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[Field Research]

The Role of Innovative Energy Public Firms' Channels according to Shale Gas for E-Convergence Economy.

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Abstract

Purpose – The E-convergence economy is requested with the economic change of the diverse energy supplies, according to the exploits of Shale gas. By analyzing the electric energy supply and demand in accordance with the various cases, it has proved indirectly to create a convergence economy.

Research design, data, and methodology – The research design would make realize its potential change with which government or companies have focused on the energy objection between Shale gas and Electric vehicles.

Results – The paper suggests that Shale gas has expanded with the emphasis on the Electrical convergence economy or EVs. Due to these results, they also show why it should not be delayed in the development of shale gas and electric vehicles at the same time.

Conclusions – All this is from the reason of opening the E-convergence economy over time. It is required that Korea should prepare E-convergence economy. Public regional energy should be present through the consistent selection of development for energy linking E-economy and E-trans distribution.

Keywords: E-economy, Public-Firm, Innovation, Shale-Gas Energy, E-trans Distribution.

JEL Classifications: L44, L94, M15, O32, P48, R12.

1. Introduction

This paper is just for how Korean energy public firms should be presented the needs for energy competition with E-software for the E-convergence economy through an algorithm by the process of new distributed system and economic change in the world. Technology E-era is opened, and it accelerates the changes in energy supplies. The convergence economy is a new paradigm in the R&D industrial economy. Next, the proportion of the electrical energy will be excessive due to the expansion of the E-products.

There is more focus on electric cars than the low-cost phones. Samsung Electronics and LG Electronics are in a position that confronting the dilemma of Chinese demand for offensive low-cost phones and premium phones. The low cost phone market cannot be possibly coped with the cost level in China. As a premium transgression to market themselves cannot raise low-cost handset market. Just what one more problem is maintaining market share the next few years, it is impossible to go back to the heyday of mobile phones' splendor. The ICT sector is an emphasis in accordance with battery electric power industry on converged electric vehicles. However, it has shown that aspects retreat back to the internal combustion engine, helping rather develop the shale gas than active development of electric cars. The obvious energy source is alternated E-industry because it is increasing power industry products on producing artificial intelligence and automated E- industry and the development and the consumption of shale gas is due to be used in the development of the converged E-economy.

This currently is because for so not long China has led even to switch automation industries from low wage labors, Becoming the E-convergent economy that the computer is to develop new technology is needed because the mobility of the energy demand. The next, traditional jobs are disappearing the static occupation of 47%, including knowledge workers due to the automation and the mobility of energy.

2. Comparison with Previous Studies

Evensen (2015) has argued that it was shown that a constant refrain in both public discourse and academic research on shale gas development has been the necessity for sound economy to govern policy decisions. He argued that first,

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philosophy (particularly moral thought and ethical reasoning) and economy must work in tandem for making good policy decisions related to shale gas development, and second, this realization is essential for policy-makers, journalists, researchers, educators and the public. By examining the range of normative claims offered within academic and public discourse, the variation in claims across contexts and the degree to which the normative arguments are well-supported, I illustrate the important role increased attention to moral thought could play in forwarding policy construction on shale gas development. Finally, I offer recommendations for how policy-makers, journalists, researchers and educators can more actively acknowledge the importance of both economy and moral thought in policy-making related to shale gas development.

However, Muehlenbachs et al. (2015) have pointed out that using statistics from Pennsylvania and an arrange of empirical techniques to control for the factors, they recovered pleasant estimates of assets value impacts from shale gas development that switches with water origin, good productivity, and visibility. outcomes indicate big negative impacts on nearby ground water-dependent household, while tap-water-dependent houses show smaller positive impacts, suggesting benefits from lease payout. Results have implications for the disputing over development regulation of shale gas.

Shale gas is an alternative to traditional electricity with natural gas. Lark et al. (2013)' s study detects that shale gas uses up a lot water over its life cycle (13-37 L/GJ) than conventional natural gas uses up (9.3-9.6 L/ GJ). Shale gas production shows a great potential source of natural gas for the country. However, shale gas consumes particularly less water than other transportation fuels when used as a transportation one. When consumed for electricity generation, the combustion of shale gas adds to the total water use compared to conventional natural gas. The impact of fuel production, however, is a little relative to the operations of power plants. So a kind of power plant is far more important than the source of the natural gas utilized.

Knudsen et al. (2014) present an economical attractive option for generating companies to increase their use of firm gas–supply contracts to the natural-gas power plants in order to secure a sufficient gas supply. The numerical results show a significant economic potential for the shale-well operators, and a viable approach for generating companies to secure a firm gas supply for meeting varying seasonal electricity demands.

The above previous studies were emphasized for economy of shale gas, and the changing of energy industry can be delayed a part of the E-economy, but with the area of energy supply being extended is expected to accelerate it. The authors focused on a local area of energy self-sufficiency and consumption according to the energy industry convergence industry.

In addition, with the price competitiveness of the energy industry revealed in the IoT energy, mobile battery, creative energy development, they insisted to be alternated or combined to be in the area energy development. The technology is the first to connect battery-free devices to a WiFi infrastructure, the researchers claim. It builds upon earlier research that enabled low-power devices, such as temperature sensors, to harness energy from existing radio, TV, and wireless signals. Shale energy for the E-industry infrastructure and the mobile industry keeps on getting expanded.

So Every entrepreneur or business professional will perceive that an exceptional business performance is what drives the company and exemplifies a solid base for success, amongst great competitions and fast moving markets, always strive for innovation and ground breaking products or services. First. Create an information dashboard for easy access to key resources. Second. Elaborate a plan for the launch of a new business. Third. Generate new ideas from a group brainstorming meeting. Fourth, Summarize key ideas contained in business books or articles into maps. Fifth, Conduct research for new projects and capture and organize your findings. Seventh, Develop detailed customer personas for marketing planning. Eighth, Outline and organize the content of a business report or technical papers. Ninth, Sales account planning and management

Driving a culture that will inspire and will find ways to reach customer loyalty, is another way to ensure business success. Mind mapping can greatly aid sales and marketing professionals in providing a suitable resource for planning and management of sales accounts. You can even communicate key benefits and usage of your products or services, to potential clients, through the use of mind maps, as a visual aid in presenting related information.

