

From Energeopolitics to Technoenergeopolitics¹

Case Study: Saudi Arabia

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Abstract

With the increasing development of technology, human will be able to optimally use energy resources. Policies applied in the field of energy are critical, because they can greatly support energy security by presenting appropriate solutions. One of these solutions is to use modern technology for development in this area.

As a research originated from a dissertation, this paper attempted to focus on energy (oil & gas) as one of the geopolitical variables to evaluate the effects of technology on them. Also, based on a descriptive-analytic approach, this paper tried to utilize SWOT analysis method in the field of energeopolitics to represent the impacts of technology in this field, so based on that information, it could investigate the impacts of these factors on the energy security and thus on the national security of Saudi Arabia.

Keywords: energeopolitics, technoenergeopolitics, Saudi Arabia, energy policy, Energy Security, national security

1. Introduction

Human dependence on minerals, including oil and gas, has a large share in the concentration of political power in today's world. With the advancement of science and technology for use of natural resources, the safety factor of countries in the energy sector will increase.

Today, the strength of a country in the international arena comes from its abilities in the use of geographical environment; how a country uses its geopolitical position always enables it to be strong in the international arena (Pishgahi Fard and Mahkuei, 92: 212).

Saudi Arabia, a country rich in natural resources, oil and gas located in the geographic area of the Middle East, will be able to consolidate its power as one of the owners of oil and gas in the region and the world using a policy based on abundance, fluidity and superior technology.

The combination of geopolitics and energy and the continued impact of technology on it could pave the grounds for a change in the energy landscape more than ever. Oil and gas as variable geopolitical factors have always been important in the industry and technology because the importance and impact of fossil fuels on the economy are so high that one cannot visualize the situation without them, and they are a way of obtaining and consolidating global power (Ezzati, 98:2011).

Continuing usefulness of spatial geopolitical as conflict and cooperation among the main contenders for energy proves that geography is still the most effective factor in the creation and consolidation of power.

Geopolitical territories and boundaries constantly undergo the forward and backward process in space. Their forward/backward is a function of the competition model of players and focal points for the production and dissemination of values in the geographic space. The competitions are also a function of power relations between players. Power and competition determine the spatial expansion and contraction of geopolitical realms and also forward and backward of geopolitical boundaries (Hafeznia, 2011-2012: 115).

Since competition patterns and power relations are dynamics and lack stability, in other words, players are constantly scrambling to produce, concentrate and increase power, and their situation is constantly changing, so their competitive capacities vary and the spatial distribution range of their values are also variable and unstable (Ibid.: 116).

It seems that the end of the Cold War allows the emergence of a new geopolitical order dominated by geographical-economical questions and issues; a world where the globalization of economic activity and global flows of trade can regenerate investment, goods and images, states, sovereignty and geographical structure of the planet.

¹Technoenergeopolitics is stands for three words, Technology, Energy and Geopolitics, Technoenergeopolitics is the impact of technology on energy geopolitics, which means that technology acts as a tool to improve energy security and the national power of a country using the resources provided by the land.

This article will explore the field of energy geopolitics and try to prove that technological advances will be highly effective in this area.

Hence, in conjunction with Saudi Arabia which has a special position energygeopolitically, it supports the effectiveness of the new production policy in the energy sector, aiming at achieving energy security.

2. Theoretical concepts

2.1 Energy Security

There is no homogeneous definition of the concept of energy security. According to the level of development, geographical location, natural endowments, political system and international relations, this concept has different meanings for countries.

Therefore, the position of countries on energy security depends on their situation. Existing perceptions of energy security involve different considerations (Luft et al,2011: 44).

While energy importers want security of demand and supply and low prices, energy exporters seek security of demand - ensuring that their production will have buyers for a long time with a fair price in their view - so that they can expect a steady and predictable flow of earnings for their national budget (Ibid).

Moreover, it is worth noting that many energy exporter countries have their own problems in the domestic supply which are related to larger economies, their population growth and heavy subsidies whose governments pay to hold down prices for electricity and transportation fuel. Thus, energy security for each country depends on its particular situation in terms of energy and attitude to vulnerability against energy supply disruptions (Ibid).

