAS INDUSTRY POLICY, *supra* note 29, art. 5 (“Strengthen the research and development of key shale gas technologies, based in reality and combined with national conditions, to form a system of key technologies with independent intellectual property rights in order to promote shale gas development.”) (“加强页岩气关键技术自主研发，立足实际，结合国情，形成具有自主知识产权的关键技术体系，促进页岩气发展”). The Policy does not clarify what a “system of key technologies with independent intellectual property rights” might entail, or to whom it would apply, and it lacks any sort of enforcement mechanism. *Id.* In addition, the Policy is not law and it lacks any binding authority to protect intellectual property rights. *Id.*

these geological differences, gas wells in China cost ten times more to drill than in the United States.¹¹⁷ China's shale gas basins are located in relatively inaccessible regions that combine complex tectonics and geology, high agricultural activity, and water scarcity—resulting in greater capital expense for drilling.¹¹⁸ The terrain in Sichuan province (where the Fuling shale is located) is mountainous, hilly, and full of faults and folds.¹¹⁹ According to Briana Mordick, a geologist at Anadarko Petroleum, “[Sichuan] formations seem to be more faulted and folded, which makes it more difficult and less economic to drill long horizontal well bores The technical learning curve is very steep. What works in one place may not work in another.”¹²⁰ In addition, the prohibitive capital expenditures required just to begin exploration may render cost-effective exploration impossible.¹²¹ One energy commentator calculated that Sichuan's hilly terrain could require companies to spend an additional 10 million yuan (\$1.6 million) just to haul equipment and level the ground for drilling rig installation.¹²²

C. Water Issues

In the United States, the shale gas revolution was ignited by hydraulic fracturing, a water-intensive process. Some critics have argued that because hydraulic fracturing “sucks up as much as 25 million liters (6.6 million gallons) of water for each well,” the process should be curtailed in China.¹²³ Admittedly, China suffers from water scarcity. According to a report from the World Resources Institute, more than 60% of China's shale oil and gas resources are in areas with high baseline water stress or arid conditions.¹²⁴ China holds one-fifth of the world's population, but only 7% of its freshwater resources.¹²⁵ In addition, producers in Sichuan Province “face significant financial risks with the added costs of accessing and transporting water,” since seasonal rainfall variations and high

117. Edwin Lee, *Shale Gas in China: How Far from Dream to Reality?*, CHADBORNE & PARKE LLP (June 2013), available at http://www.chadbourne.com/files/Publication/8f7ad604-f97c-4f13-9bcf-a2f7dd206aff/Presentation/PublicationAttachment/282810d2-4f33-4768-bf67-a98d22dacc36/ShaleGasInChina_pfnJun13.pdf.

118. EIA CHINA OVERVIEW, *supra* note 1, at 21–22.

119. *Id.*

120. Larson, *supra* note 39.

121. Ng, *supra* note 105.

122. *Id.*

123. Christina Larson, *Water Shortages Will Limit Global Shale Gas Development, Especially in China*, BLOOMBERG BUSINESSWEEK (Sept. 2, 2014), <http://www.bloomberg.com/bw/articles/2014-09-02/water-shortages-will-limit-global-shale-gas-development-especially-in-china>.

124. PAUL REIG ET AL., WORLD RESOURCES INSTITUTE, GLOBAL SHALE GAS DEVELOPMENT: WATER AVAILABILITY AND BUSINESS RISKS 54 (Oct. 14, 2014), available at http://www.wri.org/sites/default/files/wri14_report_shalegas.pdf.

125. Larson, *supra* note 39.

population density in Sichuan communities could lead to some regulatory and reputation risk for producers.¹²⁶

However, water scarcity is not the biggest barrier to China's shale gas production. Indeed, more than 2.08 billion gallons of water are used *each day* to irrigate golf courses in the United States.¹²⁷ While much of China's shale gas is located in water-scarce or desert regions, implementing new technologies could mitigate much of the perceived water scarcity risk stemming from hydraulic fracturing shale gas operations. One such technology is liquefied petroleum gas (LPG) gel fracturing, a new development that could replace conventional water-reliant fracturing methods.¹²⁸ LPG gel fracturing uses no water and allows operators to recover 100% of the used fracturing fluid, resulting in enhanced gas recovery, longer sustained production, and cost-effectiveness (especially in multi-stage horizontal wells).¹²⁹ By eliminating the need for billions of gallons of water in global fracking operations, such technological advances could go a long way towards relieving water scarcity pressure on shale gas exploration.

VI. CONCLUSION: A "BRONZE" OPPORTUNITY

The Chinese generally approach policy decisions with a long-term, relativistic approach, and China's approach to developing its immense reserves of domestic shale gas is no different. Despite the many barriers to Sino-foreign joint drilling activities in China's fertile shale basins, China's shale gas will be developed at some point—just perhaps not immediately, or not as quickly as U.S. firms seeking immediate profits would like. Instead, China views its shale gas reserves as a resource that will be tapped inevitably at some time in the future, once global prices have risen and the costs are relatively less prohibitive. In the words of Liang Digang of the China Research Institute of Petroleum Exploration and Development, "in the long run, it is necessary to develop shale gas as a supplement to [China's] conventional gas supply. The development of this industry is not for the present, but for the future."¹³⁰

When China is finally forced to address its larger energy problems in the future, it will require the assistance of foreign—likely, U.S.—shale gas

126. Ng, *supra* note 105.

127. Gregory T. Lyman, *How Much Water Does Golf Use and Where Does It Come From?*, UNITED STATES GOLF ASS'N, 2012 at 2 (2012), available at http://www.usga.org/uploadedFiles/USGAHome/Course_Care/Golf_and_the_Environment/Water/214418%20Lyman,%20Greg%20-%20How%20Much%20Water%20Does%20Golf%20Use.pdf.

128. GASFRAC ENERGY SERVICES INC., <http://www.gasfrac.com> (last visited Apr. 22, 2015).

129. *Id.*

130. Johnathan Watts, *China Takes Step Towards Tapping Shale Gas Potential with First Well*, THE GUARDIAN (Apr. 21, 2011), <http://www.theguardian.com/environment/2011/apr/21/china-shale-gas-well>.

expertise and hydraulic fracturing technology. But even though China's policy framework is increasingly favorable to shale gas investment by foreign firms, the realities of low profit margins, high capital expenditure, a shaky legal and regulatory scheme (particularly for technological and intellectual property protection), and unclear contractual arrangements make large-scale development by U.S. firms unlikely in the near future. To help U.S. firms successfully enter China's shale gas market, China must focus on improving its legal system and instilling fundamental rule of law. Doing so will (1) ultimately clarify the Chinese government's preferred contractual structure, JV or PSA; (2) consolidate and clarify its regulatory authority; and (3) ensure greater intellectual property protection for U.S. technologies.

To that end, China has taken some steps toward indicating a preferred contractual structure. Between the Guidance Catalogue wording, MLR policy statements, technology-sharing provisions in the Shale Gas Industry Policy, and recent approval of the FTSI-Sinopec JV, perhaps China has indicated some degree of preference for JVs. Nevertheless, until such time as the regulatory, legal, contractual, and technological deficiencies of the Chinese shale gas industry are addressed, U.S. firms should carefully negotiate all contractual arrangements for shale gas exploration in China, paying close attention to proposed terms and their ultimate effects on the venture.