

A Brief Review of America's Shale Gas Revolution

Zhuoyu Wang¹⁺

¹ China Center for Industrial Security Research, Beijing Jiaotong University, Beijing, China,
100044.

Abstract. Attempt to energy security through energy independence is a crucial strategy to the United States. Due to the technology innovation, the so called shale gas revolution has improved America as a potential energy power which could influence the world political and economy in several aspects. First, US could become an energy self supply country of which means less dependent on other energy export countries. Second, energy independence foresight of America could also do great benefits to a country's national power as whole, which finally may has great impact on world political patterns. Third, for China, it means both an opportunity and a challenge.

Keywords: shale gas revolution, America energy independence, world energy, geopolitics and economic influences

1. The Costs of Energy Dependence

The motive of energy independence is the overpaid cost of energy dependent over the decades. The long history of energy dependence made America has to pay more, just as Lee H. Hamilton of Woodrow Wilson International Center for Scholars once pointed out, that depend on importing of energy made America paid a heavy politic, economic, and environment price[1].

As energy supply is closely related with economy, then once the oil import is be threatened or even be embargoed, it would directly have influences to larger of industries. Oil once acted as a weapon during the Fourth Middle East War in 1973, when Organization of Petroleum Exporting Countries announced to ban the oil export to America and several other counties. For the oil export countries, the more dependent on others, the more vulnerable the country is. For energy

⁺ Corresponding author. Tel.: +86-15210961386.
E-mail address: wangzhuoyu@aliyun.com.

dependent countries, the steady supply of energy is the key for its economic security.

The negative of energy dependent for America is not only its financial costs, but also it could cause environment pollutions due to a consuming of traditional energy. The consuming of fossil energy such as oil and natural gas has accounted a considerable part in the total pollution discharge. Experts have showed that in the long run, the pollution caused by energy consuming would change the weather pattern and even cause new diseases [1].

The greatest threaten of energy dependent is focused on politics. “Each day brings further evidence that the ways we use energy strengthen our adversaries and threaten our planet”, in 2009, President Barak Obama said in his inauguration speech. During the past decades, in order to maintain energy import, America interfered with military in the Middle East, but the outcome is not as good as the original aims. America’s military exists in oil produce countries only caused the rising of hating America’s emotions, which even made America as the first target for terrorism to attack. For the past decade, the United States has been involved in the wars in the world’s most oil-rich regions. The military involvement in the Middle East has its dark side. Washington’s long-term support for Israel and Arab regimes in the region (prior to the Arab Spring of 2011), “its deployment of troops in Saudi Arabia in the 1990s and early 2000s, and its repeated military actions against and subsequent occupation of Iraq, have all fuelled anti-Americanism, leading to terrorism in the form of al-Qaeda[2]”.

2. Four Decades Pursuit of Energy Independence

2.1. Four Decades Persistence Pursuit

Since 1973, America President Richard Nixon had declared to pursuit Energy Independence, and after that, nearly most of his successors reaffirmed this aim during their terms of office. Energy Independence is a dream for Americans. Four decades have passed since Nixon published his declaration; we can broadly think that America’s Energy Independence dream partly becomes to a reality due to the Shale Gas Revolution. Although there are many arguments over the issue, the development of shale gas technology would change the world energy map.

Nixon declared in his Project Independence that in the year 1980, the United States will not be dependent on any other country for the energy. President Nixon took many measures to lessen dependent on oil rich country. During

President Gerald Ford's term, he signed the 1975 Energy Policy and Conservation Act, which means to improve energy efficiencies.

President Jimmy Carter regarded that achieving energy independence was the moral equivalent of war in 1977. He put the energy policy at a new high in the nation's strategy. In the same year, Carter signed the law in creating the United States Department of Energy. In 1978, during the Iranian Revolution, Carter urged in the national television "Beginning this moment, this nation will never use more foreign oil than we did in 1977- never." [18]

President Carter proposed a sweeping \$142 billion energy plan which would achieve energy independence by 1990. Carter imposed an import quota of 8.5 million barrels of oil per day and created the \$20 billion Synfuels program, which was supposed to produce 2.5 million barrels of synthetic fuels per day by 1990. In his 1979 speech Carter warned citizens who insist on driving large, unnecessarily powerful cars must expect to pay more for that luxury.

In 1991, in the prelude to the First Gulf War, President George H.W. Bush announced a hodgepodge of proposals as a national energy strategy. Naturally one of his strategy's guiding principles was "reducing our dependence on foreign oil."