This rapid innovation is possible an emerging area of energy was not in itself capable of supplying electricity through the solar system to get this electric car to emerge. It is the main core of consumption as the regional marketing of gravity model. That was the era of the investing system to equip cars and fuel, where everything is possible. To establish an integrated system like the Apple smart phone company's IT equipment systems on the market street corner there is a need to expand the market. Although products industry group begins to convergence, but the converging of products is not because all things are not intended to be commercialized soon innovations (Seo, 2015).

Unemployment is expanding due to the reorganization of the innovation and energy industries, among private companies, It will also shift the role of the public companies in according to changing the energy technological convergence algorithm. Shale gas development under a low oil price suggests a new direction for public companies. This is a challenge for survival under the circumstances not to achieve energy independence of the company or the industry. So it is time to raise the competitiveness of the Korea energy industry.

3. Convergence Economy through the Old System

The implications of applying the Golden Rules by IEA report, a Golden Age of Gas (2012), to unconventional natural gas widen beyond gas to other competing fossil fuels. As the global share of gas go up from 21% of main energy consumption in 2010 to 25% by 2035, growth in demand for oil and coal is hold down and, also demand for renewable and nuclear power.

Oil keeps on being the most important fuel in the chief energy mix, with increasing from 4,100 Mtoe (2010) to 4,550 Mtoe (2035) in demand, while the share of the chief energy mix falls down 27% (2035) from 32%(2010). When compared with the base ones, lower gas prices accelerate to substitute the oil in the power and transport sectors, because in 2035, international oil demands reduce by 2 million barrels per day (mb/d).

Chief coal consumption keeps to rise till 2025. The coal share in the energy mix reduced by 24% (2035) from 28%(2010). Coal demands are about 3% lower (115 Mtoe) than in the baseline one, it is greater than European total imports of hard coal. 3/4 of coal demand growth results from the power sector. For new area, lower gas prices prefer gas to coal in most countries. In China, however, coals still left cheaper than gas, in spite of environmental pollution in CO2 emissions. China for increasing gas use need development polices. Gas-fired electricity generation will be globally used than so far. Nuclear power generation grows over the future period, however it will be below the research in 2035. Gas prices give some influence to build new nuclear plant under the open economy

And as mass production of shale gas to prices and supplies being stabilized, the both chemical industry and power industry are undergoing new changes. Power industry in the United States uses the gas as an energy source, it was significantly lower the production and environmental costs. Also, thanks to lower costs of the shale gas production's, the US chemical industry has improved price of competitiveness. Chemical companies in the US that was previously a factory abroad are re-shoring and have rather expanded exports of chemical products to China. Based on the resurrection of those manufacturers, United States has welcomed the economic revival.

3.1. Korean Market of E-economy

The innovation of automation and reorganization of the energy industry requires some solutions through the exploits of shale gas such as the following. First, there is a need for a response in the petrochemical industry. Due to the shale oil and gas production, products with traditional petrochemical companies, such as the plastics industry, paint industry led to be centered the economy of Korea industry, who is required to develop a variety of shale gas. Shale gas can play a role of complementary in the new plastic and paint raw materials, chemical raw materials being extracted from the naphtha of petroleum. The development of a petrochemical based on the shale gas is required. Preferentially Korea can create directly such a raw material from shale gas technology secured in the US. Second, there is a need for a response to the automotive industry. As a shale gas revolution worldwide oil prices fell, but eco-friendly cars will continue to be required. Then Tesla has increased to a corresponding degree of the car in the US shale gas. Because the possibility of electric vehicles, including the Toyota hybrid is to be developed further in size. Third, it should be re-diagnosed in Korea's shipbuilding industry. This is because Korea shipbuilding is experiencing a crisis due to shale gas and low oil prices, which is the highcost of extracting natural gas, crude oil in the seabed. Like the projects focused by Hyundai Heavy Industries and Samsung Heavy Industries, Daewoo Shipbuilding & Marine Engineering, it is the time to resolve the issue on orders like LNG carriers or drill ships. This is because the current especially difficult to being weighted depending on cheap ship orders in China. Finally, they will be expanded the E-car, IoT, AI industries. Here is the time that needed for the alternative energies.

3.2. EU Market of E-convergence Economy

Europe's position on shale gas development differ from country to country. This is because the risk of environmental problems due to fuel consumption and income structure, energy security issues and development, is different for each country. In Europe, France and Poland possess the largest shale gas resources, and followed by Norway and Ukraine, Sweden, Denmark and the United Kingdom hold it. Further countries have set itself for reducing production of natural gas continually, while its demands are increasing, because it is necessary for the development of new gas resources in situations where the dependence on gas - oil imports is growing. US natural gas prices are so high compared to shale gas prices and the freezing of nuclear power plants, which are also an important factor that needs shale gas development. Europe shows a modest pace in shale gas development than in the United States and China, the biggest reason is of environmental impact.

Shale gas reserves in Europe are in the vicinity of the residence in the most densely populated areas (France, UK, Germany, Poland, Austria), unlike the United States and China, the greater the opposition to shale gas development is higher, while Hungary, Romania, Bulgaria, etc. are very active in the development. In addition, the development costs of gas deposits in Europe than in the United States (including environmental costs) are higher. In the ownership that belong to the Local Government (State), it is difficult to lead the development of the country.

Until 2015, the most active countries in the development of shale gas in Europe is Poland, who almost gave up developing for the burden of its high costs. The Polish government has been actively promoting the development of shale gas in order to encourage a low-carbon projects and to establish energy security of the EU. Because current Polish electricity production is accounting for 90% of coal and lignite (brown coal). If Poland is to control the carbon dioxide emissions in line with EU policy, it is expected to have considerable environmental cost. In addition, Poland has imported a significant amount of natural gas from Russia. The Polish government had spurred on shale gas development with companies such as Exxon Mobil, of which abundant shale gas resources are alternatives in this situation. In addition, the Ukraine gave exploration rights to Chevron and shell, Romania and the United Kingdom also start in shale gas exploration. On the other hand, France, Czech and Bulgaria are announced to stop the development of shale gas. Germany did not proceed with the development as the high clogged opposition of which shale gas is likely to be a highly successful situation as shown in < Figure 1 >

Source: IEA (2016), & Energy-pedia (2013)

<Figure1> Shale gas in European countries

3.3. China and Japan's Role as Becoming a Global Energy Innovator

The role of public enterprises in China is large in the energy technology innovation and development of all areas. As a side of the dramatic change of the Chinese economy, China is fast transitioning from low cost manufacturing to a higher value innovation-led economy. The conclusion of the present study is that China is on its way to become a major, global power for the innovation. This is mainly due to private firms as an essential engine of the wealth-creation process.

