Master´s Thesis

International Business

Scenario Analysis of the Philippine Energy Market

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Abstract

This research project investigates the Philippine energy market. The main objective is to provide alternative scenarios, based on the propositions which are generated from literature review. Scenario Analysis is used as the primary tool for the analysis using the Delphi method which includes eight panel of experts as participants. Findings of this research concludes three scenarios: Policy Scenario, Sustainability Scenario, and Energy Price Scenario. Political will is important to address the increasing energy demand and the environmental impact of energy consumption which contribute to economic growth. Market and government failure prevail in the Philippine energy market.

Keywords: energy, energy market, policy scenario, sustainability scenario, energy price scenario

Declaration of Research Work Integrity

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature of any degree. This thesis is the result of my own investigations, except where otherwise stated. Other sources are acknowledged by giving explicit references. A bibliography is appended.

By signing the present document I confirm and agree that I have read RU´s ethics code of conduct and fully understand the consequences of violating these rules in regards of my thesis.

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Preface

This research project concludes my study for Master of Science in International Business at Reykjavik University. This journey will not be possible without the guidance and inspiration of the people around me.

Special thanks to the School of Business and the School of Science and Engineering at Reykjavik University for allowing me to take some of my elective courses from Reykjavik Energy Graduate School of Sustainable Systems (REYST), currently known as the Iceland School of Energy. The opportunity served as a vessel to pursue my passion in the energy industry which lead me to write this research topic.

My heartfelt thanks to Dr. Gerhard Apfelthaler, my research supervisor, for providing his research expertise to help me through in completing this project. Dr. Apfelthaler has been very supportive from the very start. I highly recommend him without reservation for your research project.

My great appreciation for the technical expertise of Engineer Peter Giovanni Sangcap. He also supported this research project by providing updates on the Philippine energy industry.

This journey will not be possible without the love and support of my family – Edsel, Manwin, and Darel. I am blessed.

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Glossary of Terms

Capital Scrapping	´´withdraw the least energy-efficient equipment from production and replace it with alternatives with a lower built-in intensity´´ (Barwell, Thomas, & Turnbull, 2007)
Capital-Related costs	´´are overnight specific capital cost of plant, incurred during constructions of a power plant, dollar per kilowatt which are are also affected by the annual fixed charge rate, the plant capacity factor, the annual rate of monetary inflation and the annualized rate of return on bonds´´ (Tester, Drake, Driscoll, Golay, & Peters, 2005)
Carbon Capture and Storage (CCS)	´´is one of a host of technical solutions that are currently available for reducing global emissions of greenhouse gases (GHG) to the atmosphere, and thus curb the longer term effects of anthropogenic climate change´´ (Hardisty, Sivapalan, & Brooks, 2011)
Final Energy Demand	´´energy use by end use sectors (industry, transport, buildings, and others) either in the form of electricity or in the form of heat or fuel´´ (Graus, Blomen, & Worrell, 2011)
Fossil fuels	´´includes coal, oil, and natural gas´´ (Kolb, 2011)
Green development	´´refers to a carbon emission reduction strategy to a low-carbon development´´ (Mohanty, 2012)
Green Energy Option	´´a consumer program which encourages end-users to participate in renewable energy

generation or choose renewable energy as their source of electricity´´ (Katz, 2012)

Operation and Maintenance (O & M) costs ´´are the plant capacity factor, the specific operating maintenance cost as of the start of operation in dollars per kilowatt per year´´ (Tester et al., 2005) .

Renewable Energy ´´is derived from natural processes that are replenish constantly´´ (Mohanty, 2012)

´´Includes hydroelectric power, wind energy, biomass, waste products, and solar´´ (Kolb, 2011)

Abbreviations

ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
BOT	Build-Operate-Transfer, Republic Act 6957
BP	British Petroleum
DOE	Department of Energy
EPIRA	Electric Power Industry Reform Act
ERC	Energy regulatory Commission
IEA	Intenational Energy Agency
IPPs	Independent Power Producers
MERALCO	Manila Electric Company
MTOE	Million Tonnes of Oil Equivalent
NPC	National Power Corporation
REM	Renewable Energy Market
TRANSCO	National Transmission Company
WESM	Wholesale Electricity Spot Market

‘‘Predicting the market is not the key to riches; being prepared to whichever it goes is ’’

– Robert Kiyosaki

1. Introduction

This chapter emphasizes the importance of energy, the energy market component and the challenges and opportunities of its supply and demand, an overview of the Philippines and its energy infrastructure. Problem statement, scope and limitations, and theoretical framework will also be discussed.

1.1 Energy

Energy can neither be created nor destroyed. - The first law of thermodynamics

What is energy? How it is used? Why is it important to human life? These are three basic questions which may help understand energy market.

Energy is the ability to do work, according to Thomas Young (Levenspiel, 1996). The first law of thermodynamics explains that energy is accessible and cannot be destroyed, however, it can be transformed (Tester, Drake, Driscoll, Golay, & Peters, 2005). The transformation of energy into ''final energy demand'' is where challenges to achieve equilibrium for supply and demand of energy prevail (Graus, Blomen, & Worrell, 2011b). Players, big or small, in the energy industry are eager for new information as the market transforms into a more advance era. Along with the transformation of socio-economic development, adheres substitution process of primary energy sources (Matias & Devezas, 2011). Technological development plays a great role for this transition (Unger, 2010) to ensure sustainable energy supply.

Energy is considered to be an important factor for ''functioning the world economy'' (Aziz, Mustapha, & Ismail, 2013).The three basic kinds of energy sources: fossil fuels, nuclear and renewable energy constitute the energy mix (Kolb, 2011). An example of a primary energy mix shows different kinds of energy sources essential to operate an economy (see Appendix A). The Estimated US Energy Use in 2011 illustrates how primary energy sources are distributed in a specific energy market. Around 40% of the primary energy goes to electricity generation and the rest for direct use.

Electricity is an example of secondary energy (European Nuclear Society, 2013) which is converted using primary sources such as conventional and renewable energy. Electricity, as an important energy commodity, is crucial to modern technologies and is considered to produce higher quality output (Ouedraogo, 2013). Electricity consumption demonstrated a significant growth over the past decade (Adom, 2011). Moreover, fuel costs in the production of electricity differ on what kind of fuel a power plant uses. The total costs of electricity production comprised of Capital-Related Costs, Operating and Maintenance (O & M) Costs, and Fuel Costs (Tester et al., 2005).

The basic illustration of electricity supply chain, from fuel requirements for electricity production to electricity consumption, shows how energy provides support to improve economic activities. Fuel requirements are a big portion of the primary energy source of a particular economy as shown in Appendix A. Coal is the huge contributor to the fuel mix. The Estimated US Energy Use in 2011 shows the emerging renewable energy such as geothermal, hydro, solar and wind as fuel for electricity generation.

The investigation of energy market focuses on the supply and demand of primary energy sources. The supply side of the market addresses the accessibility of energy sources which varies from region to region. Economies which are strategically located aim to transport their energy surplus to sustain economic growth and development. Table 1 illustrates six categories of energy in which some are consumed where it is being produced (e.g. hydroelectricity, renewables and nuclear) and the huge portion of other sources are transported to energy-deprived economies (Kolb, 2011). Further, the table shows the energy outlook in the year 2030 in which there is a significant reduction in the unhealthy energy sources and a slow increase in renewable energy where coal, natural gas, oil and derivatives still dominate the energy market.

Table 1 Percentage of consumption by fuel types, estimates of ExxonMobil and BP (Kolb, 2011)

	Exxon		BP	
	2010	**2030**	**2010**	**2030**
Oil and Derivatives	34.19	32.08	31.20	26.23
Natural Gas	22.13	25.79	22.38	24.21
Coal	25.30	21.07	27.66	24.77
Nuclear Energy	5.53	7.86	4.86	6.16
Hydroelectricity	2.17	2.52	6.11	6.42
Renewables	10.67	10.69	7.79	12.21
Totals	**100.00**	**100.00**	**100.00**	**100.00**
Oil + Gas + Coal	81.62	78.93	81.23	75.21

Source: BP, "BP Energy Outlook 2030," January 2011, London. Data are available at: www.bp.com. Accessed April 16, 2011 and ExxonMobil, "The Outlook for Energy: A View to 2030," 2010, p. 53. Categories were adjusted slightly to make them congruent. Note that ExxonMobil has a category "Biomass/Waste," which BP does not. This table combines "Biomass/Waste" as a part of "Renewables." Included here in "Oil and Derivatives" for BP are their sub-categories gas-to-liquid and coal-to-liquid.

Southeast Asia, is a region composed of developing countries, faces large growth in energy demand (Symon, 2004). Based on Asian Development Bank (ADB) report in 2013, Asia and the Pacific will increase its primary energy demand by 2.1% per year between 2010 and 2035 which is projected to be faster than the world average growth rate of 1.5%. Though dependent on oil imports, this region is abundant in renewable energy. According to the International Energy Agency Executive Director, Maria van der Hoeven, as global energy map is changing, Asian region needs to transform its energy market and explore energy capital venture to ensure sufficient investments within the region (IEA, 2013b). This calls for an integration of energy-related concerns between regions.

The Asia Pacific region, compared to other regions, displays 40% of the total primary energy consumption in 2012 which is equivalent to 4.7% increases from its energy consumption in 2011 (see Appendix B) which makes the region the top energy user. Other regions which displayed positive change in energy consumption from 2011 to 2012 are South and Central America, Middle East, Europe and Africa. On the other hand, North America, Europe and Eurasia experienced a slight reduction in consumption in 2012 (BP, 2013). The Pacific Islands are not strategically located for fossil fuels sources but are rich

in renewable energy sources (Mohanty, 2012). This region is highly dependent on imported fossil fuels.

The International Energy Agency (IEA) reveals that advanced economy aims security access to modern sources of energy while a particular developing country aspires for affordable and reliable energy services. The comparison of these two energy demand drivers differs on the economic stability of a country. As an economy is growing, it needs assurance that energy supply is accessible for longer period and access to available more advance energy is secured. On the other hand, developing economies seek for energy availability with consideration on price. Concerns on energy security falls on the demand side of the equation concerning the scarcity of resources (Blum & Legey, 2012).

The supply and demand of energy confronts challenges and opportunities since the oil crisis in 1973. This leads to government´s obligation to ensure the following (Symon, 2004, p. 239):

> *1.) That energy supply is provided to industries and households as efficiently, reliably, and as securely as possible*.
>
> *2.) That the environmental impact of supply is consistent with social and equity objectives, for example, promoting the supply of electricity to isolated rural areas*.

Concentration on the primary energy supply and how to allocate this in the energy industry of a country, government and private sectors are both aiming to meet energy demand. Amidst this struggle is the urge of energy investors to compete in the market. To be updated in this specific market, an increasing number of energy firms exercise a targeting strategy in which they focus more on their financial analysis, competitor intelligence and awareness of market trends (Simkin & Dibb, 2011) .

1.2 Energy Market

Energy is considered to be an important element of today´s society (Matias & Devezas, 2011) which makes understanding energy market trend vital. Energy market faced ‘‘… changing paradigms’’ (Goldthau, 2012) since the oil crisis in 1970s. The supply and demand of primary energy sources create challenges to all sectors, specifically the increasing energy use and its environmental impact. The increasing energy consumption is

the explanation caused by population growth, change in lifestyle and income growth (ADB, 2013b). Along with the increase in demand are the environmental challenges (Liu, 2005), as energy use is a major source of carbon dioxide (CO_2) emission (Bhattacharyya & Ussanarassamee, 2004). The need to meet energy demand and its environmental impact generates new energy market opportunity. This transition in the energy market is referred to as *green development* (Mohanty, 2012). It focuses on diverting into a more sustainable energy mix, deviating dependency from oil, coal and natural gas. Considering this market change, coal is still the largest component in energy mix (IEA, 2012).

The entry of green development in the global energy market share is one of the energy market challenges. It will take long-term market penetration for green development (Duke & Kammen, 1999). Using the current energy infrastructures does not require huge investments whereas transforming to a sustainable technology for utilizing renewable energy to the production of energy-related services would require large capital. Energy investments may offer a promising venture (Peretz, 2009), however, there is a need for risk management strategies to best predict investment results (Panella, Barcellona, & D´Ecclesia, 2012). Furthermore, scenario analysis on energy market will provide options on which path energy venture will go with estimated consequences ahead. But despite these challenges in the market, more countries are shifting to green development. As of 2010, over 100 countries redesigned their energy policies in favor of renewable energy (Mohanty, 2012). Hence, the 1973 energy crisis motivated countries such as the United States (Grossman, 2009) and the Philippines (Catigtig, 2008) to concentrate on the development of alternative energy sources.

The environmental impact of using fossil fuels and high energy demand cause energy market to develop energy technologies to substitute conventional energy resources. As the market deals these challenges, the ‘‘voluntary market action is insufficient to develop new energy sources’’ (Grossman, 2009). The insufficient market action to make the transition possible may lead to market failure. Makin (2009) argued that the best way to understand market is to understand the internal environment of the industry. It is the analysis of the market success, how competitive the market is. The fewer the players in a given market, the higher the risk for price manipulation.

The possibility of market failure questions the role of the government. The government is responsible in setting policies which will enable the market to work

accordingly. However, the intervention of the government might also harm a given market which is referred to as government failure, it is … ‘‘when government has created inefficiencies because it should not have intervened in the first place or when it could have solved a given problem or set of problems more efficiently, that is, by generating greater net benefits’’ (Winston, 2006).

The transition of energy market to address the environmental impact of using conventional energy sources and meet the increasing energy demand needs to understand the possibility of insufficient market action (Grossman, 2009), price manipulation (Makin, 2009) and government failure (Winston, 2006) in the market.