Caliki and Goldwin provide a definition of energy security that takes into account the interests of both producing and consuming countries at the same time:

The ability to ensure access to energy resources required for consistent development of national power, financing buyable resources, making reliable, diverse and abundant oil and gas and their future equivalents and efficient infrastructure to deliver these resources to market.

By combining the definitions of Jonathan Elkind and Benjamin Sovacool and adding items that consider the collective security, four elements of energy security can be defined as follows:

Table1. Four criteria for energy security

Criteria	Collective interest	Basic values	Explanation
Availability	Security of Supply - Security of Demand	Diversity	*Physical exercise for producers *Ability of producers, transit countries and consumers to agree on commercial terms * Technology-based solutions for production, transmission, conservation, storage and distribution * Investment
Merchantability	Security of Supply - Security of Demand	Bilateral fairness	* Offering energy services in a affordable way for consumers, and cost-effective for produces * Minimizing the volatility of prices
Energy efficiency	Security of Supply - Security of Demand	Innovation and Learning	* Improving performance of energy equipment by manufacturers and changing attitudes of consumers
Office	Security of Supply - Security of Demand	Social and Environmental sustainability	* Protection of the natural environment, local communities and future generations

2.3 Energy Policy

Energy policy is the way by which a specific (often governmental) entity plans to address energy development issues, including energy production, distribution and consumption. Energy policy may be reflected in legislation, international treaties, incentives to investment, guidelines relating to energy conservation, taxation and other public policy techniques(<http://en.wikipedia.org>).

2.3.1 National Energy Policy

Strategies used to develop a national energy policy consist of a set of guidelines in the country's laws, treaties and guidelines of brokers. Energy policy of a country with governance may include one or more of the following measures:

- Communicating the energy policy with regard to energy planning, production, transmission and use
- Rules regarding trading activities in the field of energy (trade, transport, storage, etc.)
- Rules affecting energy use, such as efficiency standards and emission standards
- Provisions for government assets and agencies in the energy sector
- Active involvement in coordinating the exploration of mineral fuels (see the geological survey) and incentives for it, and other "research and development" programs related to energy
- Financial policies related to energy products and services (tax breaks, subsidies, etc.)
- Energy security and international policy measures such as:

- Conventions and treaties for international energy sector
- Consensus in international trade
- Special relationships, such as the presence in and/or military dominance on the country with abundant energy resources.

The main issue of energy policy is often the risk of mismatched supply and demand. Current energy policies also address environmental issues. Some governments clearly explain their energy policy and some not. However, any government applies a form of energy policy. Design of energy and economy sectors can be used by government and inter-government entities as a advice and analysis tool (Ibid).

2.4 National Security and Geopolitics

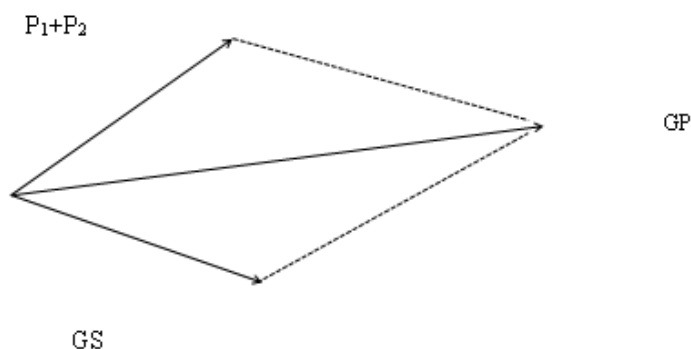
In the global geopolitical system, the security of countries, regions and the world are directly related to economic development of countries. In the twenty-first century, the formula governing the world (Ezzati, 2007-2008: 93) for increasing national power of countries is to consider all spheres of national, regional and global security in relation to security, and since the economical dimension in the current world plays a crucial role in obtaining security, effective strategy development in this area is required.