However, these operate in a unique environment, in which the public sector is extremely powerful. Metrics on China's innovation are about the quality of output and not of input. Several of the elements commonly used are discussed below: First, There are investments in R&D. In GDP case of China, it is to reach 2,5% in 2020, thus overtaking the average investments of the countries of the European Union. Given the rapid growth of China's economy, numbers in absolute terms are even more impressive. Following recent trends, this number may overtake that of the USA as early as 2023. Second, there are patent outputs. The top patent owners in China are the telecommunications companies ZTE and Huawei, as well as the car-maker Chery.

Finally, there are non-technical innovations. The metrics above concern technical innovations. Many important innovations have nothing to do with technology; which revolutionized retail stores in the 1950s. Most advances in the services sectors are not patentable. Thus, one firm may copy the service offered by a competitor. In China, many innovations concern specific aspects of the business model. For example, the way Haier, the manufacturer of refrigerators and air conditioners, guarantees one day delivery by imposing this condition to the transporting sub-contractor. Mobile phone–maker Xiaomi hardly advertises and mainly sells on the internet, Furthermore, as will be seen later, product innovations are often the result of numerous, very small adaptations of existing products; these changes are not patented, but are the reason for the success of the offering in the Chinese market.

These patterns, expected to be followed by China in the coming years include several elements, as discussed below. Chinese consider innovations in a total market-oriented way. They are ready to experiment and rapidly correct their product. Furthermore, Chinese is fully engaged with the internet, with an estimation of 800 million users in 2016. Copying a product, innovating to reduce cost by copying and improving explain the success of many Chinese companies, such as Baidu (copy of Goggle), or Alibaba, initially inspired by eBay, Xiaomi for mobile phones. Because these are the basis for the automation of the energy industry.

China's government focus onto innovation-led growth. Like Japan and Korea, innovation is perceived as a crucial ingredient of wealth-creation and economic development. China has emphasized on converged with human thinking. Innovation public policies range from favouring fiscal incentives for the digital revolution, smart energy cities, innovative firms, as well as an arsenal of programs to foster R&D and technical developments. These include 3D printing and the informatisation of manufacturing, IoT (internet of things).

A set of non-tariff barriers and practices favored domestic firms as a policy of promoting the indigenous innovation. The indigenous innovation is particularly to produce renewable energy. Chinese firms contributing a rapidly growing share of innovations are private and entrepreneurial like the ICT-information, communication technologies and electronic games, etc. State owned enterprises (SOE) is decreasing on the weight of it because Chinese investments are especially towards Europe. The Shenzen area is densely populated with innumerable firms, and it is able to rapidly produce prototypes and components (Haour, 2016). A few large Chinese firms have ventured abroad. Huawei, Lenovo, and Haier are notable examples. Combined with that is a strong government relentlessly committed to foster innovation-led growth. Chinese firms are, therefore, expected to moving into one of the major sources of innovations.

Japan has devised a series of scale offshore petroleum development budget up to a ¥ 74.8 billion. In comparison with the development budget of Korean overseas resources

decreased to 1/3 of that in 2016. On setting a priority up of energy security, the energy policy is a golden opportunity to raise the independence development rate (40% in 2030) in recent low price of oil-gas situation. In the case of Mitsubishi, it was acquired in Canadian Encana, 40% of shale gas shares to $ 2.9 billion. Marubeni boss was buying 35% of American Hunt Oil, and Eagle Ford shale'gas assets to 13 billion dollars. The Japan Oil Development Co., Ltd. (Inpex) is also activein developing overseas resources. INPEX Acquires 40 Percent in Shale Gas Project with $ 700 million from Nexen. Japan's second- biggest oil refiner, Idemitsu Kosan and fifth-largest Japanese oil distributors, Showa Shell Sekiyu began negotiations to merge equally, the 1st JXHD and 3rd TonenGeneral Sekiyu also embarked on negotiations for the management integration to this opportunity. The Japanese oil refining companies are facing a tough situation in the international oil prices and reduced demand for petroleum products within the country.

China also sets the energy security at the heart of energy policy after March 2013, Xi Jinping. The energy venture tries to expand the Strategic Petroleum Reserve (SPR) and oil and gas storage facilities to lower the price of crude oil. The state-owned oil company, Sinopec (Sinopec) was purchased successively oil and gas assets promising in Australia, Brazil, Canada, Kazakhstan and Angola. CNPC also has access to long-term and strategic aspects such as the acquisition of a stake in shale gas in United States and Canada.

4. Technology Growth S-Cuve and Regional Energy Independence : Korean Public Companies towards the E-economy

4.1. Energy Changes and Electronics Development learned from the System

The car industries still enable to act the existing situation further, in according to the decline of oil energy prices and the expansion of shale gas. It, however, is important to note that consumers' choice is starting to switch from ICE (Internal Combustion Engine) vehicle to EV (electric vehicle). At this point, it is just another alternative technology growth curve. For example, from household appliances (color TV, refrigerators, computers, etc.) to the mobile phone, the contacts have appeared that the demand is surging. There is a theory of the technology growth S-curve for demand to be established.

Kim et al. (2013) argued that in the view of technology growth vs. substitution curves, they are to provide a prediction on the coming generation's multi-media about smart situation. As their outcome, digital TV has been advanced onto the meeting its technology growth curve from an earlier version(2005) to smart digital TV (2013), which has already come to the market maturity stage. So, EVs battery energies are similar case like those of technology growth and substitution curves.

The substitution curve shows only the S-curve shape as the growth curve, the newly developed technology curve showing how we're going to deal with technology that currently dominate the market. It will figure out how to replace the S-curve shape that a new technology is initially failed at once, but it eventually encroaches on the existing market for something new. Once consumers begin to recognize the superiority of the new technologies on the market because it replaced at a rapid rate.

In 2015, EV demands increased by about 60 percent all over the world. It is syndrome on the first stage. When compared the same growth rate of the Ford Model T in the 1910s, because it's also roughly the annual growth rate for sales through 2020, Tesla forecasts, in other cases, solar panels and LED light-bulb sales are following a similar curve.

