Legal Issues in Shale Gas Development

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Overview of Presentation

- Why shale gas has become so popular and how is it different?
- Hydraulic fracturing – its impact on resources and the environment
- Shale gas development in the U.S.
- Shale gas development in China
- Key issues to be considered in connection with shale gas development
Introduction to Shale Gas Development

• Why is shale so hot?

  – Global demand for energy, with decreasing conventional reserves
  – New technology
    • Horizontal drilling
    • Hydraulic fracturing
  – Results:
    • Boom in drilling and investment in U.S. shale
    • Increase in U.S. natural gas reserves
    • Proposals for changes in laws
Introduction to Shale Gas Development

- Abundance
  - Recoverable unconventional gas (shale gas, tight sands and coal bed methane) accounts for 60% of the U.S. onshore recoverable resources
  - Current recoverable resources estimated to provide gas supply in the U.S. for the next 90 years, while a separate estimate of shale gas resources extends the supply to 116 years
  - Available shale gas reserves in China, Europe and other parts of the world are substantial
  - Natural gas is a “clean” energy source - preferred over other hydrocarbons
• **How are shale gas developments different from conventional oil and gas projects?**
  – Shale gas projects extend over large areas, involving many interested parties
  – Modern hydraulic fracturing ("fracking") technology and service contractors are essential to development
  – Shale development involves significant environmental and water resources issues in connection with the fracking process
  – Infrastructure needs and resources may be outside of conventional areas – new infrastructure may be needed for development and transportation
Hydraulic Fracturing

Overview of Horizontal Drilling

- Horizontal wells provide greater exposure to the producing formation (reservoir)

- Primary disadvantage is cost: as much as $2.5 million for a horizontal well versus $800,000 for a vertical well

- Well suited to tight formations that extend over large areas
Hydraulic Fracturing

Overview of Hydraulic Fracturing

- Hydraulic fracturing is a formation stimulation practice that creates additional permeability in a producing formation, allowing hydrocarbons to flow more readily to a well bore.
- Hydraulic fracturing involves pumping of fracturing fluid into formation under pressure to generate fractures or cracks in target formation.
- Fluid includes proppant to hold cracks open.
- Without hydraulic fracturing, the removal of gas from shale formations is not feasible.
Significant Environmental Issues
Associated with Hydraulic Fracturing

Hydraulic fracturing has been linked to a number of environmental hazards, including water contamination.

- Although fracking has been in use since 1949, environmental groups in the US and Europe claim that fissures resulting from fracking can create pathways for chemicals or gas to seep into aquifers.
- Industry experts argue that shales are separated from aquifers by thousands of meters of impermeable bedrock, and therefore such seepage cannot occur.
- Other claims of environmental damage include escape of natural gas and earthquakes.
Significant Environmental Issues

Associated with Hydraulic Fracturing

- **Significant Environmental Issues**

- **Water withdrawal / use**
  - Depletion of water supplies, particularly in times of drought, has been cited as an objection to hydraulic fracturing operations
  - Substantial drought in Texas has raised questions about the efficacy of shale development
Significant Environmental Issues
Associated with Hydraulic Fracturing

- **Managing flow back water**

  - In Pennsylvania (Marcellus Shale development), local companies disposed of contaminated water in waste treatment centers which were not equipped to clean the water of toxins before the water was released back into the water supply.

  - In other parts of the US where shale development is more established, waste water is disposed of in deep saline wells.
• **Protecting drinking water**

  – An informal moratorium on shale gas drilling currently exists; a series of environmental impact reviews and draft regulations have been prepared. At present, it is unclear whether fracking will be banned altogether, or allowed under regulations designed to protect water resources.

  – In a series of studies, researchers at Duke University concluded that shale gas wells appear to be contaminating nearby groundwater overlying shale gas basins, and also referred to inadequate disposal of flowback water from shale gas exploration.

  – A new study published in the Proceedings of the National Academy of Sciences found no evidence that fracturing shale causes groundwater contamination.
No. 1 Issue: availability of "source water"

• Fracking requires large quantities of water for each well drilled
  – are local supplies of water available?
  – does the shale gas operation impact availability of local drinking water or agricultural supplies?
  – how can water be delivered to the wellsites? Are roads sufficient for heavy cargoes of water by truck? Will smaller vehicles be required, and will a fleet of vehicles be available?