For the purpose of this study, Philippine energy market will be discussed thoroughly and challenges and opportunities of the energy sector will be investigated. The objective of the next section is to provide an overview about the country and its energy infrastructure

1.3 The Philippines

The Philippines, as a member of the ASEAN, is considered to be one of the emerging markets (Forbes, n.d.). Philippines is a 1,107 island country divided into 3 major regions – Luzon, Visayas and Mindanao. Manila is the capital city located in Luzon. With an estimated population of 11.9 million in 2011, the population is projected to rise by 37%, making it the 13th largest urban conglomerate in the world in 2025 (UN, 2012). Visayas and Mindanao regions follow closely, when it comes to the increase in the population, after Luzon. These two regions are the homes of the over 50 million Filipinos.

Table 2 shows an increasing population in the country by 17 to 20% since 1990. With 17% increase rate for the next 10 years, the country may reach over 100 million populations in 2020.

Table 2 Philippine Population 1990-2010 (NSO, 2012)

Census Year	Census Reference Date	Philippine Population (in million)
2010	May 1, 2010	92.34
2000	May 1, 2000	76.51
1990	May 1, 1990	60.70

Colonial mentality has been a huge factor for the government to develop and implement policies in respect to *economic globalization* (Barker, 2005). From 1979 to 2003, the country showed tremendous diversification of its export products from 49% of agro-based to 67% of electronics exports, respectively (Tongzon, 2005). The decline in agricultural export products from 1985 to 2011 as illustrated in Appendix C shows no huge improvement in the industry. Furthermore, Central Intelligence Agency data in 2013 illustrates Philippines GDP which generates from the country´s service sector (57.1%), industry (31.1%) and agriculture (11.1%).

The huge diversion of exports products from an agro-based to electronic venture can also be explained by the political transition of the country during this particular era. The defense mechanism of the Philippines to battle against global economic crisis and other external environment chaos can be seen in how the government faced these challenges. In the oil crisis in 1973, the Philippines opted to divert its attention to utilize its sustainable sources of energy. Though the change was not done overnight, the oil crisis way back then served as the motivation for the government to modify its energy policy (Catigtig, 2008). The build-operate-transfer scheme, which is designed for the energy sector, transportation and port projects, and telecommunications, encourages both local and foreign investors to participate in these ventures (Sicat, 1998).

During the economic crisis, which hit Asia in the middle of the 1990s, the Philippines experienced two presidential elections – the 1992 (Ramos Administration) and 1998 (Estrada Administration) Presidential Elections. Ramos administration concentrated more on *liberalizing reforms* while Estrada had less confrontation on the *structural problems* (Heeney, 1999). Despite this political transition, the country addressed Asian economic crises better compared to its neighbors. The Philippines shows progress in terms of financial development, specifically designing financial support to low-earners citizens, for example, 774 rural banks in the scattered in the country and 5.486 non-bank financial institutions (Seibel & Felloni, 2005).

The strong foundation of the Philippine banking system was crucial element in facing the regions´ financial crisis (Sicat, 1998). The General Banking Law of 2000 emphasis the Bangko Sentral ng Pilipinas (Central Bank of the Philippines) as the sole authority in the implementation of a *strong, safe and sound banking system*, eradicating the

power of the Philippine Deposit Insurance Corporation (Morales, 2002). The banking system of the country limits housing loans even in the midst of its property boom in the early 1990´s. A study shows 10.9% (is regarded for the real estate sector) of the total loan portfolio of the 21 banks participated in the survey which is considered to be relatively low in the international standard (Sicat, 1998).

With the overview of the Philippines projected population growth, technological development, housing boom, the support of the country´s energy sector will also be examined to present the importance of energy in the economic growth.

1.4 Philippine Energy Infrastructure

In 2012, the Department of Energy (DOE) in the Philippines illustrated the country´s primary energy source which is composed of oil, geothermal, coal, biomass, natural gas, hydro and other renewable energy as reflected in Figure 1. The Philippines consumed almost half of its coal production, approximately 19 million short tons in 2012 (EIA, 2013), and has been historically dependent on oil imports (Catigtig, 2008). The country´s primary energy demand changed slightly from 38.8 million tons of oil equivalents (Mtoe) from 2002 to 40.5 Mtoe in 2010 (ADB, 2013b). In 2010, the total power generation by source is 67,943 Gwh (see Appendix D) which is equivalent to 8.32 Mtoe using general converter for energy (IEA, 2013a). This translates to 21 % of the primary energy demand from ADB 2010 report. In addition, Appendix D also displayed an increasing energy demand for power generation by source annually with the highest increase of 12% in 2010.

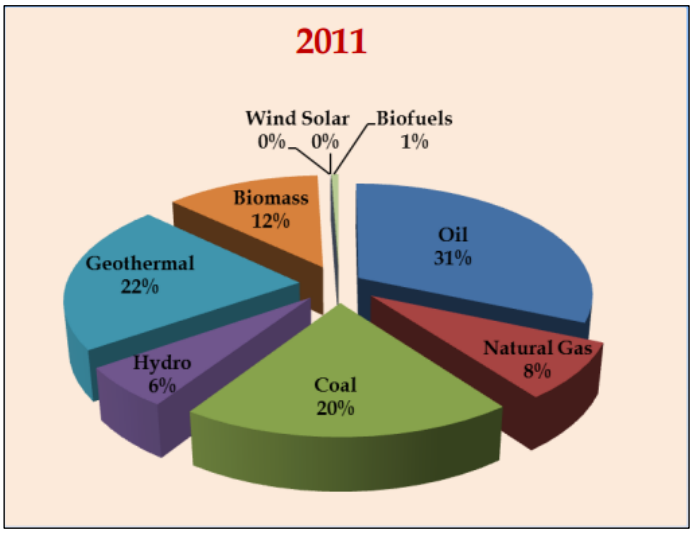


Figure 1 Philippine Primary Energy Supply (Petilla, 2012)

The Philippines is rich in natural resources. It is strategically located where renewable energy sources, such as biomass, geothermal, hydro, solar, and wind, are available. According to British Petroleum, the country is the second largest in geothermal production with 2.0 GW capacity in 2012 (BP, n.d.): a 50% of its potential capacity (see Table 3). Solar power is also accessible which the Philippines generates 5kWh/m^2/day of energy in addition to its hydropower capacity, biomass and other sources of energy in a tropical nation (Bakhtyar, Sopian, Zaharim, Salleh, & Lim, 2013). The potential capacity for grid use by fuel is a big opportunity for renewable energy venture specifically for ocean energy, wind and solar, The Department of Energy (DOE) plans to increase renewable energy – power based capacity to 15,304 MW by 2030 (KPMG, 2013).

Table 3 Renewable energy potential by renewable energy source (KPMG, 2013)

Fuel Type	Potential Capacity, Grid Use (in MW)
Hydro Power	10,000
Ocean Energy	170,000
Geothermal	4,000
Wind	76,600
Solar	5kWh/m^2/day
Sugar cogen, rice husk, and coconut revenues	500

In December 2012, DOE awarded a total of 325 renewable energy projects for hydro power, ocean energy, geothermal, wind, solar, and biomass as illustrated in Table 4. The additional potential capacity of 5,683 MW from these projects is a step towards DOE plans for 2030.

Table 4 Awarded projects under Renewable Energy Law (KPMG, 2013)

RESOURCES	AWARDED PROJECTS		POTENTIAL CAPACITY MW		INSTALLED CAPACITY MW	
	Grid-Use	Own-Use	Grid-Use	Own-Use	Grid-Use	Own-Use
Hydro Power	165		2,606.70		123.22	
Ocean Energy	3		5.00			
Geothermal	33		785.00		1,902.69	
Wind	39	1	1,569.00	0.006		
Solar	33	2	497.715	0.62		
Biomass	27	22	186.30	32.70	199.35	182.78
Sub-Total	**300**	**25**	**5,649.715**	**33.326**	**2,145.26**	**182.78**
TOTAL	**325**		**5,683.041**		**2,328.04**	

Source: http://www.doe.gov.ph/summary-of-projects/1879-summary-projects-december-2012

On the other hand, there are 193 pending projects for renewable energy resources which have a total potential capacity of 2,567 MW. From the data, both in table 4 and table 5, the total projects proposed and the number of projects approved showed 92 % of the proposed potential capacity in geothermal projects have been approved, ocean energy´s 5 MW project received full support; compared to hydro power (57 %) , wind (78 %), solar (90 %) and biomass (68 %) projects approved. In total, 69 % of the proposed renewable projects have been awarded in 2012.

Table 5 Pending projects under Renewable Energy Law (KPMG, 2013)

RESOURCES	AWARDED PROJECTS		POTENTIAL CAPACITY MW		INSTALLED CAPACITY MW	
	Grid-Use	Own-Use	Grid-Use	Own-Use	Grid-Use	Own-Use
Hydro Power	137		1,917.41			
Ocean Energy	2					
Geothermal	5		60.00		-	
Wind	23		442.00		33.00	
Solar	16	1	57.83	0.02		
Biomass	7	2	88.40	1.05	16.70	-
Sub-Total	**190**	**3**	**2,565.64**	**1.07**	**49.70**	**-**
TOTAL	**193**		**2,566.71**		**49.70**	

Source: http://www.doe.gov.ph/summary-of-projects/1879-summary-projects-december-2012

Moreover, the Philippines, as shown in figure 2, displayed over 25% decline on the conventional energy sources in the total primary energy consumption since the oil crisis in 1973. The decline could be the result of the emerging renewable energy in the primary energy supply. There was slight change in renewable energy consumption using geothermal, hydro, biomass, solar, etc. The pentration of green development in the demand side of the energy market progress slowly over the past 3 decades. The country is still in the verge of developing its energy structure to adapt to a sustainable energy industry.

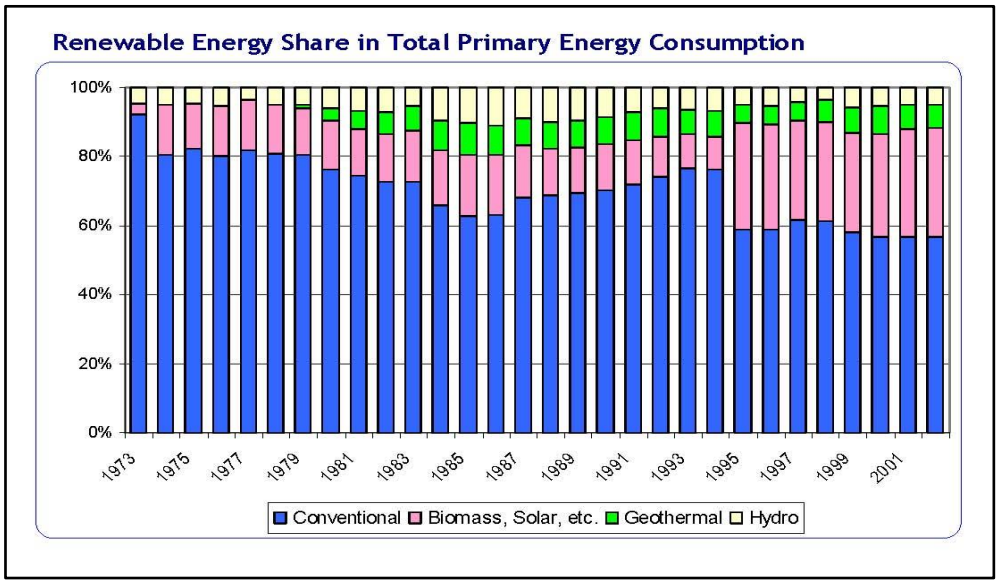


Figure 2 Renewable energy share in total energy consumption in the Philippines (Department of Energy)

The 25% decline in the consumption of conventional energy sources does not correlate to the carbon emission in the country. Though the total primary energy consumption illustrated a significant decrease on the conventional energy source, carbon emission increased dramatically as well. Since 1973, Philippine carbon emission has increased significantly as shown in figure 3. The carbon emission data in figure 3 reflected only through the consumption of oil, gas, and coal. It is based on the standard global average conversion factors which were done by the British Petroleum in 2013. The carbon emission of the Philippines in 1973 was 29.5 Mtoe and it reached to 84.2 Mtoe in 2012. It has increased to over 60% for the last 3 decades.

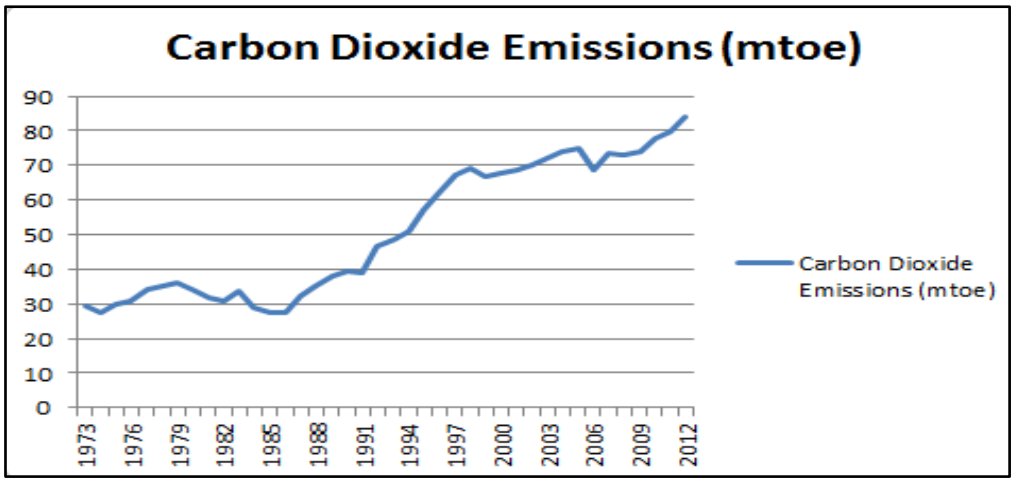


Figure 3 The Philippine carbon emission, 1973-2012 (BP, 2013)

Furthermore, the contentious of energy infrastructure in the Philippines is mostly driven by its electricity sector. Along with the restoration of Philippine democracy in 1986, the country shows economic progress in which electricity is needed (Sharma, Madamba, & Chan, Maria Rosario L., 2004). With President Corazon Aquino´s administration, the Philippines experienced major electricity crisis due to generating capacity shortage in 1988 (Toba, 2007). Aquino´s administration realized the need for deregulation of the electricity sector to help recover the economy (Santiago & Roxas, 2010).