In the pursuit of national security of countries, geopolitics appears on the international scene. In this way, knowledge of states and governments and their officials about their position in the regional and global geopolitical system, whether in the univariate or multivariate/hybrid dimension, can greatly influence the orientation and adoption of national development strategies, policy making and national goal-setting, and fundamentally change the programs and the direction of governments (Hafeznia, 2011-2012: 117).

1. Findings

3.1 From Energeopolitics to Technoenergeopolitics

As the main objective of physics is to explore, explain and evaluate systems and rules, the main objective of geopolitics is to explore, express and use geographical space based on the use of innovative policy by taking advantage of the power element. If we want to examine geopolitics based on the laws of physics, we should consider it a vector quantity because it is dynamic and has magnitude and direction.



$$GP = GS(P_1 + P_2)$$

$GP = \text{Geopolitics}$

$P = \text{Power}$

$P = \text{Policy}$

$GS = \text{Geographical Space}$

(1)

The first impression of the term geopolitics in mind is the struggle for political dominance. In the traditional approach, geopolitics was known as unilateral relations of the impact of geographical space in international events. However, in the current world, the bilateral relationship between geography and politics is evident. In other words, geopolitics is a special approach to international policies which emphasizes the importance of land and resources (Dodds, 2000: 162).

Geopolitics in the new (critical) era comes from this argument that the leaders and decision makers of countries do not read the political interests of their countries or meaning of international affairs from geographical situation or concrete structures threatening their countries in the intercountry system, as the traditional geopolitical explains. Conversely, foreign policy decision-makers and intellectuals make the concept and meaning of international affairs and interests of the country in the geopolitical culture of their countries. Here geopolitical culture can be defined as traditions and interpretative culture in which a country gives meaning to its

identity and interfacing to the world and develops a set of strategies for negotiation and confrontation. (O Loughlin & Others, 2004:5).

Factors affecting the geopolitics are divided into two categories: fixed and variable. Fixed factors include geographical location, space and its divisions, the extent of land, topographical situation, and the shape of the country. Variable factors include population, natural resources, and social and political institutions.

Among fixed factors, geographical location enjoys a unique position because in decision making and political policy making, careful attention to the geopolitical and geostrategic position will ensure the proper implementation of each of them (Ezzati, 2011: 79).

Basically, geopolitics is the struggle over space and power in a geographic context. Just as military, geopolitical, diplomatic and economic geopolitics, there is also energy geopolitics. Natural resources and trade routes that provide those resources to consumers are central to the study of geography. Any international system in modern history and early modern times is based on an energy source (Kaplan, 2014).

With technological advances in the field of energy, countries rich in natural resources like Saudi Arabia should act as a strategic counterweight and utilize a specific geographical location for development of the country. Technology development can be the engine of economic growth. In parallel, it can also help its national security. As a manufacturer and exporter state of oil and gas, Saudi Arabia should also consider that what a great effect technology will have on the production and transmission of energy. Saudi Arabia should be aware that technology can be effective on the energy balance in production and demand because technology can increase oil and gas production in different ways while academic progress can largely address environmental issues in connection with contamination. Moreover, in the field of transportation, technology can largely increase the country's safety coefficient. In the current era, it seems that technological progress can be effective on variable geopolitical factors including natural resources more than ever. The larger this growth and development, the security guarantee will be higher. A country with the highest proven reserves of oil in the world should act in the international scene in a way that it gains the greatest amount of national security.

Energy geopolitics is an element based on the international competition for national interests in order to gain power using geographic space. Natural resources that bring land for a country can pave the ground for gaining power using the right policy. In other words, the influence of geography (land characteristics against humans and other living organisms) is an inescapable reality for geopolitics which combines geographical assumptions with international research to illustrate the territorial-land factors and resources which affect the distribution of power and wealth at the international, regional and local levels.

Since energy resources are not uniformly distributed on the earth, there is a trump card in the hands of the energy owner countries, So through the implementation of a correct policy, they can ensure energy security.