• Operator may need to make long-term contract with vehicle supplier in order to gain use of vehicles
The Key Issues in Shale Gas Development

No. 2 issue: "flowback"

- As water is used and pumped into well, there is "flowback" which must be handled

- Service company may have vehicle-mounted system that can recover some of chemicals and filter out sediment

- Some water can be used in other drilling operations

- Neither water nor sediment can be responsibly left on the drill site or put back into waterways without treatment because of chemical, minerals and metal contamination
No. 2 issue: "flowback"

- Some parts of the US allow disposal wells — other areas do not have stratigraphic layers that can accept water, so handling is a big issue

- One solution is to transport flowback water to another location by truck for disposal — great expense

- U.S. companies are developing new technologies and systems to treat water — some use mobile treatment equipment to improve volume of recoverable water

- Treatment may be a big cost item for the Operator
No. 3 Issue: Disposal of water produced from the wells

- Same problem encountered with conventional drilling operations – water produced from wells where hydrocarbons are recovered

- Solutions for "flowback" may also be used to deal with "produced water"
Other Major Issues:

- Availability of infrastructure outside of conventional production areas
- Need for pipeline access to support natural gas production
- Need for gas and liquids processing
- Transportation of recovered liquids to market
• U.S. shale gas operators engage large service contractors (e.g., Baker Hughes, Halliburton, Schlumberger, etc.) to work with experienced drilling contractors on shale gas drilling operations

• Essential to have both technology and experience in drilling vertical and horizontal wells – sensitive technology may be an issue with contractors

• Fracking operations also involve sensitive technology, formulas and proprietary processes
Shale Development in the U.S.

‘The Liquids Fairway’

- Bakken
- Niobrara
- Avalon, Bone Spring
- Eagle Ford
- Granite Wash
- Marcellus SW Penn.
• U.S. Federal Government Regulation of oil and gas includes
  – Federal Energy Regulatory Commission ("FERC") which previously regulated the well head price of natural gas;
  – Environmental Protection Agency; and
  – Other Federal Departments

• U.S. states also regulate oil and gas (e.g., Texas Railroad Commission)
- **Federal Regulation of Hydraulic Fracturing**
  - excluded from regulation under U.S. Safe Drinking Water Act (SDWA)
  - Federal government has largely left regulation of hydraulic fracturing to the states
State Regulation of Hydraulic Fracturing

- Primary source of regulation
- Most states regulate through state oil and gas agency, state environmental agency, or both
- State regulations continue to evolve as states take different approaches to regulating hydraulic fracturing
• Local Regulation of Hydraulic Fracturing
  – Local governments are becoming more involved and in some instances have banned hydraulic fracturing within their jurisdiction (e.g., Syracuse, Albany and Buffalo in New York state); local government bans have been upheld by courts to date, but appeals are pending
• The U.S. Government hopes to avoid the safety and regulatory breakdowns that led to the Deepwater Horizon blowout as it oversees onshore drilling using hydraulic fracturing
Principal Agreements Used in U.S. Shale Plays

- Development Agreement
  - Joint Venture Agreement between purchaser and seller of shale properties, relating to future shale development

- Oil and Gas Lease
  - Document by which Operator/Owner gains ownership of oil, gas and minerals production
• Joint Operating Agreement (JOA)
  – Same basic concepts as in international oil and gas projects
  – Key Provisions/Issues
    » Selection and change of Operator
    » Operator’s liability
    » Well Proposals
    » Non-consent operations (i.e. sole risk)
    » Preferential Purchase Rights/Consents
    » Maintenance of Uniform Interests
    » Production balancing
Principal Agreements Used in U.S. Shale Plays

- **Midstream Agreements**
  - Gathering Agreements
  - Processing Agreements
  - Marketing Agreements

- **Drilling Contracts**
  - Day Rate Contract
  - Footage Contract
  - Turnkey Contract

- **Seismic Agreement**
  - Proprietary v. licensed
  - Transferability issues
  - Right to show to others
Shale Development in China
Shale Development in China

Source: https://www.chinadialogue.net/article/show/single/en/6661-China-s-shale-revolution-will-it-take-off-
Initial licensing of shale blocks will be done under the oversight of the PRC Ministry of Land and Natural Resources ("MLR"). Subsequent steps included in foreign participation in shale development are less clear at this time.

The Chinese Government is considering one of two possible models on how to develop shale projects in China:
- PSC Model: Foreign entity enters into PSC with Chinese co. holding the block license
- Foreign Invested Entity Model ("FIE Model"): Foreign entity enters into a joint venture with Chinese co.; JV will hold the block license

Until the Chinese State Council makes a final decision concerning which model to utilize, it is unclear which model will ultimately be utilized in China:
- NOCs appear to be pushing PSC Model (as evidenced by CNPC-Shell PSC)
- CNPC-Shell PSC still awaiting governmental approval
Advantages / Disadvantages of PSC Model

• Advantages
  – Straightforward approach to cost recovery
  – Cash call issues easier to navigate than in the FIE Model

• Disadvantages
  – PSC needs to be adapted to shale gas requirements
  – Substantial time negotiating PSC before any initial drilling activities have been commenced

Regulatory issues with using a Joint Study Agreement for a foreign company to engage in pre-PSC drilling activities still needs to be addressed
Advantages / Disadvantages of FIE Model

• Advantages
  – Greater flexibility in negotiating commercial deal points and ownership percentage
  – Avoids Joint Study Agreement issues associated with the PSC Model

• Disadvantages
  – Set-up and Initial Cash Outlays
  – License Valuation
  – JV partner issues
  – Industry restrictions
  – Cost recovery
  – Funding complications
  – Tax
KEY ISSUES TO BE CONSIDERED
IN CONNECTION WITH SHALE GAS DEVELOPMENT