Figure 4 illustrates a sample of electricity supply chain. There are different players in each sector. In the production of electricity, fuel may derive from conventional fossil fuel or renewable energy sources. Electricity will be transmitted to the transmission grid and to the distribution sectors. The end-users are commercials, residential, industries, and agricultural sectors.

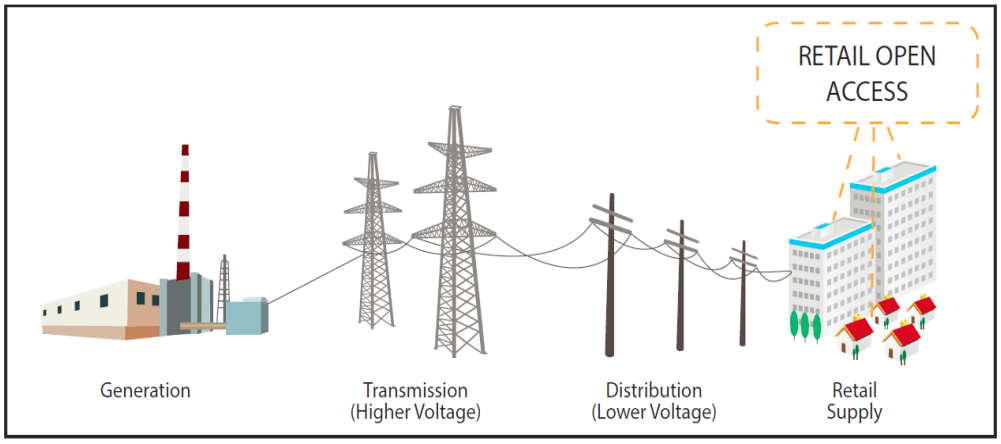


Figure 4 Electricity supply chain (KPMG, 2013)

In the Philippines, the electricity supply chain is dominated by the National Power Corporation (NPC) where it holds the operation of the generation and the transmission in the early 1970s as reflected in Figure 5. The monopoly of the electricity infrastructure led to market failure because NPC failed to deliver efficient supply in the early 1990s which was the result of ‘‘underinvestment’’ (Cham, 2007). The excessive borrowing from international financial institutions by the NPC to finance the generation of electricity was also greatly affected by the depreciation of Peso in the 1983 economic crisis (KPMG, 2013). According the report of KPMG in 2013, NPC´s debt reached $16.39 billion in 2001. As the Philippines has been dependent on imported fossil fuels, it was difficult to sustain the supply of fuel to the production of electricity when the Peso was weak.

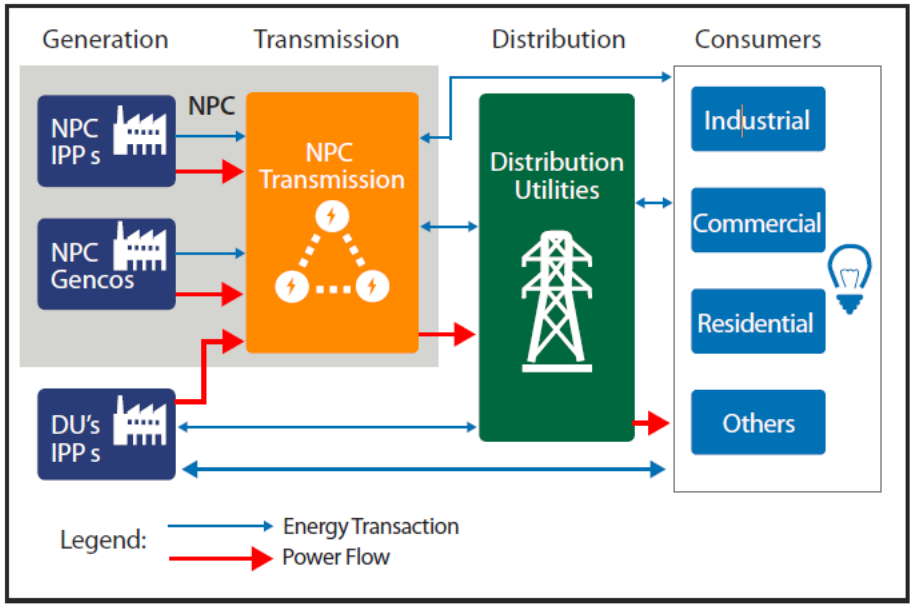


Figure 5 Pre- EPIRA Industry Structure (KPMG, 2013)

There was a need for the country to reconstruct the electricity framework which required government intervention. The purpose of the transition is to attract investors for the generation of electricity and provide freedom to choose for end-users (Sharma et al., 2004). It was only in 2001 that the electricity reforms commenced by privatization and restructuring, see Figure 6. Republic Act 9136, also known as the Electric Power Industry Reform Act (EPIRA), was introduced on June 8 2001 (Mendoza, 2008). NPC and the National Transmission Corporation (Transco) are government-owned entities and both

control the generation and transmission respectively (Blank, Gegax, & Widner, 2012). The introduction of EPIRA encourages private companies to participate in the electricity generation through long-term contracts also known as the independent power producers (IPPs) which contributed to the solution to address the crisis in the electricity sector (Toba, 2007).

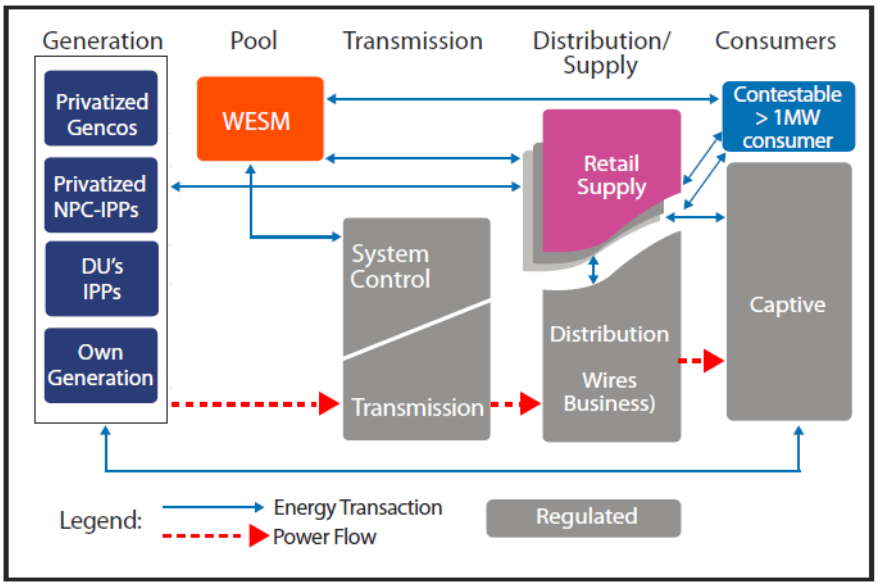


Figure 6 Post-EPIRA Industry Structures (KPMG, 2013)

EPIRA was considered as the most comprehensive piece of legislation in Asia by ADB (Santiago & Roxas, 2010). Mendoza (2008) underlined the purpose of EPIRA as follows (Mendoza, 2008, p. 42) :

1. *Ensure transparent and reasonable prices of electricity in a regime of free and fair competition and full accountability;*
2. *Provide for an orderly and transparent privatization of the assets and liabilities of the National Power Corporation (NPC); and*
3. *Establish a strong and purely independent regulatory body and system and enhance the competitive operation of the electricity marker (Section of RA 9136)*

The formulation of EPIRA is an approach to establish the following under the supervision of DOE (Santiago & Roxas, 2010, p. 53):

1. *National Transmission Company (Transco), to assume the transmission function of the state-owned monopoly NPC;*
2. *The privatization of NPC assets, including Transco;*
3. *The creation of the independent, quasi-judicial entity called the Energy Regulatory Commission (ERC) to ensure a transparent, competitive, and reliable electricity market;*
4. *The creation of Small Power Utilities Group (SPUG) under the NPC to provide electricity to those not serviced by the national grid as well as to absorb the remaining unsold assets of NP;*
5. *Wholesale Electricity Spot Market (WESM) was mandated to be established within one year;*
6. *The implementation of open access and retail competition within three years subject to pre-set conditions.*

The Philippines has improved its access to electricity to approximately 50% of the population in 1993 (Sharma et al., 2004) and 75% of the total national household in 1997 (Toba, 2007). Currently, 97% of the urban population has access to electricity whereas only 65% of the rural population enjoys electricity use (Bakhtyar et al., 2013). The geographical challenge of the nation to cater electricity to those remote areas, as showed in Figure 7, hindrance the improvement to boost its electricity supply to small islands in the country. Figure 7 illustrates the three major transmission grids represented by its 3 regions – Luzon, Visayas and Mindanao; its region source of power and other market factors (Roxas & Santiago, 2010). The electricity reforms in 2001 may attract foreign investors to participate in the market to improve power generation source in each region.

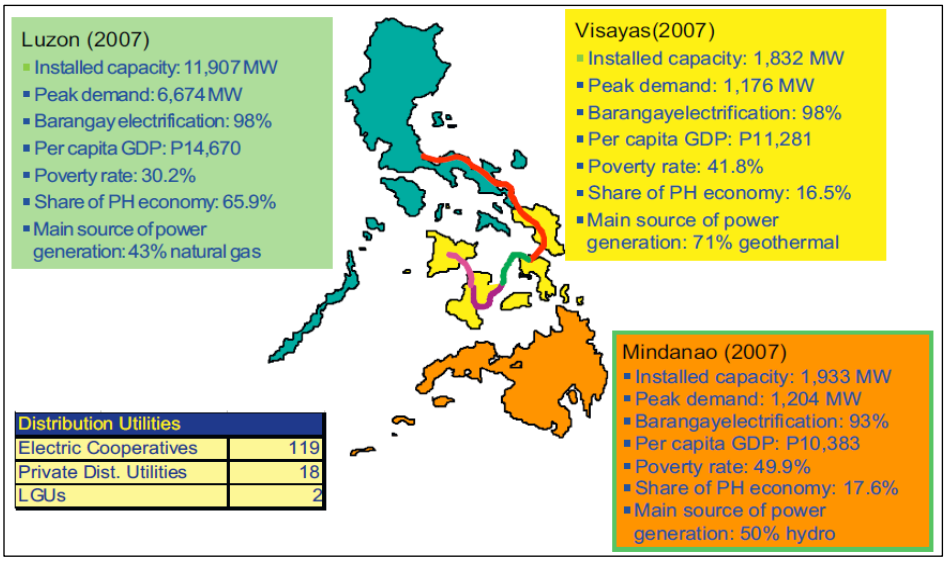


Figure 7 Philippine grids and comparative information. Source: 2009 Clean Technology Fund and Country Investment Plan, Philippines (Roxas & Santiago, 2010)

The political change in 1986 resulted to a huge change in fuel mix for power generation, as shown in Figure 8. Though it took more than 2 decades for energy transition to be possible in the country, it created a large shift from coal powered power plants to a more sustainable technology. In 1998, electricity generation by fuel comes from oil (47%), imported coal (19%), local coal (4%), geothermal power (20%) and hydropower (10%) (Toba, 2007). Over a decade, the Department of Energy reported that in 2011, fuel input mix for power generation comes from 53% renewable energy (see Figure 8). This is composed of geothermal (41.4%), hydro (11.4%) and biomass (.2%). This change leads to a more sustainable energy sources for the electricity production. In addition, the new market trend for energy use in the Philippines is the *Green Energy Option* which allows end-users to choose their source of electricity (Katz, 2012).

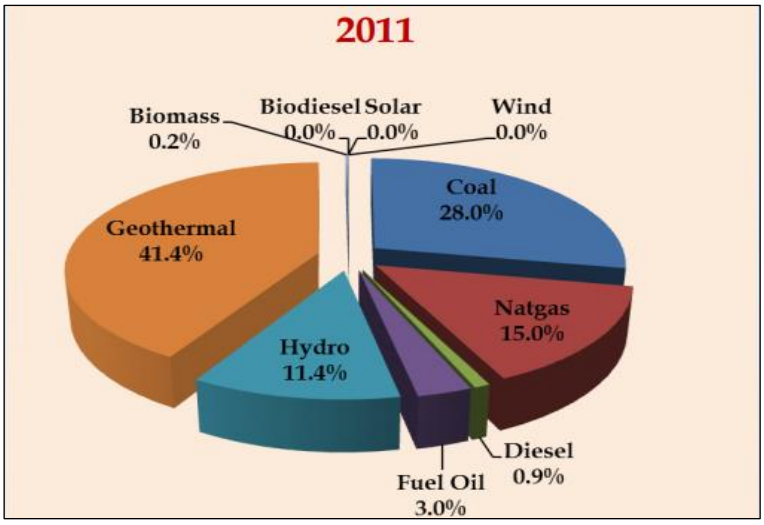


Figure 8 Philippine Fuel input mix for power generation (Petilla, 2012)

Furthermore, the Philippines experienced economic growth recently despite political instability (Rafiq, 2011). Asian Development Outlook reveals a forecast of 7% and 6.1% GDP growth for 2013 and 2014, respectively. In the third quarter of the year 2013, the Philippines suffered major several calamities. ADB stated that this will only ‘‘moderate rapid growth in the country before major reconstruction gets under way’’ (ADB, 2013a). In addition to the political and natural disasters challenges, the country also deals with ‘‘power rates and lack of technical capabilities’’ (Katz, 2012).