The spread of electric vehicles can lead to a situation of global crude oil oversupply, even if this is expected to grow further in early 2023. The year of 2014 was exactly 10 years from the subsequent oil prices. Overall energy demand will be continued to increase, however, coming time is to appear that the demand on the technology growth S-curve grows rather rapidly in higher or lower point in the price of energy and development of renewable energy.

The reason is that low energy prices for electricity surge the demand of energy-related products, and the battery storage really can solve some of the issues faced by the growing demand.

<Table 1> S-shaped curve of technology growth demand, to meet the energy source

Technology Growth S-Demand Curve	Growing year - When demand spikes	Energy priorities	Alternative energy	Remarks(Demand surge in the year)
Refrigerator	1922-1960	Coal, Petroleum	Petroleum	
Color TV	1966-1988	Petroleum, hydropower, thermal power, nuclear power,	Nuclear power,	Petroleum(1964-1979)
Computer	1983-2005	Nuclear, Petroleum, hydro and thermal power	Nuclear power,	Nuclear(1973-1994)
Cellphone	1992-2015	Nuclear, Petroleum, hydro, renewable, shale gas	Renewable	
Electric Vehicles	2020-2040	Shale gas, Petroleum, nuclear, hydro, renewable	Shale gas	Shale gas(2015-2045)

Source: Seo (2008) & compiled by author.

Currently the batteries of EVs need to be recharged after they have been driven more than 215 miles (346 km). If the old battery fell sharply at charge rates 3 to 5 years, it must replace the new one. To replace the battery, which accounts for one-third, the cost of electric vehicles is difficult in reality, even though electricity is only one-third by the price of gasoline. Everything is possible for the person who replaced with a new car every 5-year cycle.

For example, as the trend to be replaced with a notebook or a tablet in conventional desktop computer, or it resolves this, and the shale gas can be a complementary material on the production of electricity, global industrial detonator in the growth of the electric car and E-economic convergence for it. Whenever each of the alternative energy comes up as the major energy sources, the electrical products seem to have the shape of the S-curve and their demand was soaring as shown in <Table 1>.

4.2. The Relationship between LPG and Oil, and Nuclear Energy according to Shale Gas Boom

Liquefied petroleum gases (LPGs) together with other natural gas liquids (NGLs) have played an important role in the current U.S. shale gas boom. Depressed gas prices in recent years have made pure natural gas operations less profitable. The result is that liquid components in gas production have become increasingly important in ensuring the profitability of shale gas operations. In this paper, it was investigated whether the shale gas expansion, which has led to an increase in associated LPG production, has also affected the historically strong relationship between LPG and oil prices. Revealing the strength and stability of the LPG/oil relationship is relevant when it comes to the future profitability and development of the U.S. natural gas sector. Our results suggest that the LPG/oil relationship has weakened in recent years with a move towards cheaper liquids relative to oil. This is consistent with developments in the natural gas sector with increased liquid production. A consequence is that U.S. natural gas operations cannot automatically rely on high gas liquids prices to ensure profitability (Oglend & Osmundsen, 2015).

But shale gas is not a cheap alternative to the nuclear industry. By 2020, global electricity demand will be around 460 giga watts especially the 15 countries of the natural gas production in the top 20 countries promoting large-scale nuclear power program, IEA tried to remove impediments of stable energy supply. First, a stockpile of uranium is the amount that can be 100-150 years. Second, unlike oil-gas, nuclear power causes less pollution of the environment. As well as establishing a good safety measure it is that it does not repeat the same mistake Fukushima. To go open the emerging energy alliance era - one in the future.

Shale gas is to sell $ 30 to 50, not $ 100 per cubic meter, if consumers do not want to replace nuclear power. The coal and oil development in the past did not replace nuclear power. The nuclear industry will lead the future of the country by creating jobs, as well as to ensure a stable fuel supply for the next 60 years. The 1990s was booming, but do not expect the oil price is not less than $ 2 a barrel, expect oil prices are unlikely to fall below $ 100 in 2015 but fell to less than $ 30. These unstable raw energy markets are the reason for occupying the share of nuclear energy by 25% to 30% in the international energy market.

Looking at the field research in each country electric- power industry, then Germany, Japan, Italy about the electric charges of the country amounted to four times, UK to twice and France to 1.5 times. In contrast to electricity bills to income ratio the French are the most inexpensive, South Korea and the United Kingdom is that of a similar level. The electrical energy compared with other like oil or coal energy efficiency is a very good price. Currently, Korea's electricity rates are average 100 won per kWh. It is very cheap rates to the level of which the TV takes about 10 hours to turn on, but any electricity getting from renewable energy such as <Table2> is very small. As opportunity cost, if it secured only electricity from shale gas technology, the cost of production can be lower.

<Table 2> Energy use per capita of Growth demand to the electronics source

year	Gasoline prices										Diesel prices									
	US	FR	DE	HU	PL	RO	BG	KR	JP	CN	US	FR	DE	HU	PL	RO	BG	KR	JP	CN
2000	0.47	0.99	0.91	0.81	0.76	0.46	0.7	0.92	1.06	0.4	0.48	0.82	0.78	0.79	0.65	0.35	0.58	0.66	0.76	0.45
2002	0.4	1.05	1.03	0.94	0.83	0.64	0.68	1.09	0.91	0.42	0.39	0.8	0.82	0.85	0.68	0.57	0.59	0.64	0.66	0.37
2004	0.54	1.42	1.46	1.3	1.2	0.96	0.92	1.35	1.26	0.48	0.57	1.25	1.29	1.22	1.09	0.91	0.89	0.95	0.95	0.43
2006	0.63	1.48	1.55	1.3	1.3	1.26	1.05	1.65	1.09	0.69	0.69	1.33	1.38	1.31	1.3	1.24	1.08	1.33	0.9	0.61
2008	0.56	1.52	1.56	1.27	1.43	1.11	1.28	1.51	1.42	0.99	0.78	1.45	1.56	1.38	1.4	1.22	1.37	1.4	1.3	1.01
2010	0.76	1.98	1.9	1.67	1.57	1.46	1.51	1.52	1.6	1.11	0.84	1.72	1.68	1.61	1.5	1.46	1.58	1.35	1.37	1.04
2012	0.97	1.91	1.96	1.84	1.74	1.7	1.69	1.8	2	1.37	1.05	1.78	1.88	1.91	1.73	1.73	1.68	1.63	1.61	1.28