Table2. World proven crude oil reserves by country (m b)22

2008	2009	2010	2011	2012	% change 12/11
264,063	264,590	264,516	265,405	265,850	0.2

Source: (OPEC. The Organization of Petroleum Exporting Countries 2013)

Table3. World proven natural gas reserves by country (billion standard cu m)

2008	2009	2010	2011	2012	% change 12/11
7,570	7,920	8,016	8,151	8,235	1.0

Source: (OPEC. The Organization of Petroleum Exporting Countries 2013)

In this new era, geopolitics is viewed as post-modern geopolitics and has a different context compared to the past such as globalization of free market economy towards achieving economic security in individual countries. Today, counties need to move from a part to a whole to achieve security. In other words, energy security, which also provides national security, can only be achieved through maintaining international security. Geopolitics is dynamic and constantly changing.

The ever-changing energy perspective is inherently complex. Influencing factors include:

- Changing demand dynamics;
- Changing resource base, supply options and delivery requirements of oil;
- Investment, volatility of fuel prices and alternative fuels;
- Key role players and ever-changing regulations;
- Climate change and efforts to impose carbon constraints on fossil fuels-dependent world.

Taking these factors into consideration enables countries to increase their capability of maintaining energy security (Verrastro, et al, 2010: 1).

Technoenergeopolitics is the influence of technology on energy geopolitics. Advances in oil and gas industrial technologies enable countries to utilize geographical environment more and better to become powerful in energy sector. US's exploitation of oil and gas from shale is a notable example in this issue. As the technological tools are integral parts of each government's energy strategy, it is evident that technology develops and supports energy systems and strategy models and can be thought as the brain of energy strategy.

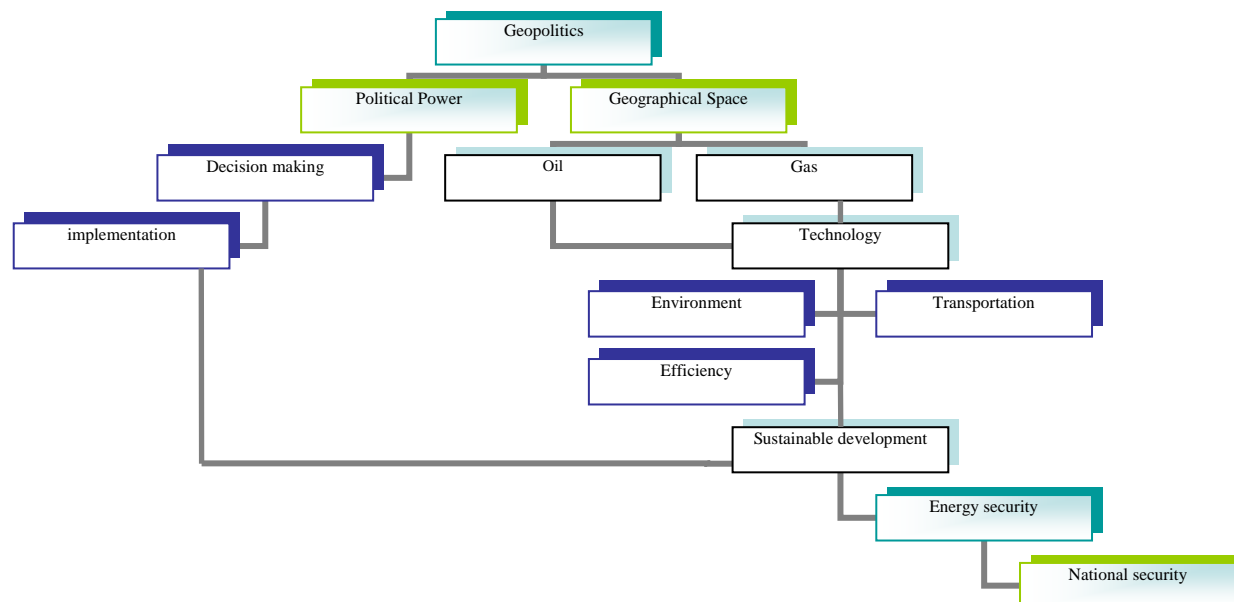


Figure1. Technology and its impact on energy and national security

3.2 Energy policy based on the abundance and fluidity

Robert Powell argues that the map of the current global energy policy is dominated by five major players, each of which having their own specific plan. In fact, each has his own role in constructing the future energy economy:

