

Research Note

Risks in Energy – Oil and Gas Industry

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Abstract: The oil and gas industry is one of the 18 critical infrastructures in the United State and is vital from an economic and strategic point of view. Since this industry is often subject to uncertainties and business risks, understanding and quantifying the risks from a public and private sector perspective is important to manage and mitigate them effectively. This paper first explains the risks faced by the oil and gas industry and then how a combination of private and public sectors can effectively help mitigate the risk. The current governmental controls in place for this sector have also been explained and suggestions to further enhance the controls have been proposed.

Introduction

The world has become a smaller place due to the advancement in technology. The growing economy brings a plethora of opportunities, but it also brings greater interdependence among different sectors and hence higher chances of risk. How businesses respond to the new threats, is critical in determining the existence of a better tomorrow. We are living in a highly volatile world today; the environment is prone to unexpected and unprecedented events which may be in the form of natural disasters, terrorist attacks, governmental change as well as health risks. All these can cause economic and political instability across the globe. A fire at a metal manufacturing plant in New Orleans can force a leading European manufacturer out of the cell phone business, and similarly social unrest in Africa can push up the global price of crude oil. This interconnectedness in the world economy is an accepted part of conventional wisdom, but what is less obvious is the “misalignment” created by the differential experiences and impacts of risks, and the resulting disconnect between those affected by a risk and those who can mitigate a risk.¹

One of the biggest risks that economies face today is depletion of their natural resources due to inappropriate or excessive usage. These

resources are primarily used for fuelling the economy in a variety of ways. Cooking food, heating a house, street lighting, running a hospital, operating a factory – all these require energy. Energy is at the heart of everybody's part of life and a decisive factor for economic competitiveness and growth. Nations have established wide spread industries that are involved in mining of these energy resources as well as ensuring that formalized operational risk-measurement procedures are incorporated in their day to day activities, as well as long term vision. Additionally governments have carved out a niche “Energy” sector for these industries which is governed by a special set of policies and regulations. The U.S. energy infrastructure fuels the economy of the 21st century. Without a stable energy supply, health and welfare is threatened and the U.S. economy cannot function.² More than 80 percent of the country's energy infrastructure is owned by the private sector.³ Thus, it is evident that the government largely relies on the private sector for meeting its energy demands and there is a growing dependency as well. The energy infrastructure is divided into three interrelated segments: electricity, petroleum, and natural gas.⁴ This paper will discuss the risks associated within the petroleum and natural gas sectors from both a governmental as well as private sector

perspective. Mitigation measures for these risks will be discussed further.

Role of the Government

Petroleum and natural gas comprise one of the most critical focus areas of the government in the Energy sector with the nation importing about 45% of its total oil demands.⁵ This implies sending more than \$1 billion offshore daily.⁶ The federal body in charge of overseeing the oil and gas regulations in the United States is the Department of Energy (DOE). The DOE is also responsible for operation of infrastructure, encouraging investments, planning, and recommending and overseeing policies for the oil and gas industry. Although the government has played an important role in developing technologies through research and development, setting up infrastructure as well as building ties with other global economies to facilitate information sharing, scaling to commercial deployment and operations has traditionally been the responsibility of the private industry. Further, the government alone cannot finance large-scale energy transformation; the total annual investment in the U.S. energy system is some \$200 billion, whereas the DOE's entire annual budget, including basic research, energy research, waste cleanup, and nuclear security, is \$25 billion, which is no more

than the capital budget for a single large energy company.⁷ Thus the private sector has joined hands with the government to run the energy sector and also ensure profitability in the process.

Government risks in the Oil and Gas sector

The DOE is the main regulatory body which governs policies for oil and gas in the United States. It is important for the DOE to ensure that global events in the energy market have a minimal impact on the U.S. market and stability prevails in the oil and gas industries. The federal agency has to constantly monitor and mitigate risks associated with this volatile industry. The major risks can be enlisted as follows:

Environment, Health and Safety Risk - The BP oil rig explosion at the Macondo site in the Gulf of Mexico has had far reaching effects on the oil and gas industry. This accident involved loss of innocent lives and also devastated the ecosystem in the area as well as the surrounding waters and beyond. The government regulatory agencies were blamed for allowing the set up and operations of dangerous drilling sites like these all over the gulf and the east coast. The oil spill incidents have had a global effect with many other countries also sounding the alarm bell and further scrutinizing their policies related to offshore drilling which could prove to be hazardous to the environment. The tighter

safety and environmental guidelines set up by the regulatory bodies are requiring massive investment on the industry's part which is completely unwelcomed.

Price volatility - The unrest in the Middle Eastern countries and the North Africa region often results in an oil price surge. Additionally demand shocks are triggered by a number of global economic crises. Since the United States imports a major part of its oil and gas reserves a change in the foreign exchange currency market could also mean fluctuations in the price range of billions of dollars.