1.5 Problem Statement

The fast innovation of technology, globalization, population growth and change in lifestyle of people are factors which make energy a very important commodity. Energy serves as fuel to electricity production and direct use to residential, commercial, industry and the transportation sectors. Electricity use is intertwined with the improvement of the economy.

In the Philippines, major energy infrastructure is still owned by the dominant wealthy families (Roxas & Santiago, 2010). Though the electricity reforms have been the focus of the government since 2001, market penetration for a more sustainable energy sources is still a big challenge. The Philippines has ‘‘high potentials for reinforcing renewable energy’’ (Bakhtyar et al., 2013) but its political conflicts may disturb future energy policymaking such as the REM (Renewable Energy Market) which is expected to take place in 2014 (Katz, 2012). This could affect attracting foreign energy investors who

are essential to safeguard sustainability in this sector (Roxas & Santiago, 2010) as renewable energy requires huge capital investments (Katz, 2012). Furthermore, Figure 9 highlights the projection through 2035 on population and GDP (left) and the final energy demand (right) by ADB. Final energy demand in all sectors shows increasing pattern throughout 2035.

The Philippines is facing increasing demand on energy in the years to come which ADB (2013) suggested that the government needs to formulate measures on energy savings mainly in transport, residential and commercial sectors. In 1973 to 1997, the country increased its self-supply of total energy mix from 8% to over 40% respectively (Toba, 2007). However, with the increasing demand in energy to 2035, as shown in Figure 9, the Philippines might need to increase its import energy such as oil and coal to meet demand (ADB, 2013b). There has been ‘‘ regulatory delay’’ for the EPIRA to take effect (KPMG, 2013) which already cause the country opportunity cost for the production of electricity which also created problems in addressing the increasing electricity demand, as well.

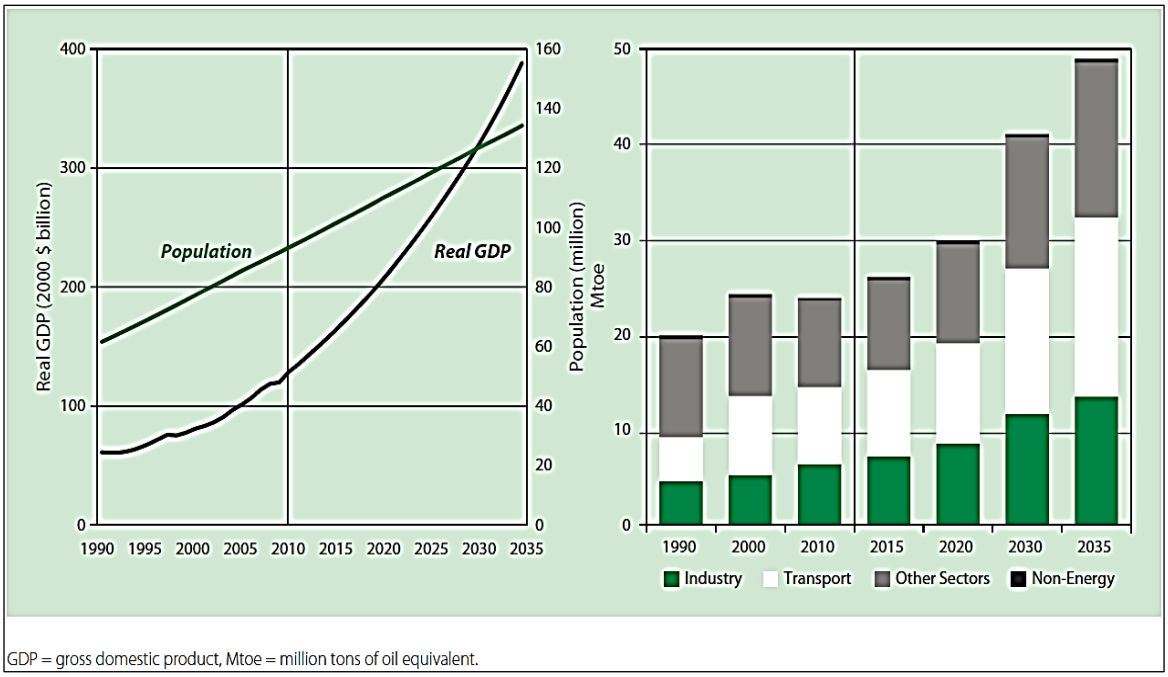


Figure 9 Philippine population and GDP (left) and final energy demand (right): Business-as-Usual (ADB, 2013)

As much as the Philippines needs to ensure energy supply, it is also important to address energy conservation in order to face the increasing final energy demand. In addition

to energy savings, energy efficiency should be addressed with the concentration on the production of electricity: because of its more technical in nature that may produce higher system loss than the distribution sector (Blank et al., 2012). Moreover, one of the many challenges in the political intervention to the energy industry in the country is energy price as it is diagnosed as politically manipulated Bowden & Ellis (1995) and Sharma et al., (2004). The target to divert to renewable energy for energy source mix risks higher energy price issues. The development and utilization of the untapped renewable energy sources requires huge capital investment which could be shouldered by the end-users. The government needs to accelerate investments and attract both local and foreign investors (Bakhtyar et al., 2013).

This study focuses on the Philippine energy market and its main objective is to provide alternative scenarios that help predict bandwidths for energy prices and some key factors in the external environment of the energy industry in the country. Research questions in the form of propositions based on literature review will be stated in chapter 2.

Specifically, this paper aims to answer the following questions:

1. Does energy market failure exist in the Philippines?
2. Is there price manipulation in the Philippine energy market?
3. How important is government intervention to the Philippine energy market?

1.6 Scope and Limitations

Every country has its own energy industry specifications. This study does not concentrate on the global energy market, rather, it specifically investigates the Philippine energy market and will investigate the political, economic, social, technological, legal and environmental (PESTLE) aspects, as well as, the driving forces of the energy industry in the country in order to conduct scenario analysis. The scenario analysis will be useful to distinguish the challenges and opportunities of the energy market of the country.

This study is focused on the importance of primary energy sources and is limited to a primary analysis of electricity value chain because of its importance to economic growth and development.

This study will not concentrate on the external evironment of the country. The influence of the increasing price of oil in the global market will be mentioned for the

purpose of providing an overview of how the country took action on analysing its own energy resources.

Using Delphi method, 8 panel of experts from both from the Philippine energy industry and multilateral companies provided their expertise. They were requested to reject or rewrite hypotheses. The data gathering was done in, approximately, one month.

1.7 Theoretical Framework

The importance of understanding energy market is very much related to understanding Hilletofth (2011) demand-supply chain management (DSCM): DSCM theory is used to determine the challenges and opportunities of the Philippine energy market by analyzing factors affecting the demand and supply of energy. Hilletofth (2011) identified the main elements of DSCM which includes the following: market orientation, coordination of the demand and supply processes, viewing the demand and supply processes as equally important, value creation, differentiation, innovativeness, responsiveness, and cost efficiency in the demand and supply processes (Hilletofth, 2011) . Examining energy through DSCM will serves as the basis for strategic management for energy companies.

Strategic management requires analysis on business company´s strength and determining the external and internal factors that will guide the company to future scenarios (Isoherranen, 2012). Strategic management components as illustrated in Figure 10 are based on the study conducted by Johnson and Scholes (1993). Isoherranen (2012) distinguished each component purpose to company´s decision making process where strategic analysis refers to evaluating the internal capabilities of a company; strategic choice involves company´s decision on what path it will take considering all other options. On the other hand, strategy implementation is generating the necessary steps to make things happen.

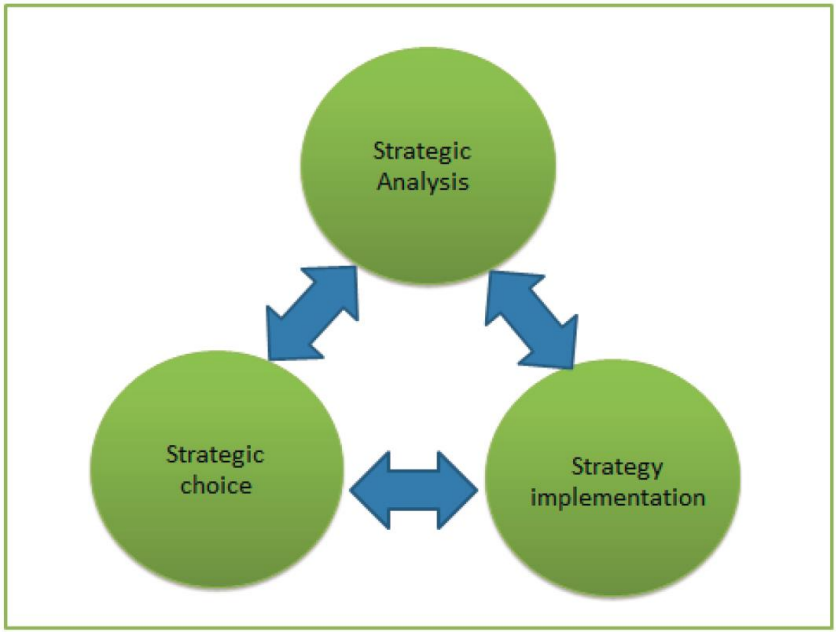


Figure 10 Strategic management components, based on Johnson and Scholes 1993 (Isoherranen, 2012)

To provide scenario analysis for the Philippine energy market, essential variables which constitutes the energy market will be distinguished. This process will focus on the role of each variable to the future of energy market in the Philippines. An examination of the Philippines internal environment shows an economic growth despite its political instability.

DSCM of energy is an important concept when discussing variables affecting economic growth and determining requirements that would benefit the Philippine economy. By distinguishing these variables, a particular proposition will be presented and analyzed by energy experts using Delphi method.

2. Literature Review

This chapter aimed to review related studies on energy. Specifically, discusses the concern on energy consumption and its effect to economic growth, human development and environment. The researcher examined the role of energy conservation, energy efficiency and energy price in connection to energy consumption. Furthermore, theoretical foundation on the challenges and opportunities for the energy market in the form of propositions was established based on these studies.

2.1 Energy Consumption and Economic Growth

The importance of energy to humankind is ‘‘undeniable’’ (Rafiq, 2011). Thus, people´s basic needs, medical support, food sector, housing industry, are highly dependent on energy accessibility. Notably, developed countries aim to secure access on ‘modern renewable energy‘ (Bilen et al., 2008). On the other hand, developing economies strive for affordable option.

Azlina (2012), Toman & Jemelkolva (2003), Graus, et. al. (2011) and Blum and Legey (2012), illustrated the value of energy to all sectors, both the supply and the demand side. The need in understanding energy market is vital to policymakers, governments and energy investors. The fast pace of technological changes causes energy as the ‘‘… crucial policy prescription’’ (Goldthau, 2012). Energy development (Azlina, 2012), GDP and population growth (Moshiri, Atabi, Panjehshahi, & Lechtenböehmer, 2012) are three major drivers for energy demand. In the case of developing countries, there is still a need on accessibility to energy supply. The government active role on these findings is important because energy development is an essential element of economic development (Toman & Jemelkolva, 2003). Moreover, there is a need to ensure affordable and environmentally-friendly energy to maximize sustainable development (Blum & Legey, 2012).

Masih & Masih (1997) conducted a study on energy consumption and its relationship to real income using price as third variable for highly energy-dependent economies. Findings showed a positive relationship between energy consumption and real income. Hence, an increase in energy consumption is directly related to economic growth

in the long-run. The multivariate co-integration / vector error-correction approaches and Engle-Granger two-step procedure were used to find out the long-run relationship of certain variables. The results showed significance on income, prices, and energy consumption at 5% significance level or higher for these two countries.

Remarkably, the study proved that in two energy-dependent economies, the rate of price change affect energy consumption which will have an impact on economic growth. With this new result, findings from several previous studies on the causal relationship of these two variables were cross-examined.

Soytas and Sari (2003) conducted a study on the causal relationship of energy consumption to several variables. Findings showed that in the long run, energy conservation may harm economic growth in the G7 countries which explained that the performance of a country could be greatly affected by the decrease in energy consumption. A study was conducted among 16 Asian countries in 2008 using Granger causality. It showed that energy consumption resulted a significant effect to GDP in the long run, but not vice versa both in short run and long run (Lee & Chang, 2008). This indicates that high demand in energy may improve economic growth.

Recently, Apergis & Tang (2013) investigated the validity of energy-led growth hypothesis using bivariate, trivariate and multivariate models. The causal relationship of energy consumption and economic growth was tested on 85 countries including the Philippines, a country classified as a lower-middle income economy. The result showed that there were 46 countries strongly support the energy-led growth hypothesis and more prevalent in high and medium income countries. Result showed that the causal relationship of energy consumption and economic growth, concluded that energy conservation may harm economic growth specifically on middle to high income countries (Apergis & Tang, 2013).