- 1 - United States of America
- 2 - European Union
- 3 - Developing world
- 4 - Energy producers including Companies and countries
- 5 - Claimants against the current situation and non-state regulator

Producers have invested much in oil, gas and coal, which implies that they are continuing to explore for new energy economies in which fossil fuels play significant roles. Accordingly, Saudi Arabia, as the world's largest oil producer, should increase make new investments to increase drillings and develop transportation routes. Mohan Malek believes that the Indian-Pacific region has a considerable potential in importing hydrocarbon fuels. Therefore, Saudi Arabia has to focus on developing technologies in upstream and downstream energy industries to provide energy security. Safety of oil pipelines, as the main vessels of oil industry, is very important. In fact, they are unique transportation systems playing roles from the oil extraction through refineries or terminals where it is loaded on ships. From the moment that oil is considered as a raw material and of low value to the moment when it is processed, valuable, and ready to be exported, pipelines are integral and vital component of the oil industry. Environmental parameters have profound effects on the price and course of long pipelines in Middle East. Topology and characteristics of the ground, as well as population density and environmental sensitivities, are among these parameters (Held, 2000).

Additional capacity of the main source of in the oil market is "fluidity" in the form of strategic reserves that could meet the demand in the crisis and is one of the main mechanisms for energy security.

It has to be noted that the strategic facilities are not able to strengthen energy security, unless being activated as a part of an international framework in a balanced manner (Luft and Korin,2009: 338).

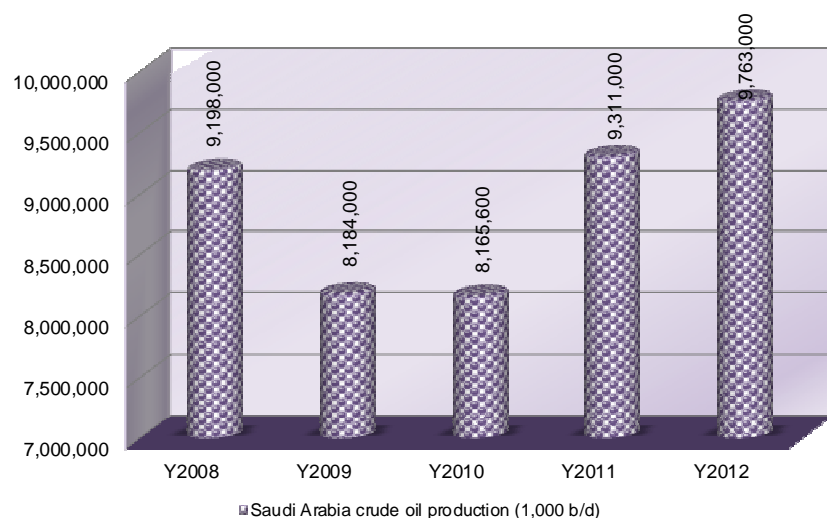


Figure2. Saudi Arabia Crude Oil Production (1,000 b/d)
 Source: (OPEC. The Organization of Petroleum Exporting Countries 2013)