In 1992, President Bill Clinton proposed a BTU tax on fossil fuels to raise money to reduce the deficit. Clinton's tax proposal would have put a levy on natural gas, coal, and nuclear power of 25.7 cents per million British thermal units. In 1993, Clinton launched the \$1 billion Partnership for New Generation Vehicles with the Big Three automakers, aiming to produce a prototype car that was three times more fuel efficient than conventional vehicles by 2004.

In 2003, in the State of the Union address, George W. Bush president said one of his administration's goals was "to promote energy independence for our country." In that speech, Bush announced his \$1.2 billion Freedom Car proposal to develop hydrogen fueled vehicles. [18]

2.2. Attempts to the Energy Independence

During the past four decades, America's energy policy gradually enriched. The energy strategy has experienced a huge change from control requirement to control supply, "from traditional energy to untraditional and substitute energy" [3]. And finally thanks to new innovative techniques of extraction; the United States became leaders in the production of shale gas. According to EIA 2011, America's degree of dependence on foreign has begin to decline after reached its summit in 2006 and 2010, the degree of dependence fall below 50% [3].

The success of Shale Gas Revolution in America can be attributed to

government, enterprise and individuals. The government use law and investment to encourage shale gas exploit. For example, Crude Oil Windfall Profit Tax Act (1980) has provided a tax exemption to some untraditional energy's produce. In the finance support, US government has supplied a special fund for untraditional energy research. In recent 30 years, up to more than 6 million dollars have being invested by the US government for untraditional gas extraction [3]. The success of Shale Gas Revolution also has closely related with the efforts of George Mitchell. His plan to drill for hydrocarbons in the rocks of the Barnett Shale was puzzling to the engineers who cautioned Mitchell about the likely futility of their efforts, but Mitchell persisted. "Global Unconventional Gas 2010" conference in Amsterdam on June 16, the Gas Technology Institute (GTI), presented the legendary Houston oilman with its Lifetime Achievement Award. Upon receiving his award Mitchell commented, "I'm truly honored to be receiving the Lifetime Achievement Award from the Gas Technology Institute. I believe that the United States should examine all forms of natural gas in order to ease our dependence on coal and foreign oil "[4].

2.3. Progress and Problems

The technological development, notably fracking, is now able to develop the energy vast reserved deep in the shale rock under America. According to the report "Oil: The Next Revolution" published by the Harvard-based Belfer Center, which predicted that the shale oil could providing America with as much as six million barrels a day by 2020. Due to the exploring of shale gas, the import of oil has come to a new lower point in recent years. In 2011, it's imported only 11 million barrels of crude oil a day. "Given the potential for offshore and conventional domestic oil production, it is strongly indicated that by 2020, America could achieve near energy independence in oil"[5]. In April, 2012, the Federal Energy Regulatory Commission approved a proposal by an American liquefied natural gas (LNG) Energy Company to export LNG abroad. This approval, "the first of its kind in 40 years, was a landmark for the United State's shale gas revolution, signaling that the country had turned itself from an importer of energy to a major exporter" [6].

The shale gas revolution makes energy independence as possible; it is helpful for the industry, jobs, and economic growth; and beside that, "the natural gas boom has also been a major player in 2012 marking the United States' lowest carbon emissions in two solid decades" [7].

However, the other side of the coin is the exploit of shale gas could threaten to the environment. The hydraulic fracturing practice has been opposed by some

from within the environmental lobby and “green” community. They regarding the hydraulic fracturing are dangers for the environment. “The hydraulic fracturing technique by which cracks are created in shale rock deep underground and then flushed with liquid to draw out the oil and gas trapped within”[8]. Some regards that “the actual reason we see a gas drilling boom is not because more gas is being found. It is because that is the only way the extractive industry can pay its debt load” [9].

3. Shale Gas Revolution: A Blessing or a Curse Decades

3.1. The New Energy Axis: North America

The idea of developing shale oil and gas as a future source of energy, mainly by the United States and Canada, has made North America as a new energy axle. And around the world, it is estimated that approximately 6,600 trillion cubic feet (TCF) of shale gas are reserves in 32 countries [5], which means an energy geopolitical changing era has coming.

The great reserves in shale gas means a new energy axis is taking shape in North America, “comprising proven shale gas deposits in Alberta, Canada, North Dakota and Texas of the US, the French Guiana and a newly discovered super-large reserve under the ocean near Brazil, promising a new rising oil-gas production center of the world in the foreseeable future”. Energy is a strategic resource and is closely linked to a nation’s security, and any changes in the world energy map could impact the international geopolitics in several aspects [10].

The International Energy Agency predicted that these reserves will make the US as the world’s biggest gas producer by 2015. The IEA pointed out in its World Energy Outlook, “The result is a continued fall in US oil imports, to the extent that North America becomes a net oil exporter around 2030” [8]. Besides with United States, in Australia, it is figured out that they have a shale gas resource probably larger than Canada’s oil sands [7].