Similarly, Azlina (2012) conducted a thorough study on the causal relationship of energy consumption and economic development in Malaysia. Result showed that economists failed to consider the significance of energy both in the supply and demand side of the equation which effected to inadequacy of the general agreement among economists. Energy utilization has been examined as to what enable the increase. The focus was done mainly on the effects of development to energy consumption (Toman & Jemelkolva, 2003). The transition of energy utilization may define as harnessing from biological sources and

human effort, intermediate stages which include commercial fossil energy, to most advanced stages of development (Azlina, 2012). This progress is imputed as energy development. It is the increase availability and use of energy services (Toman & Jemelkolva, 2003). Significantly, there is a positive cointegration relationship between electricity consumption and Human Development Index (Ouedraogo, 2013) which in effect contributes to the increase energy consumption that leads to the improvement of the whole economy. In conclusion, modern energy has direct impact on productivity, health, education and communication. Thus, the relationship between energy, economic activity and other variables change significantly as an economy goes through the process of development (Toman & Jemelkolva, 2003).

2.2 Energy Conservation vs. Economic Growth

The concern on global warming caused by the increase of energy use has been a challenge in the energy sector. An increase in energy consumption may increase carbon dioxide emissions. As mentioned earlier, energy consumption has a positive causal relationship to economic growth, energy conservation would then detriment the latter (Apergis & Tang, 2013). Policymakers and governments deal this crisis on energy utilization impact to environment and the scarcity of resources (Ouedraogo, 2013), putting in mind the implication of reduction in the growth rate of energy to growth rate of GDP in the long run (Kronenberg, 2010).

The industrial sector in the United Sates accounted for 37% of the country´s primary energy in 1997 (Worrell & Price, 2001), an increased by 30% for residential buildings and more than 65 % in commercial buildings from 1978 to 2004 (Harris et al., 2008). The increasing rate of energy utilization for developed countries such the US over a period of time explains the increasing demand for energy. This growth in energy use redirects the attention to energy conservation. A thorough examination of the latter is vital for continuous economic growth advantages. Previous studies mentioned in this paper, outlined the outcome of energy consumption to the advancement of an economy. There should be proper administration on how to handle energy conservation. The management of energy consumption raises the question on the solution of energy efficiency and energy savings vs. renewable energy. Energy efficiency is regarded as the ratio between service

output or result and the energy input required to provide it while energy savings is the reduction in the use of energy (Pérez-Lombard, Ortiz, & Velázquez, 2013).

Energy efficiency has been treated as a means for energy conservation (Harris et al., 2008). It is acquired through developed technologies. The intercession of technical change to the current energy infrastructure and the existence of energy-dependent household's appliances and commercial equipment are the fundamental of energy efficiency. However, policy scenarios on efficiency shows the lack of improvement in the implementation of practices and technologies (Worrell & Price, 2001). Furthermore, energy efficiency is regarded as a course of action to slow the growth of increasing demand of (Harris et al., 2008). It is basically more on the supply side of the equation in the market. Energy efficiency is the design of technology to use more of the energy requirement to operate in order to produce energy services rather than put it into waste.

Bashmakov (2009) conducted a study on resource of energy efficiency in Russia specifically focused on the importance of technical change, from the design of houses to energy consumption for electricity production, to promote responsible energy consumption and environmental effects. The assumption of both reduction of energy use and energy efficiency, by the intervention of technical change, will potentially result to a 50% carbon dioxide (CO_2) emission reduction of the Russian 2005 emission which is equivalent to 793 million tons of CO_2. This huge potential CO_2 emission reduction for Russia is not only the outcome of its energy infrastructure advancement but requires the participation of all sectors. Figure 11 illustrates the energy efficiency of Russia´s primary energy consumption in 2005, with the injection of modern technology. Study revealed that the potential reduction exceeds the joint annual emission of UK and the Netherlands which also an equivalent to 2, 9% of the global energy-related emission. This enormous reduction through technical change signifies the implication of energy used, decreasing energy loss in the system.

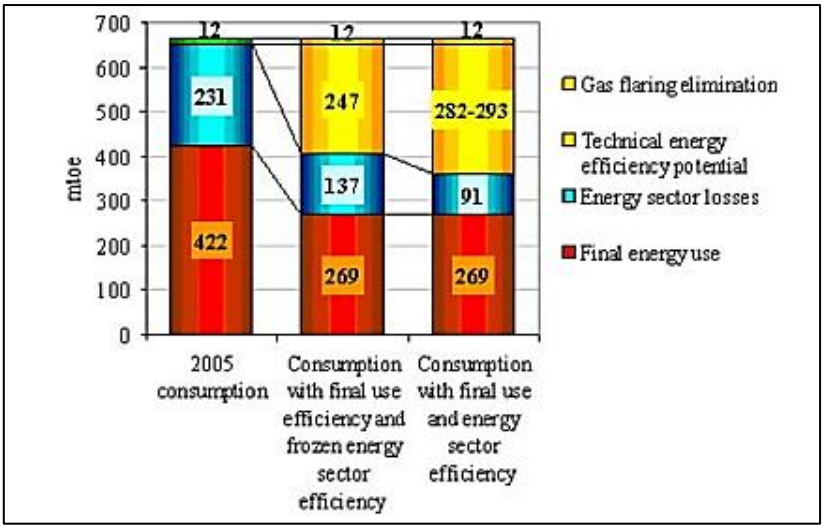


Figure 11 The energy efficiency resource (golden zone). The scale of Russian primary energy consumption reduction induced by the complete implementation of technical energy efficiency potential (Bashmakov, 2009)

Moreover, energy efficiency using conventional primary energy sources still contributes to greenhouse gas emissions. Figure 12 shows the global primary energy consumption between 2005 and 2050 which emphasizes the increasing rate of energy consumption by sectors. Thus, by looking at this illustration, there is an important focus on how to address the environmental effects in relation to the increasing energy use. Energy use constitutes around 75% of the global greenhouse gas emissions (Graus et al., 2011b). In this case, energy efficiency is not enough to control energy consumption (Harris et al., 2008)which may lead to reduction of CO_2 emission. In the concentration of reducing emission, an implementation of carbon capture and storage (CCS) has been intensely explored globally (Hardisty, Sivapalan, & Brooks, 2011). This modern technology is an added value to fossil-fired power plants. However, this technology advancement will result to an increase of 1.7-3.8% primary energy in 2050 (Graus et al., 2011b) due to the implementation of CCS which will reduce energy efficiency and will require an additional amount of energy to operate the plant, added Graus et.al. (2011). Hence, CCS contributes to the increase of energy consumption. This lead to an alternative renewable energy to scale down global CO_2 emission (Hardisty et al., 2011).

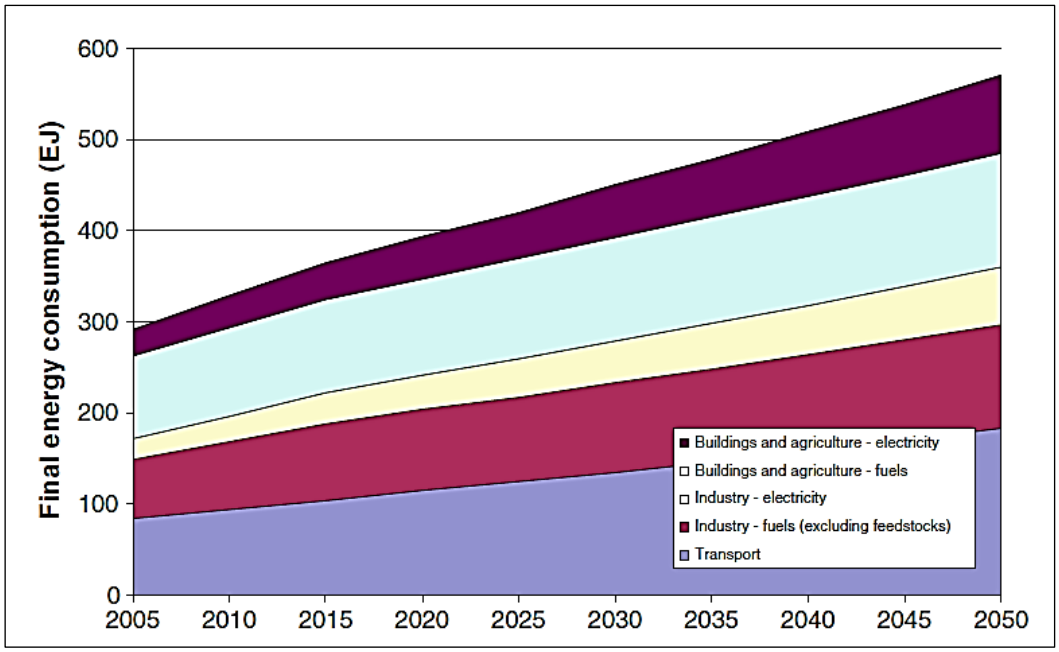


Figure 12 Global final energy demand (EJ) per sector (Graus, et.al., 2011)

2.3 Energy Efficiency and Renewable Sources

To reduce environmental effects caused by energy use, the balance between increasing price of imported oil and the joint force of energy efficiency and renewable sources has been the issue in many economies.

Renewable energy plays an important role in the primary energy mix to improve the environmental effects of the increasing energy consumption. Herzog, Lipman, Edwards, & Kammen (2001) investigated the impact of renewable energy on the development of energy and environmental issues suggested that renewable energy investments are feasible and have positive effects on economic growth and the environment. Emerging renewable energy sources reduced the dependency on imported fossil fuels, as well as, emission of carbon dioxide.

Asia has been the center for renewable energy development and investments. However, though the region has abundant resources, it is challenged by the lack of technology and financial investments. Curnow, Tait, & Millar (2010) identified barriers in investing in Asia for renewable energy projects which includes: difficulties in achieving cost-competitiveness, a lack of financial familiarity, resource intermittence, and project and technology performance risks. Furthermore, Gupta & Ivanova (2009) identified concerns

on promoting energy efficiency citing that ‘‘…energy efficiency global governance framework is diffuse’’. The importance of energy efficiency was not treated to be a crucial factor to reduce carbon emission in policymaking. An effective energy policies (Herzog et al., 2001) which has regulatory measures to make renewable energy projects possible (Curnow et al., 2010) is the key factor for sustainable development.

On the other hand, several studies have pointed out that energy efficiency was identified as a solution (Pérez-lombard et al., 2013) and the most effective way (Heap & Kasemo, 2010) for decreasing carbon emission and achieving sustainable development. However, Harris, et al. (2008) identified that energy efficiency is one of the solutions, rather than the mere answer, for sustainable development. The impact of energy efficiency is mostly observed in the electricity generation (Wu, Pineau, & Caporossi, 2010), buildings (Friedrich, 2013), and transportation (Menon & Mahanty, 2012). Studies conducted by Punte, Repinski, & Gabrielsson (2005), Brunoro (2008) and (Graus, Blomen, & Worrell, 2011a) pointed out the need for energy efficiency improvements because of the increasing demand (Hasanbeigi, Menke, & Du Pont, 2010).

Moreover, several countries in Asia have concentrated on sustainable development. For example, Table 6 reflects the principal forms of renewable energy sources in Turkey, an economy adversely affected by the increasing price of imported primary energy source (Nalan, Murat, & Nuri, 2009). Turkey focused on harnessing its available renewable energy sources to lessen its dependency on imported fossil fuel, which accounted to 65% of its energy consumption (Ocak, Ocak, Bilgen, Keles, & Kaygusuz, 2004). Currently, it has established transition in its electricity generation using hydropower, wind, wave, hydrogen solar (thermal and photovoltaic) and utilized its geothermal and tidal power capacity.

Table 6 Turkey´s renewable energy sources and means of utilization (Nalan, et.al., 2009)

Energy sources	Energy form	Availability
Agriculture and forestry waste	Combustion process	Now
Energy crops	Combustion process	Now
Landfill and sewage gas	Combustion process	Now
Municipal solid waste	Combustion process	Now
Direct solar (active and passive)	Heating	Now
Geothermal	Heating/electricity	Now/limited scope
Hydropower	Electricity	Now
Wind power	Electricity	Now and developing
Hydrogen/fuel cells	Electricity	Now and developing
Solar photovoltaic	Electricity	Now and developing
Tidal power	Electricity	Now/limited scope
Wave power	Electricity	Medium-/long-term
Solar thermal	Electricity	Medium-/long-term

Pérez-Lombard, et. al. (2013) identified energy efficiency and renewable sources as ‘‘strategic instruments’’ to address world energy challenges and environmental change. Energy efficiency applies to energy used for a given production to produce energy services while renewable sources refer to the replacement of primary sources of energy to engage in carbon emission reduction. The importance of these two variables aims to affect economic growth and improve environmental effects. The challenge of converting to renewable energy sources for sustainable development and reduce global environmental impact lies in the cost of this transition.

The objective for sustainability through renewable energy and energy efficiency needs to look at the market systems. (Vine, Prahl, Meyers, & Turiel, 2010) concluded that it is important to encourage ‘‘market stakeholders’’ participation and ‘‘commitment to growth’’ (Trainer, 2013) to achieve sustainability goal. Thus, energy efficiency and the use of renewable energy are essential for policymaking to address the increasing energy demand and its implication to economic growth and environment through a ‘‘ … more comprehensive strategy’’ (Vine et al., 2010).

2.4 Energy Price

Egging (2013) identified long-term energy price as a factor to consider for energy management. Modern technology era gave importance of energy use on individual´s daily activities. Countries were divided by its capacity of securing energy supply and the ‘‘…quality and quantity of energy spending…’’ (Nikiforuk, 2012) varies from country to country. This is merely for the fact that energy, as a commodity, has a price. To import fossil fuels will take huge amount to support energy supply, as well as, focusing on harnessing renewable energy which is an alternative for using fossil fuels to address environmental issues and the increasing energy demand. Bodman (2005) claimed that ‘‘…we are using energy faster than producing it …’’ which makes high energy price to be the tip of an iceberg because the real problem is energy supply. Energy price is constantly changing due to risks link to energy sources development since high energy price may reflect from external forces of the market such as the ‘‘strong global demand and/or constraints on the global supply of energy (Barwell et al., 2007).