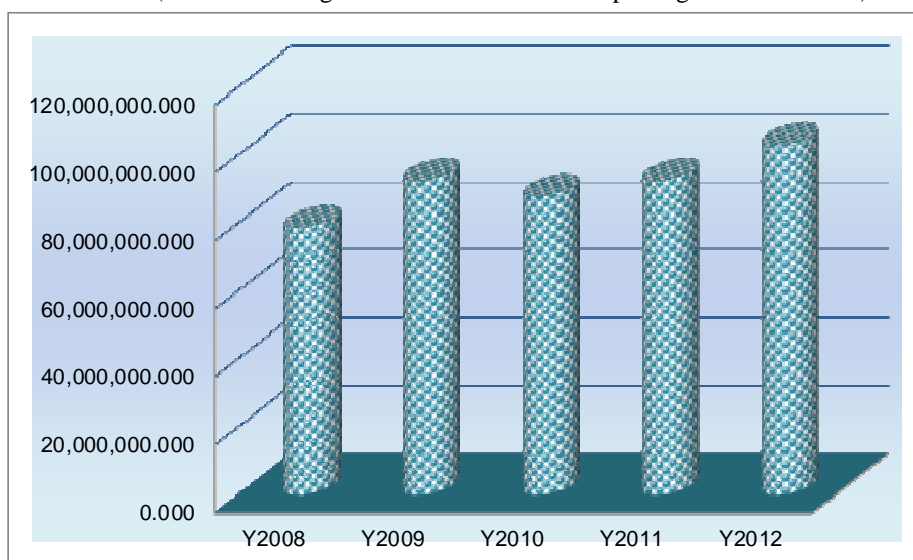


Figure3. Gas Production in Saudi Arabia-bcm
 Source: (BP Statistical Review 2013)

“Abundance” is also binding for the producers. Energy exporters are dependent to a vast network of pipelines, export terminals, and LNG liquefaction plants to supply products to the market. Malfunctioning of each of the rings of supply chain can damage not only activities’ economic, but also the attitude of the producer as a “reliable supplier” (Ibid). Superior technology can be influential in these fields.

Table4. Refinery capacity in OPEC Members by type and location (1,000 b/cd) 37

Saudi Armco	Ras Tanura	550.0	550.0	550.0	550.0	550.0
Saudi Armco	Jeddah	88.0	88.0	88.0	88.0	88.0
Saudi Armco	Riyadh	122.0	124.0	124.0	124.0	124.0
AOC	Khafji	30.0	-	-	-	-
Saudi Aramco	Yanbu (Domestic)	235.0	235.0	235.0	235.0	235.0
Saudi Aramco/Mobil	Yanbu (Export)	400.0	400.0	400.0	400.0	400.0
Saudi Aramco/Shell	Jubail	310.0	310.0	310.0	310.0	310.0
Saudi Aramco/Petrola	Rabigh	400.0	402.0	402.0	400.0	400.0
Saudi Arabia	-	2,135.0	2,109.0	2,109.0	2,107.0	2,107.0

Source: (OPEC. The Organization of Petroleum Exporting Countries 2013)

To Saudi Arabia, energy is the source of life. The country derives 80 percent of its national budget revenue from

the sale of crude oil and natural gas liquids (NGLs) in the international market. The government views its resources as both economic and strategic. So it comes as no surprise that the country has invested much in ensuring that it is able to maximize the utilization of those riches (Akhonbay, 2012: 1).

Table5. World proven crude oil reserves by country (m b)22

2008	2009	2010	2011	2012	% change 12/11
264,063	264,590	264,516	265,405	265,850	0.2

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Table6. World proven natural gas reserves by country (billion standard cu m)

2008	2009	2010	2011	2012	% change 12/11
7,570	7,920	8,016	8,151	8,235	1.0

Source: (OPEC. The Organization of Petroleum Exporting Countries 2013)

A close look at the country’s evolving energy policy reveals that the kingdom is a dynamic player. KSA has put in place factors that will help it adapt to changes and, to a certain extent, help shape those changes (Ibid: 2).