Inability to find alternatives in case of failure - The Department of Energy is constantly faced with the challenge of reducing dependency on the non-sustainable sources of energy like oil and gas and coming up with renewable sources of energy. This results into further and deeper drilling offshore, which may further pose a variety of operational hazards.

Natural disasters and extreme weather conditions - The DOE is also faced with concerns about private companies drilling on offshore deep waters where tropical storms and hurricanes can have serious consequences on production as well as on the environment.

These form the major risks that the department of Energy is constantly challenged with, however, other risks like economic stability and concerns, change in demand for oil and gas, and climatic changes etc. are also part of the risk portfolio that the DOE manages.

Role of the Private sector

The private sector is pivotal in partnering with the government with capital, infrastructure and technology to set up industries that harness the resources that would fuel the economy of the nation. Major companies in the United States that are major players in the private sector are Exxon-Mobil, Chevron and BP. The U.S. energy department is majorly in the hands of the private sector on the basis of the investments made, and therefore it is also the executive agent for any change. The role of the private sector is however very much influenced by the regulations and policies of its governing body. The private sector industries in the United States are governed by the DOE. Although the private sector is profit driven it is necessary to combine the interests of the private sector with the priorities of industry to set up an effective value chain for energy supply.

Private Sector Risks in the Oil and Gas Sector

The risks identified in the private sector largely depend on the policies and regulations of the government. Also environmental factor contribute to a majority of the risks. Some of the identified risks are:

Operational Complexity - Private sector oil and gas companies are operating in increasingly remote geographical locations and harsher environmental conditions for their offshore drilling operations. Tighter safety and environmental guidelines are requiring massive investment on the industry's part.

Environmental Restrictions and Regulations - The greenhouse gas emissions legislation and climate changes globally, along with concern over the future of hydraulic drilling in the high seas, are a source of constant risks to the oil and gas industry.

Inadequate Liquidity or Access to Capital - The oil and gas industry does not only have concerns about its own financial stability. The current financial condition of the partners, customers, vendors as well as suppliers together contributes to the top risk factors.

General Industry Competition and Constantly Changing Market

Scenario - With government agencies imposing new regulations and

profit margins reducing for oil companies, increasing competitiveness among the companies to capture and retain market share leads to a fear of being run out of business.

Shortage of Experts - Shortage of expert resources is one more risk that the oil and gas industry is plagued with. The looming shortage of expertise spans multiple departments in this industry; notably operations (81%), IT (61%), risk and regulatory (62%) and research and development (60%).⁸ These areas are mainly involved in analyzing the scientific and engineering data used in exploration and production of oil and gas.

Government Regulation and Sector-Specific Controls

In January 2009, the U.S. Department of Homeland Security (DHS) announced a revised version of the National Infrastructure Protection Plan (NIPP), a comprehensive risk management framework that defines critical infrastructure protection (CIP) roles and responsibilities for all levels of government, private industry, and other sector partners.⁹ The NIPP builds on the principles of the President's National Strategy for Homeland Security and strategies for the protection of critical infrastructure and key resources (CIKR).

The U.S. Department of Energy (DOE) has been designated as the Sector-Specific Agency (SSA) for the Energy Sector and has developed the Sector Specific plan (SSP) for the Energy sector. The Energy SSP is based mainly on the risk management framework defined in the NIPP. The major constituents of the NIPP management framework are a continuously improvement process of: Setting goals and objectives → Identifying Assets Systems and Networks → Assess risks → Prioritize → Implement Programs → Measuring Effectiveness.¹⁰

The United States government also plays a major part in regulating policies based on environmental concerns for the oil and gas industry. It is a well-known fact that oil and gas is not a sustainable source of energy and thus there is a constant urge and push from oil companies to authorize drilling in deeper seas and newer avenues. Many new regulations from the government try and control the operations of these companies, for example a recent policy addition by the Obama administration tightened regulations on the oil and gas industry by requiring drillers to capture emissions of certain air pollutants from new wells.¹¹ The rule will require all oil and gas companies to capture the volatile organic compounds that are emitted during the final stages of well construction, including during the process

of hydraulic fracturing.¹² Similar measures like these have been implemented by the government to ensure a cleaner, greener and safer environment for the oil and gas industry.

Dependency Amongst Sectors

The oil and gas industry accounts for the majority of the world's energy generation. While many critics and opponents might contest the use of such fossil fuels, it is a well-known fact that without them our lights would go out and our vehicles would stop running. Virtually all the critical sectors ranging from food and agriculture to banking and finance, from defense Industries to Information Technology have a heavy dependence on the energy sector which is heavily driven by the oil and gas industries. In short the economic growth of the nation is largely dependent on the oil and gas industry.