Dhawan & Jeske (2006) concluded that modern economy is very resilient to energy price increase. Economic growth was affected by energy price control in the 1970s and free market could affect the economy to be vulnerable to energy price. Taheri & Stevenson (2002) confirmed that energy demand is significantly price inelastic. With this, energy price is an important input to scenarios for energy development (Egging, 2013).

Energy, development, and climate change are interrelated (Mohanty, 2012). The use of fossil fuels raised environmental issues which led to the investigation on primary energy mix. In 2004, a study was conducted on the energy sector of Turkey observed that during the 1973 oil crisis, countries such as Turkey (Nalan et al., 2009) to divert their attention in harnessing available renewable energy sources where its primary energy comes from 63% oil and natural gas (Ocak et al., 2004). The motivation shifting to renewable energy is observed mostly on imported oil dependent countries where government provided incentives and subsidies on renewable energy development (Samson & Stamler, 2009). However, Taheri & Stevenson (2002) concluded that the unhealthy fossil fuel continues to dominate even with the existence of technical change and environmental compliance. The effort on the continuation of using fossil fuels or switching to alternative renewable energy raises an issue on energy price because of inflation risks which accompanied in the

importation of fossil fuels and the huge investments requirements on developing new technologies for renewable energy ventures.

The change in energy price is based on how the market performs, thus, in the global energy stock price, ‘‘market index is the most important factor in energy stock price movements’’ (Ergun & Ibrahim, 2013). Duke & Kammen (1999) identified fossil fuel price as extremely volatile. The price volatility was caused by foreign trade on energy sources: the impact on ‘‘macro economy … which includes balance of payments and transfer effects’’ (Dahl, 2006).

Furthermore, oil is a kind of fossil fuel (Gordon, 2001) which showed price volatility, see Figure 13. Oil price volatility reflected in a 5 year instability which was experienced consequent to the Arab-Israeli War on 6 October 1973 (Verleger, 2013). Price volatility in 1981 was caused by deregulation, another oil crisis in 1986 which showed a tremendous price increase and the highest reach in oil price was in 1991 caused by Gulf War (Regnier, 2007). Energy price changes when there are economic and political instability in the oil-producing countries. With this change, Regneir (2007) detected in his examination of oil and energy price volatility that the increase in oil price has never went back prior to oil crisis in 1973. Compared to oil price, as this volatility reflected to other commodity prices, most commodity prices were declining during the stability of oil-producing countries Regneir (2007). Importantly, most of oil price shocks from 1970 has also been triggered by strong global demand (Kilian, 2008).

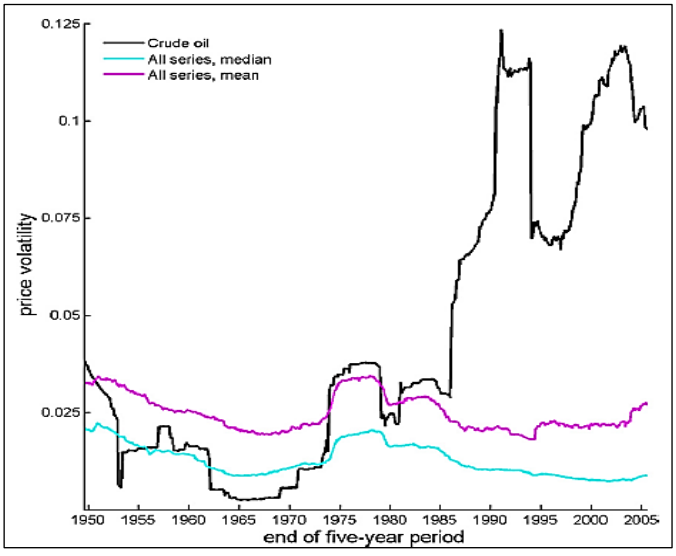


Figure 13 Crude oil 5-year volatility (Regnier, 2007)

Energy price is one of the factors affecting energy demand in developing countries (Aziz et al., 2013). It is crucial for energy consumption because agricultural, industry, households, commercial and transport sectors are dependent on energy (Regnier, 2007) and energy, such as electricity, has explicit effects on productivity, health, education and communication (Ouedraogo, 2013). The argument of energy price impact to energy demand has been an important issue in order to examine economic growth. Medlock & Soligo (2001) pointed out that long term growth in energy demand is expected mainly on the transport sector. Kilian (2008) also observed that the decrease in energy consumption in the United States prior and after 1987 was due to the innovation of its automobile sector. On the other hand, energy demand on residential and commercial will exceed industrial demand (Medlock & Soligo, 2001).

Moreover, the effect of energy price to electricity production, which requires large amount from primary energy sources for fuel, can be explained by end-users consumption through its electricity utilization. Ouedraogo (2013) reported that electricity demand is inelastic to energy price in the long run and energy utilization, specifically electricity, is perceived to have an impact to HDI. Kuper & Van Soest (2006) validated the claim on the effects of energy price to energy use and the findings showed that an increase in energy price has a relatively small impact on energy use. The study also revealed that even imposing energy tax and energy-saving technologies will not hinder energy use.

In the long-run, high energy price has rather small impact to agricultural industry because energy conservation plays a great role in addressing energy price scenario in the United States (US) (Williams, Nelson, & Langemeier, 2005). Similarly, high energy price has relatively small impact on United Kingdom´s (UK) economy due to flexible goods and labor market and deal high energy price with *capital scrapping* (Barwell et al., 2007). The small impact of high energy prices to the US and UK are parallel to the research findings of Dhawan & Jeske (2006).

High energy price has an impact to the energy use in the short-run, but not in the long-run due to some factors addressing the increasing energy demand such as energy conservation and energy efficiency. But this will depend on the energy policy, which is designed to promote energy conservation and energy efficiency measures, of a country.

2.5 Propositions

To provide Scenario Analysis on the Philippine energy market, it is essential to distinguish market indicators and its importance and contributions to the future energy market trend. An examination on these market factors is done based on theoretical exploration of significant studies.

Masih and Masih (1997), Lee and Chang (2008), Kronenberg (2010), and Apergis and Tang (2013) concluded the positive causal relationship between energy consumption and economic growth. Ouedraogo (2013) pointed out that energy consumption enhance human development. Energy market analysis comprises investigation on to whom the energy is being served for and to what purpose.

Therefore based on these findings and to provide Economic Growth Scenario, the researcher proposes:

Proposition 1:

Energy consumption is related to economic growth, therefore, energy conservation may harm economic enhancement in the Philippines.

However, increasing energy consumption signifies large contribution to climate change through increasing CO_2 emission. Soytas & Sari (2003) claimed that energy conservation may negatively affect economic growth. Harris, et.al. (2008) suggested that energy efficiency plays an important role for energy conservation by means of advance technology in the production of energy-related services and these authors pointed out that energy efficiency does not exempt energy use from environment issues. Worrell and Price (2001) reported that the lack of application in technological practice has been a challenge. Hardisty, et.al. (2011) illustrated in their examination on the issue of using CCS technology to capture CO_2 discharge from power plants requires huge amount of energy resulting an increase in energy use. Lombard, et.al. (2013) recommended the promotion of energy efficiency and renewable energy to address environmental challenges. Taheri & Stevenson (2012) observed fossil fuel penetrates the energy source.

Therefore, the researcher presents a second proposition:

Proposition 2:

The promotion of energy efficiency measures and the increased use of renewable energy through government intervention will benefit economic growth in the Philippines.

Aziz, et.al (2013) and Regnier (2007) agreed on the importance of energy price to its demand. Kilian (2008) and Verleger (2013) pointed out that energy price volatility is generated by political and economic chaos. Kuper & Van Soest (2006) described the effect of energy price on energy use. The current energy market trend is diverting into a more sustainable energy sources and the concentration on energy efficiency.

The researcher proposes the Energy Price Scenario and develops the third proposition:

Proposition 3:

There´s no correlation between energy prices and energy use.

3. Methodology

The methodology used in this study will be discussed in this chapter. The manner by which the objectives were achieved will also be addressed.

3.1 Research Design and Setting

The most applicable method to provide alternative scenarios to the Philippine energy market is qualitative research which requires an in-depth data gathering. The questionnaire used for gathering data was developed from literature review. Qualitative research was adopted to integrate the theoretical and empirical analysis on the Philippine energy market.

3.1.1 Scenario Analysis

The Scenario Analysis is the primary analysis used for this research. Using Scenario Analysis, this study will analyze both qualitative and quantitative data. Scenarios will be created as derived from the contribution of experts using Delphi method.

Scenario Analysis helps firms to ‘‘respond quickly and cost-effectively to challenges and opportunities in the business environment’’ (Lindgren & Bandhold, 2003). Similar to Shell Global, a company focuses on providing transportation fuel, which used Scenario Analysis since 1970s. It geared the company to different directions on a possible oil shortage. Scenario Analysis helps Shell Global on engaging political change, recessions and awareness on challenges with great impact to regions where their ventures are located (Shell, 2013).

Moreover, the scenario technique has also been used in studies in the energy industry such as the solar photovoltaic electricity which investigated energy consumption, energy efficiency measures, energy technology and future costs (Delisle, 2011). It was also used as the methodology for the research on biomass which studied the driving forces and the clusters of the international market, specifically, globalization, economic and political aspects (Heinimö, Ville, & Kassi, 2008). Scenario technique helps understand the transition of energy market in which factors affecting the market can be used to predict the possibility of an event in short-term period (Grienitz & Schmidt, 2010).

Scenario Analysis provides alternative sequence of event for future possible outcomes. It has no specific answer, rather, provides ´´qualitatively different directions´´ (Lindgren & Bandhold, 2003) .

Scenario methods can be classified according to the nature of the source of information used for the analysis (Gambelli, Vairo, & Zanoli, 2010) :

1. *Participatory Scenarios - approaches where experts and stakeholders (e.g., scientists, decision makers, and business executives) have active roles in the scenario generation system (e.g., data elicitation, narrative development).*
2. *Desk Analysis Scenarios - exploit information based on the existing literature and/or statistical data, which is then elaborated into the scenario form without a collaborative process.*

Participatory Scenarios is the applicable analysis used in this project where energy experts provided in-depth assessment to statements which were formulated based on literature review. A thorough selection of panels was done to create alternative scenarios. The analysis was conducted not to produce impractical results, rather, to conceptualize the current situation of the Philippine energy market through theoretical observation.

Furthermore, Lindgren and Bandhold (2003) developed a scenario planning framework, TAIDA, as illustrated in Figure 14. The TAIDA process presents how scenarios were established and implemented. Tracking is the stage in which we will be able to distinguish the external environment of a company or an industry. By distinguishing threats and opportunities, we will be able to generate scenarios (*Analysing*) and describe our objectives (*Imaging*). The implementation of a scenario will derive in choosing the desired strategies (*Deciding*) for short-term goals and do constant evaluation on the progress (*Acting*).

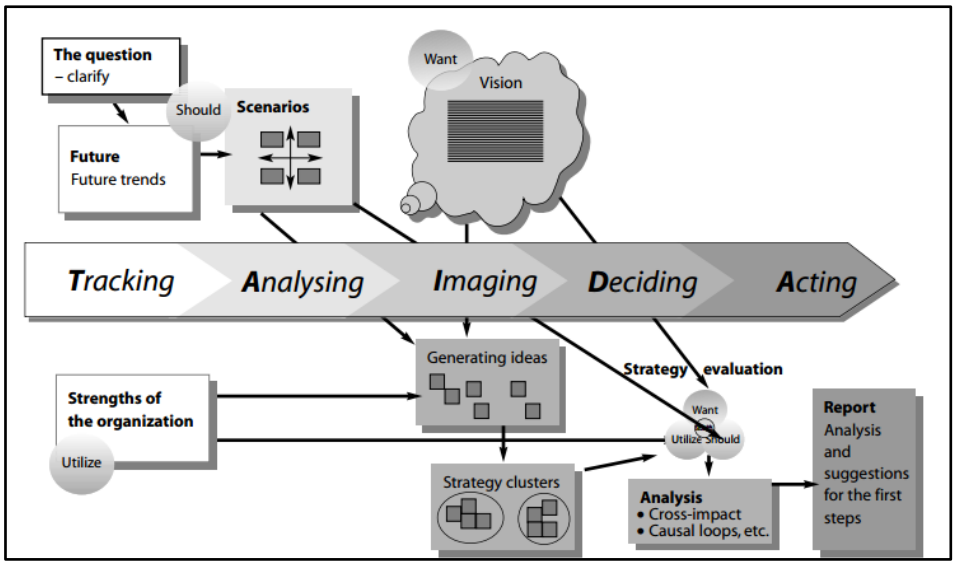


Figure 14 An overview of the TAIDA process (Lindgren &Bandhold, 2003)

The result of this research will conclude the *Imaging* phase. *Deciding* and *Acting* are crucial stages to the implementation of scenarios because it is when energy companies face the real challenge. It takes a great deal deciding on which path to go and at the same be aware on the consequences of each decision and be able to adjust along the way (Lindgren & Bandhold, 2003). The TAIDA process is useful for insights to energy companies on their strategic planning through identifying possibilities and consequences of a given scenario.

The objective of the scenario analysis is to generate 3 to 5 alternative scenarios for a given situation in which each scenario has hypothetical situations which will be distributed with calculated possible outcome (Heinimö et al., 2008). This is the applicable analysis for this study because the Philippine energy market showed instability in its energy supply since the oil crisis in 1970s which the market needs to be investigated to prepare any energy ventures for what lies ahead, to identify paths on what might happen if existing conditions will continue and to implement necessary actions to protect investments. To reach a company´s goal, it will face challenges aside from its opportunities. Managing these challenges through alternative scenarios, companies may gain competitive advantage in the industry because they will be able to adjust to … turbulent surrounding conditions … (Grienitz & Schmidt, 2010).