Saudi oil exports in 2012 are as follows:

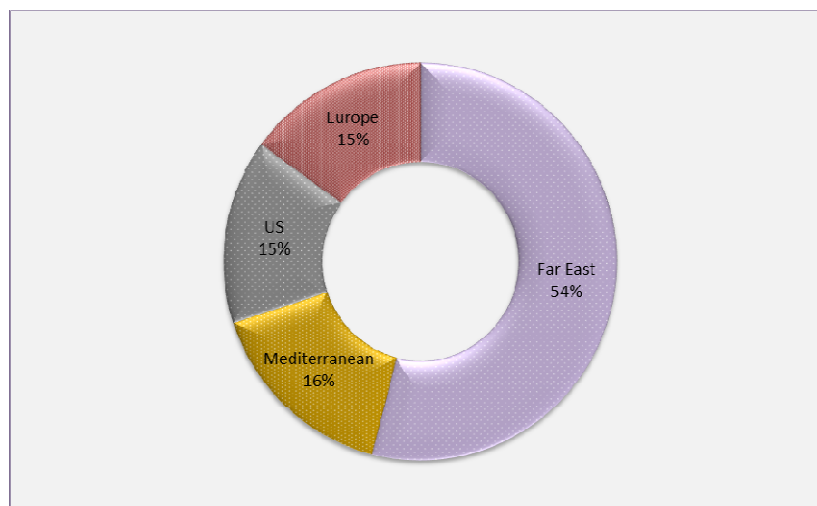


Figure4. Saudi Arabia Crude Oil Exports by Destination

Source: (U.S. Energy Information Administration, APEX)

According to Khalid Al-Falih, president and chief executive officer of the Aramco Company, this company plans to add 20 percent or 160 billion barrels to the Kingdom's oil reserves. This figure is more than the combined current reserves of the United States, Russia, China, the UK and Brazil,” the Aramco chief said during an address in Dhahran. He said Saudi Aramco would continue its efforts to find new oil and gas resources across the Kingdom. “Our research centers will play a big role in achieving this objective,” he said. “Our company aims to establish export-oriented integrated industries apart from oil and gas, which is considered the backbone of the Saudi economy.” he added. “We also want to discover large additional resources of oil and gas from both conventional and unconventional sources. We want to image 15,000 feet deep into reservoirs with a seismic resolution of five feet. We want to drill 50 percent faster than we do today, and cut costs along the way”. Saudi Arabia has long been a major exporter of petroleum, Al-Falih said. “In the future, we want to see our nation also become a leading exporter of technological solutions, and a valued contributor to the global pool of knowledge and innovation” (www.arabnews.com).

Therefore, by implementation of systematic policymaking and based on the future prospects that are already in progress, the Saudi Kingdom can have the utilization of modern technologies in its plans, so, they can provide the demand security for themselves and also security of supply for the buyers and in this way, they can achieve their specific objectives in the field of energy security.

3.3 Technological advances in upstream and downstream industries

According to Aramco, in order to meet global markets’ demands, Saudi Arabia has separated production and processing operations from geographic point of view into two parts: “Northern area oil operations,” and “Southern area oil operations.”

Aramco claims that it is a pioneer in production, operational reliability and technology development at its

upstream operations.

They believe that they have undertaken the most adventuresome exploration operations to provide reliable and cheap energy resources, which has led to considerable developments in both sections of onshore operations: Manifa, the fifth largest oil field in the world, and Karan, the Kingdom's first separated gas field. Also, they had developments in gas machinery in Vaset, which is one of the largest integrated machines ever built.

In 2011, Aramco launched the first shallow water exploratory excavation project in the Red Sea. Technological development has led to extensive oil exploration in challenging areas.

Technological advancements are useful in upstream operations. These advancements have contributed to excavation and infrastructural operations, working on enormous project in petrochemical engineering, and development for extracting hydrocarbons reserves from thousands feet under desert sand or sea beds, as well as the development of a gas operations business.

Southern area oil operations produce and process all the exploited oil from southern area and manage and preserve all gas fields in the region. Southern area oil operations operate on approximately 200,000 square kilometers, and its field includes the largest onshore oil field in the world, the Ghawar field, which was discovered in 1937. SAOO is also responsible for management and maintenance of the largest treatment and brine injection system in the world which maintains reserves' pressures to support oil production.

Aramco has developed the MOROSAT technology (patent pending), which can obtain important parameters related to oil and gas reserves from well-testing data acquired from hydrocarbon reserves and use them to calculate water saturation.