Energy independence will potentially destabilizing Russian and Saudi Arabia’s oil market, and generates a global stimulus.

3.2. Traditional Energy Producers: Middle East and Russia

The shale gas revolution would make the traditional energy produce regions and countries lose some of their primacy, such as in Middle East and Russia. The immense deposits of natural resource provide those countries with tremendous political leverage in the international relations.

In Middle East, due to great reserves of oil and gas in the Arabian Peninsula, Iraq and Iran will continue keeping their energy exporter's powers as before. However, "the shale gas revolution will complicate the world's hydrocarbon supply and allocation", so the importance of Middle East would somehow be lowered in the future [11]. In the history, oil once acted as a weapon to fight against West, and this may be can not play the role in the coming years.

The shale gas revolution seems not good news for Russia and Saudi Arabia countries. In the future, shale will be developed worldwide and natural gas infrastructures will be constructed wider spread. It is difficult to avoid the oil prices dropping in the market [12]. Russia's volume of conventional gas means it has little impetus to start fracking itself, though it is thought to have significant shale reserves – but there can be no harm in watching the competition. "Russia has massive deposits, but feels the need to understand unconventional [gas] – so you have Russians sitting in South Texan courthouses," says Bobby Tudor, chief executive of energy-focused investment bank Tudor, Pickering, Holt and Co, based in Houston[8]. Russia providing 50%of European gas, it is the dominant source of natural gas to Europe. The shale gas exploit in North America would supply diversify sources of natural gas to choice for Europe. In the recent past, it shut off supplies to the Ukraine after a price dispute and cut deliveries to other countries during bitterly cold winters [7].

3.3. Traditional Energy Consumers: Europe and Asia

Currently almost only in the United States, which existing the shale gas producing. In the other place of the world, there are many development plans, most notably in Europe, currently in Germany, Poland, and elsewhere. "In the Asia-Pacific region, the development of shale gas is still in its infancy. Countries like Australia, China, India, and Indonesia have substantial potential, but no large-scale commercial producing has yet begun. In that sense the shale gas revolution has yet to reach this part of the world" [13].

For the Europeans, in one hand, the shale revolution is largely positive for the following reasons. First, the shale revolution would make some pressure for the oil prices, probably could cause a dropping in oil prices which is finally benefit for Europe. Second, "a greater variety of gas supplies from liquefied natural gas originally destined for the United States has been dumped in European markets; by 2020, shale gas in the form of liquefied natural gas is likely to begin arriving in Europe in significant quantities". And third, Europeans have their own shale gas reserves; therefore with the development of technology, its own shale gas

producing could available [12].

However, there is also some consideration that the US shale revolution is already distorting EU climate change policy. “American gas prices are now so low that US coal producers are shipping their product to Europe. The surge in such exports seen in 2012 is likely to be a foretaste of a bigger problem for Brussels [12]”

Meanwhile, there is a considerable economic impact. As other regions access to significant quantities of cheap resources, “Europe faces a bleeding of energy-intensive manufacturing. This is likely to be made worse by the effect of cheap fossil fuels drawing such industries back to America [12]”

In the Asia, the main energy consume countries are China, Japan, and India. Those countries take an extra considering to the shale gas revolution. In the Asia, America will get deep interfered in the area as it withdraw some of it power out of the Middle East. And the competition between energy consumer countries in Asia would be fiercer. America joined into which side would determine the power pattern of the region.

An article in Japan said, “the shale revolution will push the United States and Japan in opposite directions, reversing the economic relationship that supported Japanese growth during most of the post–World War II era.”“If regulators and politicians in Washington decide to open the floodgates to gas and oil exports from the United States, Japan’s already dwindling trade surplus with the United States will turn into a chronic and growing deficit—something our current government and business leaders could never have imagined a decade ago”[14]. Japanese also worried about that once United States withdraw from Middle East, then it will push Japan into dangerous, its security will lack of protection.

4. The Influence of Shale Gas Revolution upon Geopolitics and Economy

4.1. Geopolitics Influence

In the long history, the distribution map of energy always had great influence on the pattern of geopolitics. German economist Frederick William Engdahl once wrote in his book which transferred in English titled as *A Century of War*, that in recent 100years of world history was a competitive history for the oil, and oil politics is determining the world new order [15].