year	Energy use per capita										Energy per $1000 GDP									
	US	FR	DE	HU	PL	RO	BG	KR	JP	CN	US	FR	DE	HU	PL	RO	BG	KR	JP	CN
2000	8,057	4,136	4,094	2,448	2,320	1,614	2,277	4,003	4,093	919	175.2	118.93	110.71	137.8	158.5	157.49	254.58	192.84	127.13	249.94
2001	7,828	4,246	4,210	2,513	2,336	1,664	2,418	4,034	4,018	933	170.25	120.64	112.13	135.88	157.65	151.59	254.5	187.33	124.68	235.82
2002	7,843	4,226	4,108	2,520	2,314	1,755	2,401	4,172	4,006	979	169.16	119.6	109.62	130.07	153.86	149.28	233.91	181.35	124.22	238.37
2003	7,749	4,271	4,085	2,580	2,375	1,832	2,475	4,236	3,965	1,107	164.92	120.76	109.82	127.87	152.36	146.62	228.13	179.77	121.17	236.33
2004	7,882	4,302	4,114	2,579	2,383	1,803	2,421	4,337	4,091	1,265	162.18	119.2	109.32	121.54	145.31	132.43	208.25	176.09	122.17	246.65
2005	7,847	4,291	4,087	2,731	2,414	1,810	2,571	4,368	4,074	1,362	157.68	117.89	107.76	123.08	142.1	126.82	205.15	171.03	120.12	239.93
2006	7,698	4,196	4,205	2,713	2,537	1,885	2,657	4,419	4,066	1,478	152.13	113.42	106.8	117.61	140.53	121.46	197.59	165.28	117.95	232.42
2007	7,758	4,120	3,986	2,658	2,527	1,904	2,666	4,573	4,025	1,551	152.09	109.47	97.91	114.55	130.52	113.15	180.44	162.96	114.4	214.61
2008	7,488	4,116	4,037	2,637	2,564	1,929	2,649	4,640	3,868	1,576	148.62	109.76	97.91	112.48	127.47	103.94	168.51	161.95	111.16	200.03
2009	7,057	3,919	3,790	2,481	2,466	1,713	2,352	4,662	3,689	1,693	145.33	108.23	97.16	113.08	119.54	98.47	155.19	162.34	112.18	197.64
2010	7,162	4,024	3,997	2,568	2,640	1,730	2,416	5,060	3,896	1,846	145.05	109.53	98.29	115.95	123.05	99.69	158.32	166.23	113.23	195.74
2011	7,029	3,854	3,798	2,504	2,654	1,777	2,617	5,233	3,614	1,994	141.2	103.25	90.12	110.8	117.87	100.83	167.7	167.05	105.33	194.11
2012	6,812	3,846	3,877	2,373	2,567	1,742	2,513	5,269	3,543	2,079	134.77	103.31	90.09	106.23	112.22	97.76	159.77	165.17	101.27	188.72
2013	6,914	3,843	3,868	2,280	2,565	1,592	2,327	5,253	3,570	2,226	134.83	103	91.51	99.92	110.7	85.99	145.26	160.73	100.25	188.59
2014	6,919	3,656	3,750	2,293	2,496			5,262	3,470		132.75	98.27	86.08	96.63	104.14			156.47	97.38	

year	Electricity from renewable sources, kWh										Access to electricity									
	US	FR	DE	HU	PL	RO	BG	KR	JP	CN	US	FR	DE	HU	PL	RO	BG	KR	JP	CN
2000	77,160	3,069	13,743	65	226	0	0	101	16,874	3,058	100	100	100	100	100	100	100	98	100	98
2001	72,174	3,471	15,162	71	458	0	0	107	17,042	3,218										
2002	81,103	3,813	21,353	43	488	3	0	201	18,239	3,351										
2003	81,824	4,115	27,869	165	579	3	0	221	19,902	3,525										
2004	86,869	4,387	36,538	731	993	4	1	301	20,836	3,822										
2005	91,760	4,831	42,867	1,668	1,646	6	5	379	25,231	7,438										
2006	103,340	6,023	51,630	1,307	2,249	4	20	550	25,842	11,099										
2007	112,195	8,318	67,151	1,673	3,078	38	47	926	27,195	15,691										
2008	134,307	10,114	72,806	2,144	4,455	29	138	1,305	26,813	29,822										
2009	153,105	12,535	75,827	2,667	6,303	19	248	1,874	27,024	48,043										
2010	178,403	15,714	83,856	2,832	7,968	417	732	2,504	42,536	70,235										
2011	207,219	19,608	106,102	2,486	10,806	1,587	1,018	2,881	44,659	104,600	100	100	100	100	100	100	100	99.7	100	99.7
2012	234,198	24,636	121,703	2,433	14,842	2,860	2,101	3,124	47,636	136,197										
2013	264,037	26,622	131,430	2,507	14,643			4,311	50,537		100	100	100	100	100	100	100	100	100	100

Source: The World Bank (2016) & compiled by author.