In 2011, a cornerstone in development of software solutions for accessing online data of "land knowledge" was achieved. This can collect the data obtained from company's database and geology and geophysics experts and combine them into the knowledge related to specific disciplines, or exploration fields.

Aramco's computer modeling team is improving the speed and computational capability of GigaPOWERS™, which is their exclusive simulation technology.

Hyper-Dimensional software allows engineers to use hand gestures and voice commands to cooperate to manage large quantities of data from below ground level more efficiently. This prize-winning technology enables Saudi oil engineers to acquire exceptional knowledge about the activities of Saudi Arabia's hydrocarbon fields.

Research on subsurface downstream activities is conducted by the "The Exploration and Petroleum Engineering Center - Advanced Research Center" in (EPEX ARC). In the field of technology of exploration, strategic objectives aim to increase reserves and recycling rates. In EPEX ARC, petroleum engineers and geology experts work in close collaboration to develop highly sophisticated three-dimensional computer simulation programs of the reserves.

In "Events Solution Center", multidisciplinary teams focus on solving the problems regarding production. Their work has significantly reduced the completion time of the research, compacted decision-making cycles, and reduced uncertainty.

According to Aramco's website, Saudi Arabia is pioneer in using advanced technologies in the field of refining and distribution. Accordingly, domestic laboratories are developing innovative techniques for supporting refining and distribution operations. Chromatographic techniques developed by Ra'as-al-tanoor laboratories support export operations from terminal and identifies crude oil resources.

The impact of technology can be seen in the progress or the lack of progress of Saudi Arabia upstream and downstream industries and it can be regarded as one of the characteristics of the strengths, weaknesses, opportunities and threats for the petroleum and gas industry in Saudi Arabia. In other words, any kind of advances in technology, keeps the oil and gas industries of the country moving forward and given the global competition, any kind of delay in technological productivity and investment can result in falling behind and the lack of improvement. As can be seen in the table below divided based on SWOT matrix, technology can be effective in the four listed elements:

TABLE 7. SWOT Matrix of Energieopolitics

<p>Strength</p> <ul style="list-style-type: none"> - The world's largest capacity in excess production - Access to low-cost production of crude oil and gas - Exploiting new technologies in upstream and downstream industries 	<p>Weakness</p> <ul style="list-style-type: none"> - Sour crude oil - Excessive dependence to crude oil market - A relatively small capacity of the downstream industries
<p>Opportunity</p> <ul style="list-style-type: none"> - The high price of crude oil and insufficient investment - Increase in Heavy-oil demand, especially in Asia - Saudi Arabia's accession to the WTO - Innovation in improved performance in the field of energy and transport equipment 	<p>Threat</p> <ul style="list-style-type: none"> - Increasing growth in domestic demand and a potential gas shortage - Potential reduction in oil demand growth due to the recent rise in global oil price - Being competitive in the application of modern technologies in the oil and gas industries worldwide

4. Conclusion

Superior technology can be a factor in national security against aggressions. It also can act as fear and intimidation factor imposing a preemptive war. In energy context, due to the economic discourse, this has found a special place in relations between states. This means that by using technology and the advantages provided by land (oil and gas) countries will be able to provide energy security more effectively. Therefore it can be said that one of the factors affecting energy security, and subsequently, security of a nation, is a country's technological capability.

Saudi Arabia must follow a comprehensive energy strategy to incorporate Geopolitics and Geoeconomics elaborately.

Modern technologies play a significant role in improving and extending upstream and downstream industries. During past decades, the Saudi national oil company has invested extensively in this area.

Saudi Arabia also seeks economics developments and promotion of political relations and capacities; therefore, it has set its main strategy to contribute in management of the international system with the means of energy. Saudi Arabia has set out and implemented its foreign policy aimed at the realization of this strategy.

Saudi Arabia has sought to promote its political, economic and cultural position as well as participation in regional and international relations. Saudi Arabia is using all its available capacity to achieve these goals. Saudi Arabia must note that in this new era, achieving national security in oil and gas-producing countries depend on regional and global security. So, to develop a comprehensive energy strategy, it is necessary to consider this issue.

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