Risk Mitigation for the Government Sector

It is evident from the examples and discussion that to effect a harmonious balance in the oil and gas industry the government must fully engage with the private sector, understanding that mindset of the private sector as well as thinking like a business. It is also important to

ensure that environment as well as health safety standards are maintained at the same time.

Increased Audits for Health and Environment Safety Risks - It is pertinent for the Department of Energy to conduct regular mandatory audits and make maintenance a necessity. It is also important to periodically review control systems and address defects that surface. Auditing control systems that are put into place for disaster and crisis situations should be made obligatory. These systems can be in the form of software systems, pre-setup hardware equipment or even calibrated alarm systems that respond to critical alerts

Set up Predictable Policies - The first and most important consideration is predictability. Given the stretched time horizons, policies that are unclear or alter every few years will not get the industry anywhere and in fact are often counterproductive. Further it is important that the policies are well considered and streamlined towards the goals of the economy on a whole. The industry does not want to be treading on paths that are not optimal in terms of technology, economics, or environmental impact.

Self – Test new Technologies - The DOE’s advanced National Laboratories could play a major role in shaping the use of new technologies in the industry and thus mitigating risks related to technology. This could be achieved by self-testing the new technologies at the DOE’s scientific facilities itself. The results could provide significant insight into the operation of the pioneering technologies and mechanisms at scale. For example, a micro grid test bed where various demand-side technologies can be tested in real environments, or combustion facilities where technologies for gas treatment, CO2 absorption, and other components could be tested at commercial scale and operational conditions would reduce uncertainties and risks surrounding the deployment of new technologies.¹³

Loan Guarantees for Capital Risk - To address capital risk, the DOE has been executing loan guarantees. This would help extend financial stability in an ever changing and competitive market. It would also serve as an incentive for the industry to invest in latest technology which would reduce the chances of errors or blunder occurring due to lack of adequate technology.

Use of Simulation - Simulation is a significant tool that the government research departments can use to mitigate risk. Simulation is currently

used in the federal science and weapons programs for testing nuclear arms for defense purposes. The United States is leading the world in applying high-performance computing to realistic physical models. It is now time to focus simulation capabilities in the energy department. Simulating the mechanics of the devices that would be instrumental in the production of the resources in the oil and gas industry would help optimize the designs, operation as well as technology transition.

Green Business Continuity Plan - The DOE should ensure that its regulations involve a mandatory Business Continuity plan that points out how an industry will recover in case of an imminent crisis with least possible damage to the environment and its ecosystem. The BCP is also necessary to ensure that production cycle of oil and gas is not hit and there is no immediate effect on the economy because of a crisis situation.

Risk Mitigation for the Private Sector

The constantly changing and highly complicated governmental policies pressurize companies to look for superior ways to manage and monitor their risk and controls across the enterprise, eliminating deviations, human-errors and redundant activities.

Prevention of Non-Compliance - Non-compliance is a risk that oil and gas companies cannot avoid with increasing regulatory pressure. Timely reporting on operations and accidents is required, as well as risk mitigation plans for critical operations like drilling must be prepared and reviewed well in advance. The companies need to ensure that important documents, including the approvals for drilling, building and maintaining the oil and gas wells, are made available throughout the company and across enterprise boundaries to curtail risk and ensure compliance.

Real-Time Monitoring and Predictive Maintenance - Oil and gas firms generally follow a defensive approach and suffer major losses by not identifying risks in a timely manner. The undiscovered exposures can result in massive damages in terms of money as well as reputation. By guarding against situations where collective risk exposure exceeds its risk appetite, the company can prevent such situations. Thus preventive and detective controls should be put into place, which will help mitigate risks in real time using alerts.

Collaborative Planning, Operations, and Decision-Making - It is important for process owners to take direct responsibility for intensive planning and managing controls. To eliminate risks from deviations in

procedures, miscalculations and redundant activities, compliance and controls should be made consistent across the enterprise using a centralized framework and collaborative environment. It is also helpful to reduce non-productive time and enhance production along with reduction of both economic and environmental health and safety risks. To facilitate this, the companies should create a stronger and more comprehensive connection between field operations staff and remote experts.

Role of IT - IT is one of the most important assets an energy company can have to mitigate risks related to technology. Automation of secure manual control systems in a company can be done with the help of a robust IT system.

Conclusion

The oil and gas industry is one that has numerous complexities; there are distinctions and aspects that may not be readily apparent to most people not directly involved with the energy industry. It hence requires a long term vision as well as a continuous partnership between the government and private sectors to set up a safe and sustainable atmosphere for a prosperous and energy efficient industry—and secondly, the government’s key role in catalyzing a change in the



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energy system is to mitigate risk for the private sector. Setting a predictable and well-considered playing field of policies and economics is the most important thing government can do.¹⁴ Beyond that, the DOE should facilitate large-scale demonstration projects and support precompetitive research, as well as the technology transfer necessary to move new technologies into the private sector.

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