<Table 3> Energy use of Oil, Nuclear power, LPG for the electronics

year	Oil production											Oil consumption										
	US	DE	FR	RO	PL	HU	CZ	BG	KR	JP	CN	US	DE	FR	RO	PL	HU	CZ	BG	KR	JP	CN
2000	9,057.78	134.96	93.21	137.16	22.81	49.41	9.36	1.96	14.01	112.20	3,377.53	19,701.08	2,766.76	2,000.57	224.24	411.28	143.25	169.82	99.88	2,135.33	5,480.14	4,795.71
2001	8,957.01	129.52	90.13	139.59	24.79	48.74	9.25	1.16	14.78	121.06	3,434.63	19,648.71	2,807.45	2,054.44	228.91	404.68	138.15	178.94	101.31	2,132.05	5,379.64	4,917.88
2002	8,998.43	135.70	86.21	140.43	23.02	42.96	12.48	2.65	21.91	120.17	3,534.86	19,761.31	2,710.41	1,991.50	232.28	406.43	140.40	175.99	105.73	2,149.15	5,286.91	5,160.71
2003	8,765.83	139.07	90.24	133.66	22.54	45.53	15.35	3.13	14.59	116.57	3,572.91	20,033.51	2,679.23	2,000.84	219.61	430.67	135.22	187.67	102.21	2,175.38	5,397.28	5,578.11
2004	8,722.27	124.67	89.10	131.63	34.79	47.53	17.17	3.66	16.92	123.39	3,674.75	20,731.16	2,648.03	2,008.49	225.09	454.15	136.21	205.91	99.45	2,155.13	5,288.02	6,437.48
2005	8,324.94	153.74	84.25	124.72	39.27	42.28	17.54	3.36	17.25	128.45	3,809.02	20,802.16	2,624.06	1,989.85	221.88	470.78	154.75	212.95	103.90	2,191.34	5,298.10	6,795.44
2006	8,316.32	166.60	89.20	116.64	40.23	39.49	15.83	3.38	21.29	129.42	3,884.35	20,687.42	2,635.78	1,991.20	217.63	502.27	163.15	211.50	105.05	2,179.91	5,168.23	7,263.33
2007	8,469.40	120.22	74.63	115.65	35.23	32.82	13.74	3.12	30.03	132.44	3,958.34	20,680.38	2,406.69	1,978.97	224.05	523.70	160.89	211.22	105.36	2,240.48	5,009.21	7,479.92
2008	8,563.93	137.69	77.17	116.98	36.30	37.74	10.91	3.52	41.66	133.98	4,039.27	19,497.97	2,533.45	1,944.38	230.95	536.64	158.89	215.02	104.27	2,142.32	4,769.60	7,697.13
2009	9,130.08	146.24	76.31	112.70	34.25	35.37	10.39	3.34	54.65	137.42	4,074.54	18,771.40	2,434.47	1,868.07	201.35	541.23	158.21	205.45	98.54	2,188.49	4,362.79	8,069.82
2010	9,695.59	139.87	76.54	107.14	28.66	34.46	10.28	3.58	58.47	142.58	4,372.66	19,180.13	2,466.93	1,833.45	192.35	564.65	149.24	201.42	90.33	2,268.52	4,429.24	8,938.36
2011	10,128.47	158.13	75.88	105.34	28.34	27.64	13.01	3.38	59.79	136.53	4,369.98	18,882.07	2,392.20	1,793.20	188.45	557.01	143.20	196.92	83.58	2,259.38	4,442.45	9,504.05
2012	11,118.69	161.16		101.65	28.26	27.84	10.27	3.38		127.74	4,421.45	18,490.22	2,389.13		190.11	527.02	132.85	193.90	87.30		4,694.76	10,175.14
2013	12,342.77	162.77		103.70	34.22	27.85	10.68	3.38		138.21	4,501.41	18,961.10	2,403.16		188.00	511.04	134.80	187.82	89.00		4,530.82	10,480.00
2014	13,972.60	159.04		103.58	39.26	25.26	10.68	3.38		137.21	4,526.35											

year	Electricity production											Nuclear power generation										
	US	DE	FR	RO	PL	HU	CZ	BG	KR	JP	CN	US	DE	FR	RO	PL	HU	CZ	BG	KR	JP	CN
2000	3,802.10	540.12	509.73	49.65	133.94	33.24	68.61	38.32	271.99	989.28	1,280.61	753.89	161.13	394.40	5.23	0.00	13.47	12.91	17.27	103.52	305.95	15.90
2001	3,736.64	549.70	519.51	51.30	134.56	34.39	69.93	40.65	291.34	971.61	1,426.68	768.83	162.74	400.02	5.04	0.00	13.42	14.01	18.24	106.53	303.86	16.60
2002	3,858.45	549.98	526.19	52.18	133.50	34.14	71.66	40.76	310.30	990.13	1,584.67	780.06	156.60	414.92	5.11	0.00	13.26	17.80	20.22	113.15	280.34	25.17
2003	3,883.19	572.50	533.65	52.42	140.48	32.22	78.06	39.53	323.92	981.87	1,810.26	763.73	156.81	419.02	4.54	0.00	10.46	24.58	16.04	123.19	228.01	41.66
2004	3,970.56	579.23	540.65	53.99	142.92	31.86	78.98	38.80	345.72	1,010.21	2,103.53	788.53	158.71	425.83	5.27	0.00	11.32	25.01	15.60	124.18	268.32	47.95
2005	4,055.42	576.85	544.91	56.75	145.63	33.74	76.97	41.25	363.92	1,020.22	2,370.15	781.99	154.61	431.18	5.11	0.00	13.02	23.26	17.38	137.59	280.50	50.33
2006	4,064.70	593.51	542.77	59.74	150.95	33.66	78.60	42.69	379.07	1,038.53	2,714.78	787.22	158.71	429.82	5.18	0.00	12.51	24.50	18.15	141.18	291.54	51.81
2007	4,156.75	597.85	538.53	58.60	149.25	37.75	82.56	40.25	402.36	1,077.84	3,087.25	806.42	133.21	420.13	7.08	0.00	13.86	24.64	13.69	136.60	267.34	59.30
2008	4,119.39	595.21	544.00	61.70	145.66	37.71	78.31	41.72	419.07	1,012.92	3,280.67	806.21	140.89	419.80	10.33	0.00	13.87	25.02	14.74	144.26	241.25	65.33
2009	3,950.33	556.71	507.33	54.83	142.45	33.73	76.95	39.63	426.00	985.64	3,507.51	798.85	127.72	391.75	10.82	0.00	14.30	25.67	14.22	141.12	263.05	65.71
2010	4,125.06	591.15	540.29	57.88	148.21	35.16	80.45	43.13	468.27	1,044.19	4,051.88	806.97	133.01	410.09	10.71	0.00	14.66	26.44	14.24	141.89	280.25	70.96
2011	4,100.14	572.31	531.55	59.02	153.61	33.89	81.86	46.65	489.73	1,032.17	4,547.14	790.20	102.31	423.51	10.81	0.00	14.71	26.70	15.26	147.76	156.18	82.57
2012	4,047.77	585.22		56.01	152.73	32.45	81.86	43.73		966.43	4,768.32	769.33	94.10		10.56	0.00	14.76	28.60	14.86		17.23	92.56