3.1.2 Delphi Method

The Delphi method is the secondary analysis used in this study. It was used in identifying trends of the Philippine energy market. The data gathering which was done in a two-round course involved eight energy experts as participants. Brief description of each participant will be discussed in the participants section of this paper.

The Delphi method is designed to achieved an 80 percent consensus among experts (Green, Jones, & Williams, 1999). In this method, Hasson and Keeney (2000) recommended the following:

1. *Research problem identification*
2. *Understanding the process*
3. *Selection of experts*
    a. *Informing experts*
    b. *Data Analysis – discovery of opinions*
    c. *Data Analysis – process of determining the most important issues*
    d. *Data Analysis – managing opinions*
    e. *Presentation and presentation*

The significance of the approach is to determine how to use Delphi method on a particular research problem, specifically in adopting the appropriate Delphi method technique. In this study, Kartian Inquiring System (IS) was the chosen technique to conduct Delphi method. It is designed to investigate as many different alternate solutions as possible (Turoff & Linstone, 2002). These authors underlined Kartian IS characteristics:

> *(1) Truth is synthetic, the truth content of a system is not located in either its theoretical or its empirical components, but in both. A model of a system is a synthetic model in the sense that the truth of the model is measured in terms of the model's ability*
>
> > *(a) to associate every theoretical term of the model with some empirical referent*
> >
> > *(b) to show that (how) underlying the collection of every empirical observation related to the phenomenon under investigation there is an associated theoretical referent.*
>
> *(2) A corollary to (1) is that neither the data input sector nor the theory sector have priority over one another. Theories or general propositions are built up from data, and in this sense theories are dependent on data, but data cannot be collected without the prior presumption of some theory of data collection (i.e., a theory of "how to make observations," "what to observe," etc.), and in this sense data are*

> *dependent on theories. Theory and data are inseparable. In other words,' Kantian IS require some coordinated image or plan of the system as a whole before any sector of the system can be worked on or function properly.*

The Kartian IS technique in this study developed three propositions which were built from theoretical examinations of the energy supply chain, specifically looking into the relationship of energy consumption and economic growth which lead to the challenges on sustainability of energy industry and the importance of energy price to energy use. These propositions were the basis for the statement used as questionnaire for data gathering. The process of the Delphi method was to test these propositions through the evaluation of the panel of experts. The diverse group of experts provides in-depth assessments on statements generated from propositions based on literature review.

The selection of experts is the crucial stage of the Delphi method because it needs to be taken into consideration that experts are directly involved in the industry being investigated: that they will be able to provide significant evaluation on the statements and be able to add value to the arguments specifically in the first round (Millar, Thorstensen, Tomkins, Mepham, & Kaiser, 2007). Preble (1984) identified in his study that in the second round of data gathering, responses may come in late which need follow up. This was also observed in this study, which the author needed to send a reminder and even extended the deadline to two more days for 2 particular experts.

Furthermore, one of the advantages of the Delphi method compared to forecasting is that the latter uses a single expert to provide assessment to subject matter, whereas, in the Delphi technique it requires diverse panel of experts which may provide quality evaluation which is also important when investigating supply chain management (Ogden, Petersen, Carter, & Monczka, 2005) In addition, the advancement of technology improves the process of data gathering with regards to time and money constraints, effectiveness of the process, and the geographical locations of global experts which reexamined the validity and reliability of research findings (Cole, Donohoe, & Stellefson, 2013). It is also important to distinguish the achieved consensus among experts if it is … agreed wrong answer … or the consensus on positive statements (Mullen, 2003).

Cole, et. al. (2013) concluded the disadvantages of conducting the *e-Dephi* technique which are the problems arises in accessing *the e-survey,* and sending responses.

This was not the case in this study. Invitation letter and questionnaires, in both rounds, were sent to either participants´ personal or business email address. Participants had no problem in accessing the questionnaire. The Delphi method process in this study was done in an orderly manner. The author considered the appropriate time to send the invitation letter via email to participants, as well as the timing in sending the first and second round of data gathering. The investigation of the Philippine energy market requires insights from experts which makes Delphi method applicable for this study.

3.1.3 PEST-LE

P.E.S.T. also known as PEST-LE or PESTEL, is an examination of the external factors that can affect an organization, company, or industry (Boeninger, 2013). An example of PEST analysis is illustrated in Figure 15 below shows the four component of the method. The analysis in political, economic, socio-cultural and technology provide a thorough understanding of factors affecting the operation of a certain industry. PEST analysis have been used to different industry studies such as the human resource development where it was used as a tool in analyzing the national and international factors affecting professionals understanding of ethical issues in the corporate world (Lin, 2006); it was also used in the study of a pharmaceutical sector (Abdullah, Shamsher, & University, 2011), food industry (Mashhadi & Ijaz-Ur-Rehman, 2012), served as a technique for external environmental scanning of a public-private partnership (Roumboutsos & Chiara, 2010), and analyzing a power sector (Bashir et al., 2013).

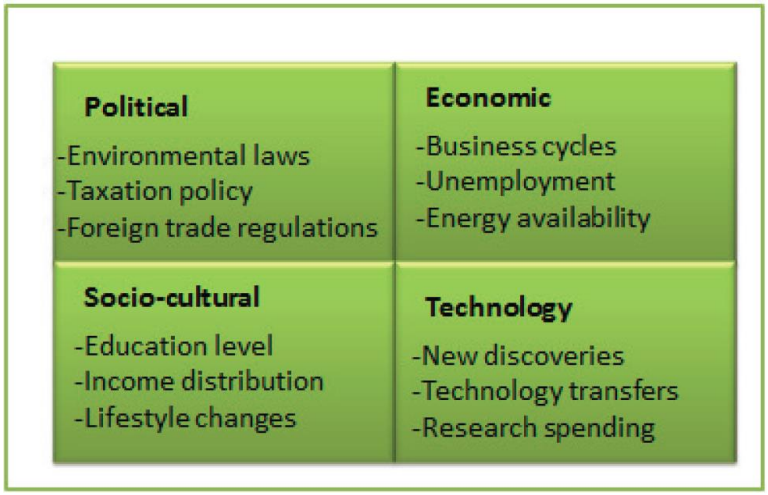


Figure 15 Example of PEST strategy analysis framework, based on Johnson and Scholes 1993 (Isoherranen, 2012)

The use of PEST analysis in the studies mentioned: Abdullah et al. (2011), Lin (2006), Mashhadi & Ijaz-Ur-Rehman (2012), and Roumboutsos & Chiara (2010) investigated the macro environment of the industry. The validity of PEST analysis lies in the extent of how the method being used which Yuksel (2012) concluded that a thorough investigation on a subject matter needed when using the metod.

This study evaluated the Political, Economic, Social and Technological aspects of the Philippines. The Legal and Environmental factors were included in order to provide more insights to the problem statement. This analysis tool supported Delphi Method by providing the foundation of the propositions which is essential to the statements used for data gathering. The in-depth assessment of experts in the Delphi method supports the validity and reliability of PEST-LE analysis in this study.

3.1.4 Porter´s Five Forces

Porter´s five forces analysis determines how competitive the environment in an industry (Isoherranen, 2012). It is a tool used in examining how the market operates; specifically focusing on the players or a certain market, and the goods and services offered as shown in Figure 17. It emphasizes the components of the framework which include the industry rivalry, threat of new entrants, power of buyers, threat of substitutes, and power of suppliers. The importance of Porter´s Five forces is to provide information on other competitors because there are several companies underestimated the competition environment by focusing only on its direct competitors (Porter, 2008) . It needs to examine threat of new entrants referred to as renewable energy companies, threat of substitutions which may refer to as renewable alternative energy sources, the power of supplier which can also be translated to the availability of supply, and the power of buyers which may refer to the purchasing power of buyers and the freedom to choose from energy-related services.

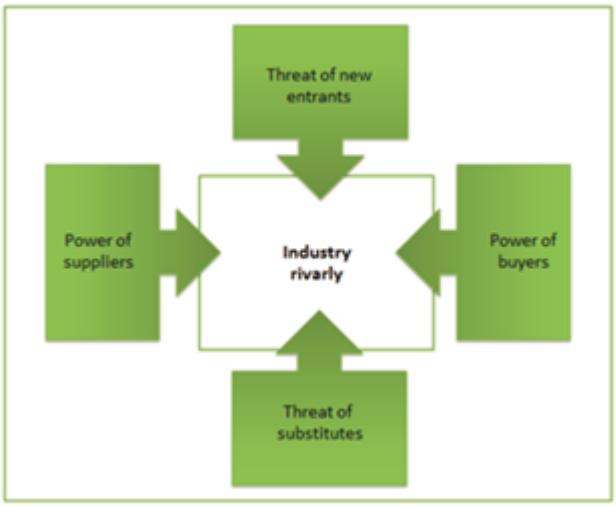


Figure 16 Porter´s five competitive forces, based on Porter 1980 (Isoherranen, 2012)

Porter´s Five Forces is an integration of PEST-LE analysis in this study. The purpose is to provide an in-depth investigation on the attractiveness of Philippine energy market. The author used Porter´s Five Forces in the market scanning of the energy sector in the Philippines which provides importance on the competitiveness of the industry. Market analysis requires a close monitoring on market behaviors and a comprehensive understanding of its target market which are essential for firms to gain competitive advantage in a specific sector (Slater, 2002). However, as much as the investigation of the energy market forces is important for companies, non-market forces are also crucial which determines the intensity of each market force (Prasad, 2011). PEST-LE analysis supports the findings in Porter´s Five Forces.

3.2 Participants

The 8 diverse panel of experts include 5 Filipinos, 2 Germans, and 1 Italian. Participants were mostly consultants involved in energy policy, business development, marketing, and business start-ups in the energy sectors and with experience in the energy industry for over 3 decades.

Below is a brief decription for each of the participants:

- An energy industry consultant, a Director of one of well-known international associations for geothermal industry, a Marketing and Communications Director of an energy company founded by Icelanders and Norwegians, and the Founder of an energy strategy and service firm. An expert on global geothermal energy industry concentrating on business development, business strategy, communication, global industry network, marketing, market research, and policy. His knowledge about the Philippine energy market started in 2008 when he founded his own energy consultation firm. He was able to take a glimpse with the reality of the energy situation in the Philippines during his involvement with an international energy company which currently investing on power generation in the country.
- A Bachelor´s degree in Geological and Earth Sciences from the University of the Philippines and a PhD in Geological Sciences (Major) and Resource Economics (Minor) from the College of Engineering at Cornell University in New York, USA. He has been a mineral exploration consultant in the Philippines since 1976, a consultant for the German Development Institute or GDI (Berlin) in 1980 and for the UNDP in 1989. Between 1976 and 1982, he worked as a geologist, senior geologist and a supervising geologist for the Philippine Bureau of Mines and Geosciences. One of his responsibilities is domestic mineral inventory (base and precious metals) and resource exploration which includes energy resources such hydrocarbon fuels (oil and gas), coal, geothermal and uranium for nuclear fuels as well as hydroelectric dams. From 1990 to the present, he works as a Federal Employee with the US Army Corps of Engineer (on flood control, natural disasters and navigation). He also works with the US Environmental Protection Agency (on Superfund Sites, environmental compliance, brownfield and greenfield sites, mine closures, et. al.) and with the US Nuclear Regulatory Commission (on Pressurized Water Reactors or PWRs, Boiling Water Reactors or BWRs and new nuclear reactor technologies). He deals with nuclear fuel safety licensing as well as the licensing (EISs) for

new reactors and relicensing (SEISs) of existing reactors. He focuses mainly with alternative and economic analyses of various energy (electric power) sources as well as impacts of greenhouse gas emissions and climate change. Currently, he is a strategic technical and management consultant for mineral, energy, water and land resources development.

- He is a licensed geologist and currently a site manager for an international geothermal company in the Philippines. For over 30 years, he has been a geophysicist for Philippine National Oil Company - Energy Development Corporation (PNOC-EDC). This particular participant has a bachelor´s degree in geology from Mapua Institute of Technology and a post-graduate diploma in geothermal exploration course from the International Institute for Geothermal Research in International School of Geothermic, Pisa, Italy.
- By profession, he is a lawyer, licensed industrial engineer, economist and entrepreneur. He specializes in energy law, corporate rehabilitation, project development and management, financial packaging, and manufacturing management. He has vast experience in the energy sector working for both private companies and government agencies in the Philippines. This energy expert has a bachelor´s degree in law from the University of the Philippines in 2004 and a bachelor´s degree in industrial engineering from the said university in 1970.
- This particular participant co-founded a consulting firm in 2009 which is currently located in Quezon City, Philippines. The firm provides market research for multinational companies on Base of the Pyramid (BoP), project development, incubation of social projects, and offer consultation for international development agencies, multinational companies and universities on inclusive business and renewable energy. He is the editor of a reference guide book on how to avail renewable energy under 100 kw in the Philippines. He earned his master´s degree in International Community Economic Development from Southern New Hampshire University.
- She is a University Professor for 17 years in one of the most prestigious universities in the Philippines. In 2011, she was a Labor Economist for Asian Development Bank in the Philippines which she focused on labor

market analysis and development policy research. She was also a Project Consultant for International Labor Organization – United Nations (ILO-UN) in 2005. The project was about policy analysis and provides recommendations to the national government and the ILO. She has a PhD in Philosophy (Development Studies) from the University of Saint La Salle, Philippines.