The professor Alan Riley of the City Law School at City University London wrote an article in *New York Times*, he said, “the shale revolution strengthens the United States, reduces China’s energy dependence, generates a major global

stimulus, which takes the Western economies off the fiscal rocks, while potentially destabilizing both the Russian Federation and Saudi Arabia[12]” An experienced diplomat regards that the US-initiated shale gas revolution will not only change the global landscape of energy distribution but will also change the world’s geopolitical layout. In the future, global energy supply will become multi-sourced. And the balance of energy pattern will shift. And this change will mean more to China and the United State [6].

The geography plays an importance role in the coming of shale gas era. Which countries have shale gas reserves and which don’t have will construct the power pattern in the future. And states with coastlines which can transport the shale gas will have the advantage. Countries that have considerable shale deposits will be better placed in the 21st century competition between states, and those without such deposits will be worse off. Ideas will matter little in this regard [11]. Thus, new energy discoveries would bind the two North American countries closer, even as North America and Australia become more powerful on the world scene [9].

There is a view that the United States would withdraw from the Middle East after realize its energy independence. U.S. would reduce its involvement or some said “interference” in the Middle East. However, this is not true. “The US is in the region at least partly because it is expected to guarantee the security of oil shipments (especially through the Strait of Hormuz) to its allies, namely Europe, Japan, South Korea, and a few others”[9]. Meanwhile, US is involved in Middle Eastern affairs also means to protect Israel and to maintain a balance of power in the region [12].

4.2. Economic Influence

The direct influence of shale gas on economy is that it will help pull the manufacturing industry of the United States out of recession and give a strong boost to the economic recovery. More broadly, the shale revolution will grant the United States a greater range of options in dealing with foreign states. [12]The shale boom is creating millions of shovel-ready jobs throughout the US economy, stimulating the economy with trillions of dollars of new investment, lowering energy costs for residential and industrial customers and generating billions of dollars of savings, making U.S. natural gas prices more affordable than anywhere else in the world and sparking a manufacturing renaissance, adding billions of dollars of revenues for federal and state governments, and creating thousands of new millionaires from the oil and gas royalties being paid out to farmers and landowners around the country. And the impact of the energy revolution is only beginning [16]. Shale is spurring US manufacturing in

downstream industries – petrochemical, chemical, metals and other energy-intensive industries. A Price WaterhouseCooper (PWC) study projects that the benefits from shale could allow US industry to lower raw materials and energy costs by \$11.6 billion and create approximately one million more jobs by 2025 [17].

The shale revolution is claimed to bring multiple benefits to the world community; it is expected to enhance global energy security, reduce import dependency and potentially lower the cost and energy price volatility. Besides reducing greenhouse gas emissions, it would create millions of employment opportunities as well as economic dividends to the key producing countries [5]. As a clean and cheaper form of energy, shale gas is expected to become a major energy source for the world. And review from history, it is indicated that the change of energy structure often triggers a new round of economic development [6].

However, major topic of discussion among public is regarding shale's effect on the market price of natural gas. The major concerns emerge from the fact that it will affect the international oil market as Shale gas offers the means to vastly increase the supply of fossil fuels for transportation, which will cut the rising demand for oil which was accelerated by China's economic growth, dominating the policy decisions for a decade now [5].

5. The Implies for the World

Energy security plays a important role in the nation's security since it's can not replaced by other resources. It has a close relation with both political and economies. To make sure the security of energy consume and supply is a key part in the nation's strategy.

In the international politics, energy always is not just a resource; it is a kind of power, can made a state either more powerful or vulnerable. as far as its importance is consider, it is no difficult to understand why shale gas explore has became a hot issue among all nations. America's shale gas revolution has attracted eyes from all over the world. The outlook of shale gas revolution has inspired those country's who heavily relied on oil imports. America's success in exploring the shale gas made parts of optimists wants to duplicate US experience in their own country.

However, it is difficult to duplicate shale gas revolution in out country's currently, because just as we wrote in the front, America's shale gas revolution is a long terms of dream and practices which eventually lowed the costs of shale

gas explore, fulfils the manage rules and laws, and so on.

For other country, it is wiser to learn America's strategy thinking rather than just wants to duplicate US experience. Energy independence is crucial important in make sure the nation's energy security. And for America, shale gas revolution is just one of the results in pursuing of energy independence, neither the only one, nor the last one. Since oil crisis in the 1970s, United States makes great efforts in improving its energy self supply and reduce dependent on Middle East.

With the energy independence, America can get more geopolitics and economic advantage around the world, which will also make America acts more flexible in the world stage. To China, there is more challenge than opportunity. First of all, although we also have potential reserves in shale gas, however, it is difficult to exploit because of lacking in technologies, funds, and laws. Second, America will step up its return to Asia-Pacific areas, which would help its allies to deal with China. Third, if American withdraw from middle east, then the traditional oil transfer path usually protected by America would be dangerous, which also threaten to China oil import.

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