year	LPG consumption											Electricity consumption										
	US	DE	FR	RO	PL	HU	CZ	BG	KR	JP	CN	US	DE	FR	RO	PL	HU	CZ	BG	KR	JP	CN
2000	2,433.78	86.56	113.46	9.23	34.92	10.62	8.37	7.04	226.13	639.56	461.16	3,592.36	509.08	409.84	42.35	113.34	31.84	53.64	27.41	259.54	942.33	1,178.03
2001	2,200.38	89.88	117.39	10.30	42.04	9.41	8.71	9.42	225.90	634.13	459.99	3,557.11	520.19	420.51	43.11	113.63	32.88	55.48	27.33	279.25	926.26	1,314.78
2002	2,295.31	83.45	119.97	11.48	51.67	9.79	7.66	10.65	244.45	621.32	520.80	3,631.65	532.52	418.25	42.64	112.03	34.00	55.42	28.28	296.40	940.53	1,459.43
2003	2,205.07	85.55	111.40	11.26	63.24	9.69	7.82	11.40	232.60	604.92	587.25	3,662.03	542.14	435.49	45.57	115.86	34.92	56.76	28.01	312.89	932.09	1,676.83
2004	2,264.03	86.73	112.34	12.71	70.36	9.86	9.01	10.66	229.08	576.92	658.39	3,715.95	548.37	447.00	46.75	119.20	35.35	58.18	27.83	332.93	961.34	1,955.39
2005	2,146.05	90.49	109.83	17.42	75.26	11.17	8.33	10.70	237.98	561.35	649.29	3,810.98	542.96	452.35	47.77	119.88	36.03	59.31	28.78	350.19	969.78	2,193.32
2006	2,135.48	91.90	122.65	20.35	80.18	10.65	7.66	12.92	241.95	574.47	727.28	3,816.85	548.15	447.63	48.89	125.94	36.90	61.08	30.04	364.48	988.30	2,522.01
2007	2,191.32	96.33	127.16	23.10	81.86	9.84	6.77	12.04	266.80	552.58	740.49	3,890.23	551.99	450.10	49.76	129.49	37.78	61.49	31.08	387.01	1,026.85	2,870.76
2008	2,044.39	101.58	127.78	17.80	80.86	9.48	6.94	11.92	272.13	532.96	675.56	3,723.80	545.00	462.53	50.26	132.41	37.72	62.18	31.71	402.96	961.61	3,054.08
2009	2,126.94	101.12	122.97	20.45	79.10	9.25	6.04	12.90	276.65	507.78	695.32	3,886.40	519.43	446.52	45.51	127.73	35.64	58.82	30.05	409.23	935.11	3,270.31
2010	2,265.27	105.60	118.09	15.36	78.17	11.11	5.88	12.28	276.95	500.80	723.75	3,882.60	547.22	474.17	48.55	135.01	36.55	61.03	30.21	450.24	994.80	3,781.54
2011	2,236.83	102.07	110.50		76.24	10.70	5.98		272.36	499.65		3,832.31	543.75	442.73	49.98	137.73	36.74	60.41	31.60	472.30	983.16	4,264.31
2012	2,300.98	103.67			75.24	10.46	6.59			536.06			540.12		46.15	139.01	36.76	60.55	31.20		921.04	4,467.92
2013	2,495.45	108.92			75.93	11.57	7.37			512.18												

Source: The World Bank (2016) & compiled by author.

As the results of <Table 3> shown in field research, Electricity production through a variety of energy consumption let them further accelerate the E-convergence of every industry within emerging countries in Europe or Asia including South Korea. This will expand the use of electric vehicles. By the public to participate actively in the development of shale gas, it will fulfill the future demand rather than supply exceeded market.

4.3. Change of the New Tech-demand and Korean Public Companies' Perspective

The underlying strategy of expanding low-cost line will fail. Korea or EU companies need to overcome the discontinuity of the market (Seo, 2015). For example, the commercialization of electric vehicles, Tesla Motors were founded in 2003, but in just five years, it has lead the electric vehicle market in the US market. It was reserved for the traditional automotive companies which are currently growing in the market to break. Tesla model also with Shale gas and low oil price.

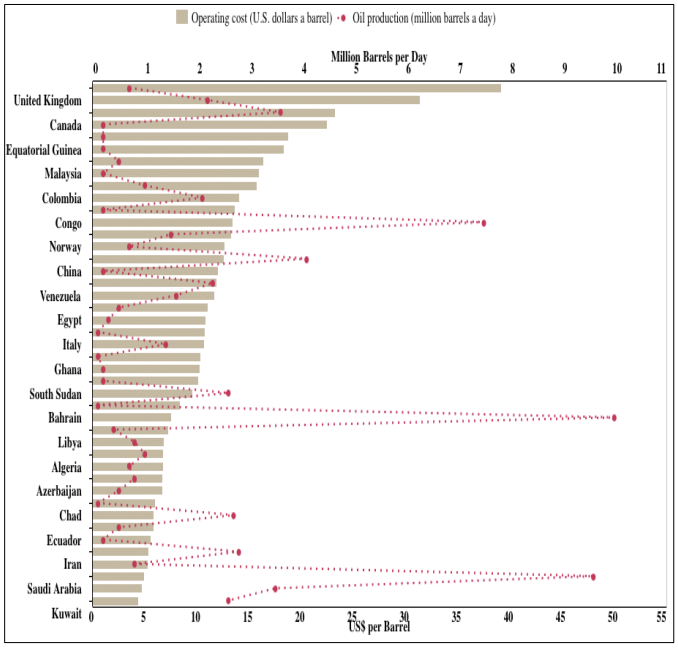
In another case, the European countries that have introduced the 30% of natural gas demand from Russia are to diversify gas supply efforts and energy cooperation with Iran, interest in shale gas development when Russian company Gazprom has stopped gas supplies to Ukraine.

Low oil prices in the mid-1980s brought three low (low interest rates and low dollar, low oil price) boom. This was a great benefit to the country that is based on exports. In case of the lower oil prices in 2015, that was because it led to another challenge to the electrical and electronics industry, meant the end of the peak oil theory keeping up to now. If only they could find fossil fuels, including crude oil extracted from the oil-gas layer of unconventional fossil ones, these industries have been granted for an unlimited. The costs producing a per crude oil barrel are classified as Middle East crude oil is $ 30 or less, extra- heavy crude oil $ 47 ($ 35-60), deep-sea oil $ 52 ($ 30-70), shale oil $ 45 ($ 30-70) and more as shown in < Figure 2 >

Declining in oil prices from which the overall state of the economy remains unchanged will be a good effect on the economy ahead, under the recession, however, it can cause the dangerous consequences. Other types of industries come to deflation as the consumption decreases integratedly and to bring stagflation phenomenon. While the exports plunge worldwide and is the reason that influence on the development of electric vehicles.