The following key issues should be carefully considered, when involved in the development of shale gas reserves internationally:
1) **Environmental Protection Issues**

- assuring that the Operator of the shale gas development takes necessary steps to fully protect the environment from damage caused by shale gas operations

- use of the most advanced technology and know-how, and proper cementing and casing are essential
2) Water Management and Treatment Issues

• assuring that there are adequate supplies of source water for hydraulic fracturing, and that the water can be delivered to the drill site at a reasonable cost, and that the water usage does not cause problems for the local population

• treatment of flowback and produced water, including the possible use of disposal wells, will be major issues in drilling operations
3) Transfer of Technology Issues

- engaging Operators, service companies and drilling contractors with access to the most advanced directional drilling and hydraulic fracturing technology

- negotiating appropriate technology provisions in service and drilling contracts
4) **Transportation Issues**

- assuring that water and equipment can be transported economically to the drill site, and that natural gas production can be transported to market

- also assuring that any liquids production can be processed and transported to market
5) Contractual Issues

- reviewing and negotiating the terms of contracts governing the acquisition of interests in shale reserves, and governing the exploration and production of shale gas and liquids (e.g., oil and gas leases or PSCs, and other contracts relating to shale gas and liquids operations)
- assuring that the terms of relevant contracts require the Operator to conform to international standards, and contain necessary protections in connection with shale gas and liquids operations
- negotiating terms of service contracts, drilling contracts, technology transfer agreements which provide adequate protections; negotiating contracts for natural gas processing and transportation

6) Further Information on shale related matters can be found at http://fracking.velaw.com/
Paul's practice is focused on international mergers and acquisitions and on the development and financing of international energy projects. He has worked extensively on international oil and gas projects, including the acquisition and disposal of oil and gas assets and companies owning those assets, cross-border oil and gas pipeline projects, and LNG and electric power projects in Europe, Asia, the FSU, and the Middle East. He has represented developers as well as multilateral lenders on international energy project financings.

Paul has worked on projects in China since the early 1990s, and was managing partner in the Beijing Office from 1997-1999 and from 2002-2012. He has broad experience on Chinese oil, natural gas, and electricity projects. He has represented major international clients, including Chinese SOEs, in the development and financing of energy projects in China, Russia and other countries.

Representative Experience

- Represented Sinopec International Petroleum Exploration and Production Corporation (Sinopec) on its C$10.3 billion acquisition of Addax Petroleum Corporation, a Canadian company publicly traded on the Toronto and London Stock Exchanges with assets in West Africa and the Middle East. This transaction was named Energy and Natural Resources Deal of the Year at the ALB China Law Awards 2010 and a Deal of the Year 2009 by Asian Counsel.

- Represented Sinopec International Petroleum Exploration and Production Company on its C$2.1 billion takeover of Tanganyika Oil Company Ltd., a Canadian oil and gas company with assets in Syria which was listed on the Stockholm and Toronto stock exchanges.

Prior results do not guarantee a similar outcome.
• Represented Chinese clients on the purchase of companies owning the oil and pipeline interests of EnCana Corporation in Ecuador for approximately US$1.42 billion

• Advised two large Chinese state-owned enterprises on the preparation of model documents for shale development, including advice on structuring shale projects.

• Represented a large European national oil company in connection with a proposed shale gas project in China.

• Represented a Chinese state-owned company in connection with a US$700 million investment in an Asian mining company

• Represented one of China’s largest state-owned petroleum and petrochemical companies in connection with the bid for and attempt to acquire an interest in the Kashagan oil field in the Kazakhstan sector of the Caspian Sea from BG Group plc

• Represented Sinochem Petroleum E&P in the US$218 million acquisition of a U.S. limited liability company with producing oil interests in the Zhao Dong Block, offshore China

• Represented Sinochem Petroleum E&P in the acquisition of interests in two production sharing contracts in Indonesia

• Represented a U.S. utility in connection with the sale of its majority interest in a company owning interests in 12 power plants in China and Korea
• Represented a large Chinese oil and gas company on the proposed acquisition of an offshore company owning producing oilfields in Russia

• Represented a Chinese company in connection with the Sino-Russian Crude Oil Pipeline project

• Represented Unipec Asia Co. Ltd., a subsidiary of Sinopec, in its long-term sale and purchase agreement with the owners of the PNG LNG Project

• Represented a large Chinese state company in connection with the development of a new LNG regasification facility in south China

• Represented a large European oil and gas company in a bid to develop natural gas reserves in Sichuan Province, China

• Represented a large U.S. based energy company in the negotiation of agreements relating to the development of a large natural gas field offshore China

*Solicitors and Registered Foreign Lawyers. A list of partner names is available for inspection at CityPoint, One Ropemaker Street, London EC2Y 9UE. Vinson & Elkins RLLP is a limited liability partnership formed under the laws of New York authorised and regulated by the Solicitors Regulation Authority (No. 0079019).*