On the other hand, high oil prices in the 1970s and the low oil price in the 1980, S-curve of a newly developed electronics products took place at the same time. This is because any substitution was adjusted according to the demand against the

energy supply. Due to these results is also why it should not delay the development of shale gas and electric vehicles at the same time.



Source: IMF (2015) & KNOEMA compiled by author.

<Figure 2> Cost of Oil Production by Country

The paper offers an outlook for Korean energy industry according to Progress Energy as the company prepared. While abundant cheap shale gas has revolutionized the energy industry, it will become clear that the quest to build new nuclear plants cannot be abandoned. Companies explain that the electricity industry is eventually going to need the larger nuclear plants in the pipeline to assure reliable power in the future.

In the case of the domestic shale gas development in Korea, the capital and technical competence are little and lacks of storage facilities. There are limits to the flexible disposal of surplus quantities with minimal manpower and the current system of supply management center. Working in public and private companies should establish a Korean shale gas development model that links the 'gas development - operating a liquefaction plant construction and trans-distribution's introduction.

Because Korea is aiming to secure 20% of LNG introduced an amount of shale gas by 2020, there is a need for impact analysis in the power industry. Power production in United States to lower gas prices is switching to the gas and renewable energy. Coal power generation is falling, and gas generation rising the gas generation portion will increase to 30 percent in 2035. Utilizing the industrial complementary know-how during ensuring the public progress, however, it is promoted of the joint venture with private companies. This allows that the public may be provided to be supporting the equitable sharing and technical aspects of the introduction by the government more than the aspect of investment cost burden.

As more and more enlarged, E-expanding economic convergence is slow because of the demand for joint research and technology development in public energy industry. In this regard, however, Korea was 49.2%, which is taken now a real advantage by introducing external technologies. When need to develop an E- convergence economy, the S-curve growth for the E- replacements associated can occur in various fields.

Thus, there should be an active utilization of external technologies. But South Korean situation for private companies or public corporations seems to have a passive attitude about it. At first, it is time to be the public demands with a positive attitude. However it is recently why the 7 of 10 domestic companies feel the need of using external technical knowledges, but In fact, it appeared that enterprises are not utilizing less than half of them. Germany Pradesh Fortune Harper and Berkeley Institute of the United States in 2012 survey targeted at 78% of European companies that the results are about 30 percentage points lower than the figure for them.

However, looking at the domestic manufacturing investigate, 71.1% of the responding companies among the 380 companies feel the need to use external technology-knowledge management activities for changing and innovating. By industry, technology and development (R&D) with high proportion is in Medical Pharmaceutical (61.0%) and rubber-plastic (57.1%) in sector enterprises that have high rates of leverage of external technology-Knowledge. Steel-metals (30.0%), Shipbuilding-Plant (29.4%) which is more focused on operating efficiency in the field know-how and process were low.

A list of the reasons was figured out as the following, the enterprises that do not utilize external technologies are external dependencies expansion (43.5%), financial and economic problems (33.2%), closed organizational culture (11.9%), lack of experience (5.7%). The enterprises that utilize external technologies are getting into the field of the basic research (30.7%), prototype testing (28.2%), goods production (16.3%), production processes (11.4%).

That approach is that the most common were collaborative research (49.8%), and products user opinions (22.5%), commissioned research (18.0%), technology purchases (6.8 percent). Partners were focused on cooperative enterprises (31.8%), college (26.2%), a national institute (15.9%). Companies are got mainly difficulties to the Search-Excavation (35.7%) for a partner to take advantage of external technology, Lack of external technical and market information (23.6%), internal information leakage - technical burden (22.7 percent). Also, as requests the policy challenges, there are the commercialization and market development support of joint technology development (37.2%), excavation-diffusion of success stories (23.1%), building platforms that support the trading and exchange of information (16.7%) in order to activate the external use of technology.

By actively introducing the external energy technology of public company they must obtain a new energy industry and economic convergence. The movement of global energy companies is focusing on the M&A activities of the new energy.

British-Dutch Shell has secured Brazil's deep water assets in merged with BG last April 2015. This strategy is focused on developing deep water competitive and eliminating redundancy. US Noble Energy was to ensure superior shale assets in merged with Rosetta and increased efficiency in May 5, 2015. Malaysian state-owned energy company, Petron as has bought the assets of Azerbaijan Statoil to 22 billion dollars. Spanish Repsol has increased the asset by 36% as a strategic approach, with acquiring Talisman held in the UK North Sea and onshore US assets.

5. Conclusion & Implication

This paper has shown that it is rather imperative for Korean firms to carry out the E-convergence economy in terms of Energy marketing of Shale gas exploit. The efforts to increase the energy independence of the local economy will contribute to the realization of an E- convergence economy. Because developments such as shale gas focus on the influence areas of environmental technologies. It becomes more difficult to produce natural gas, oil, and energy resources, etc. and the mining environment has become harsh environments such as the Arctic. While emphasizing technology-push strategies, it is because the most difficult aspect is an economic convergence of shale gas. Even if this can be expanded to CNG or LPG fitted cars in shale gas development, it does not mean a reduction in the electric vehicle. Cheap energy will increase the competitiveness of the whole industry due to the expansion of shale gas, when taking advantage of a variety of electric vehicle technology growth S-curve rises. It will open faster E-convergence industry, however, the public companies primarily lead them in order that they can be the active participation of the private sector.

The global expansion in shale gas is reshaping the distribution channels of the vehicle fuel market. By vehicle market changes in conjunction with the mobile and Internet of Things (IoT) including the expansion of electric and hybrid vehicles. Coming time is to appear that the demand on the technology growth S-curve grow rather rapidly with higher or lower point in the price of energy and development of renewable energy. Korea needs to be developed to prepare the E-convergence economy. For this purpose, public regional energy shall present through a consistent selection of development for energy linking E-economy and E-trans distribution channel.

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