- A Senior Engineer who works for Renewables Corporation, a PNOC subsidiary, since 2010 is one of the panel of experts in this study. He specializes in project management, hydropower project development, laboratory set-up and operations, statistical process control, semiconductor package reliability, materials development, materials characterization, laboratory equipment qualification, solar module manufacturing, renewable energy, feed-in tariff, hydropower, materials development, quality engineering, reliability engineering, technology management; solar photovoltaic, customer interface, supplier qualification, and Philippine Quality Award. He finished his master´s degree in Technology Management from the University of the Philippines in 2011 and earned his bachelor´s degree in Metallurgical Engineering from the same university in 1998.
- He was born in Italy and with work experience from the global energy sector for over 3 decades. Last year, he joined a multinational company as Senior Project Manager. The company engages in renewable energy investments in Asia. He received his bachelor´s degree in Electronic Engineering from the University of Pisa in 1979.

3.3 Data Gathering Procedure

Questions were sent through e-mail to the participants in a two-round process (see Appendix E and F). Ten out of fifteen experts confirmed to participate in the study. The questionnaire for the first round (see Appendix F) was sent on the 8th of January 2014, which has a deadline on the 15 of January. After the first round: the questionnaire was revised according to the assessment of the 10 experts. On the 20th of January 2014, the questionnaire was sent for the second round. The panel of experts was given 5 days for

their evaluation. The deadline given was extended to the 29th of January due to the workload of 3 panelists. A total of 8 experts completed the second round. The duration of data gathering for both rounds is 3 weeks. But it took approximately a month for the whole process to complete including the invitation of participants.

4. Analysis of Results

This chapter presents the consensus among the panel of experts on three specific topics: Energy Consumption and Economic Growth, Renewable Energy and Energy Efficiency, and Energy Price.

Energy Consumption and Economic Growth

Most participants agreed on the 3 main arguments on the importance of energy consumption and economic growth to the Philippine energy market presented below:

1. The will of the government to advance the energy sector while addressing environmental issues.
2. Proposed net metering meant to satisfy energy demand.
3. Proposed FIT (feed in tariff) contributes to slow development and does not include geothermal power thus more opportunity cost.

Experts claimed that the sustainability issues of the Philippine energy market are principally tied to supply of energy. The country has available domestic sources of both non-renewable and renewable energy. Non-renewable heat sources available domestically are hydrocarbon fuels including oil, gas, and coal as well as (the hot) magma (volcanic or plutonic that are cooling-off in-site) or natural geothermic. Currently, except for geothermal sources, the domestic hydrocarbon fuels consisting of oil, gas and coal are currently of limited proven reserves unless exploration within the archipelagic islands (e.g. recently in Cebu island) reveal more reserves. Among these hydrocarbon resources, the Malampaya natural gas is the most robust as well as least environmentally problematic in regard to greenhouse gas emissions.

Domestic renewable sources of energy include water and waves (hydroelectric sources), biofuels or biomass, wind and solar. Hydroelectric sources and wind turn turbines (mechanical energy) to produce electrical energy. Biofuels/biomass and the sun turn heat to electrical energy. There are technological issues related to these sources of renewable energy however. Hydroelectric sources (particularly river dams) are challenged by availability of rainfall and climate change (where wet areas can turn into drought areas). As well as, prevailing winds may change directions and regular meteorological paths as a

result of climate change. During drought, biofuels or biomass may as well be challenged as the agricultural industry may be impacted. In addition, there is the "storage issues" during low demand-cycles for electrical energy generated by wind and solar.

Based on the realities of domestic supply of non-renewable and renewable energy in the Philippines, sustainability of the domestic energy market would be better answered by a combination of both nonrenewable and renewable sources, depending on the supply/demand as well cost/price requirements in each sector of the Philippine Grid system(s): Luzon grid, Visayas islands grid, and Mindanao grid. For example, due to transport cost and supply consideration including Malampaya gas and Semirara coal, natural gas and coal may be the principal sources of electric generation in the Luzon grid and the Visayas grid. In the Luzon grid, the HC fuel sources can be supplemented by hydroelectric dams (e.g. Ambuklao, Pantabangan, Angat dams) as well as geothermal fields (e.g. Bicol) in Luzon; wind (Pagudpod), biomass/biofuels as well solar can also supplement the energy needs in Luzon. In the Visayas grid, geothermal (Leyte) as well as solar and wind can supplement natural gas and coal. In the Mindanao grid, a plethoric of bunker oil, gas, coal, solar, wind and biomass/biofuel can provide sustainability in the energy needs of Mindanao.

The current energy policies in the Philippines including: the Renewable Act of 2008, net metering rules to be implemented in 2013, Feed in Tariff (FIT) in 2014 and the EPIRA (Electric Power Industry Reform Act) should be reviewed and amended with provisions that benefits all stakeholders in the energy industry of the Philippines including the investors, producers as well the consumers. Investors should be encouraged to invest in new technologies, particularly in the untested renewable sector of energy generation as well supported in the standard non-renewable sector. Incentives as well subsidies can be provided by the government fairly to investors, energy producers and consumers with the goal of expanding supply, encouraging power plant construction, investments in renewable including biomass, wind and solar, electric/power price stability as well as expanding demand. Clarity, certainty and transparency in energy policies are required for growth in the energy industry sector of the Philippines to establish reliability and sustainability of the energy market that is necessary to fuel economic growth in the Philippines. Companies involved in the various facets of the energy infrastructure in the Philippines operate on

marginal profits that added costs as lack of clarity, certainty and transparency as well as too much government intervention, particularly corruption, in the energy regulatory environment may contribute towards the price volatility of the energy delivered to the consumers; these energy management issues should be avoided as the robustness of the energy industry depends on certainty in supply, regulatory policies and demand. Energy policies in the Philippines need to be constantly reviewed to provide an improved framework to advance and provide an enabling framework for regulating an oligopolistic market structure with high barriers to entry for new, especially foreign, market actors.

Furthermore, the power industry sector is currently under fire from civil society and investigation by Congress, because of the high spot market prices incurred in November 2013. Collusion is suspected among the power producers and Meralco to manipulate the supply so as to take advantage of the EPIRA and WESM rules, thereby increasing the generation charge by an unprecedented Php 4.15 per kWh in December 2013. Meralco projects an even heftier hike of Php 5.67 per kWh in the generation charge in January 2014. The Department of Energy, Energy Regulatory Commission, Philippine Electricity Market Corporation, and Power Sector Assets and Liabilities Management Corporation are also being accused of failing to protect the interests of the consumers. Many legislators are even suggesting repealing EPIRA and overhauling the WESM rules. If the installation of RE resources had been encouraged following the provisions and timetable under the RE Act, the high spot market prices caused by the shutdown of the Malampaya natural gas plants could have been aborted. In Europe, Australia and other countries where solar and wind power installations contribute are abundant, these RE supply has moderated or even prevented spikes in the spot market price. Since the peak demand in Luzon is normally from 10 in the morning to 3 in the afternoon, solar power installations would definitely temper the spot market prices. Solar power could reduce the power bills of industrial and commercial establishments not only by decreasing their electricity import, but also through peak-shaving.

Participants believed that private investors are needed in the energy supply security in the country, significantly in the production of electricity. Clarity, certainty, and transparency are key factors to attract investors. Government intervention is essential to

impose economic and energy policies to meet energy demand, more importantly in the implementation of these policies.

Renewable Energy and Energy Efficiency

Currently, the Philippines continue to import most of its oil supply the fact that local energy resources are not enough to meet the domestic demand. This is because major inputs for the electricity sector come from conventional source or have to be imported at international prices subjected further to foreign exchange risk and inflation.

Below are the trends on the importance of renewable energy and energy efficiency in the Philippines from the evaluation of the participants:

1. Sustainability depends on the political will by providing investment incentives and changes in the policy direction from centralized transmission to distributed generation.
2. Private sector interested to participate in advancing energy infrastructure
3. Effect of power plants on climate change as indicator
4. Transparency is important as well as eradication of corruption
5. The need to educate community on renewable energy
6. Stakeholder's participation in energy development through public engagement.
7. Government to secure energy supply avoiding monopoly by few players
8. Joint effort of government and private sector to address environmental and economic sustainability

The biggest challenge of the energy sector in the Philippines, other than being archipelagic and separated by water, is that the huge grid found in Luzon which is half-fuelled by coal, while in Visayas it is geothermal resources and 50% of Mindanao grid is sourced from hydro. Luzon and Mindanao are huge land masses that can be easily connected by transmission lines. It is appropriate to have large capacity power plants in these island grids. Visayas on the other hand are a group of several islands where transmission lines would be challenging and would require expensive grid investments if these islands are connected to large capacity power plants. The large capacity power plants

would be appropriate in Luzon and Mindanao, with medium and small capacity plants as support systems and maybe engage during high demand. All of these plants can then supply the grids in these regions. Because of the geography of the Visayas Island as well as transmission expense, it would be rational that medium to small capacity power plants can supply efficiently to each of the various islands. Large capacity power plants can be constructed to serve very closely adjoining islands where construction of transmission infrastructures are not expensively prohibitive and where heavy industries are located, as well as, they can operate as support systems to the dedicated plants of each island during downtime or emergency

Furthermore, the Philippines has scope for natural gas development, which provides tremendous potential for electricity generation. On the other hand, though coal-fired power plants attract environmental concern for the country and the government plans to reduce the country's dependence on the most polluting fossil fuels but the government and country is not in a position to stop the coal sourcing immediately as the demand and consumption for the electricity has to be balanced.

As far as sustaining solar power resources and getting rid of the risks associated with the solar energy, reform must be focused on providing incentive and protection. Second, solar energy cannot be relied as Philippines is a tropical country and has a lot of rainfall. The solar power has become a burden to consumers being expensive and investments are high with break-even point on investments achieve only after 5 to 8 years.

Moreover, under EPIRA, the power and transmission companies previously owned by the government have been privatized and power subsidies were removed. The overall energy policy is to leave power generation and transmission to the private sector. However, government cannot relinquish its obligation to protect the welfare of the end-users. Sufficient and reliable power at reasonable costs is vital to the economic growth of the country and the quality of life of every Filipino. The government should ensure that power at affordable costs is readily available not only to industry, but to each individual. Climate change and adaptation as well as the geography of the Philippines should also be considered in the long-term policies of the country. The Philippines should harness its indigenous resources, shift to distributed generation to address the archipelagic nature of the country and to mitigate the effects of strong typhoons, prioritize the construction of RE

plants over fossil-fired plants, and impose carbon tax on imported fuels to support its greening and energy sufficiency programs. Most of the laws are already in place: the Renewable Energy Act, Biofuels Act, Clean Air Act, Solid Waste Management Act, Climate Change Act, Electric Power Industry Reform Act and other laws. The policies and mandates under these laws are very clear, but their effective execution had been delayed and sometimes even impeded by the implementing agencies themselves.

The role of energy policy is to ensure the correct behavior of the power industry. If there has been collusion, the court has to intervene. What is happening is that the EPIRA squarely puts the burden of protecting the interests of consumers and ensuring competitiveness in a deregulated on the shoulders of the Energy Regulatory Commission.

Obviously, EPIRA failed because the rates continued to be very high and the government appears to be helpless in controlling the power rates. The government has to muster enough political will to decide whether or not to continue with the half-baked deregulation or full deregulation. The provision in the RA 9136 in order to get rid of 'collusion' among transmission and distribution companies must be scrapped. The government including the office of the President must recommend final solutions to the problem.

Participants were convinced that government will is the key to prosper in the green development. The delay of the implementation of EPIRA caused doubts to investors, even after energy infrastructure was changed to encourage private players to generation and transmission. The restructuring of the energy sector caused burden to end-users. Energy price is in constant scrutiny, unclear basis of the increase in price. Experts believed that the government role is to constantly review energy and economic policies and implement it. The prolonged implementations of policies were influenced by political interests.

Furthermore, participants recognized the combined effort of the government, private sectors, end users and other stakeholders are important to make the green development possible and effective. It is important to find a *win-win solution* to improve the energy sector. Renewable energy venture is still on its way to reality, increasing demand is a fact, and to meet energy demand the country is in need to increase supply. This means that the country will continue to import fossil fuel.

Energy price

The participants provided an in-depth assessment of energy price of the Philippine energy market below:

1. The energy price does not hinder demand nor taxes and energy saving technology.
2. Power supply had been unreliable which forced users to use the costliest form of power.
3. The rise of prices is caused by:
    a. The lack of subsidies apart from rural electrification program;
    b. Generation is concentrated on the few oligopolists
    c. Privatization of electricity generation
    d. Changes in fuel cost by generation companies passing these to consumers
    e. Slow implementation of RE act of 2008
    f. Reliance on foreign sources of energy
    g. High generation costs due to high cost of contracts with independent power producers entered by the government

The increase in price in 2013 was caused by the Wholesale Electricity Spot Market (WESM) prices which reached record high because of reduced supply of electricity due to Malampaya shutdowns (source of natural gas in Palawan) and the scheduled or unscheduled shutdowns of other power plants. The ERC failed to act on the rising costs.

The government is now setting rules for distribution that distribution units use for determining the return to capital. This is the largest component of the distribution charges billed to consumers. The purpose is to adopt a regulatory process which eliminates monopoly pricing to provide a fair return to network owners while creating incentives for managers to pursue efficiency gains through cost reductions. The return on distribution unit's investment is determined using the replacement value. But in a country like Philippines where inflation is higher than developed countries, most of the system network assets imported using foreign exchange which fluctuates widely with a Philippine peso. The

benefit to consumers using historical cost could result in lower electricity rates but this is short lived because investments in network expansion would not happen in depreciation expense is not sufficient to fund the required investment to sustain the network.

Increases in world oil prices have had a significant effect, particularly on the cost of electricity generation, as the oil price rises the Philippines will feel its effects particularly in the cost of supplying electricity to consumers in off grid areas where the generation is almost completely reliant on imported fuel oil. The rising oil prices and limited source of energy supply is a major concern for the government that is why government is maximize dependency RE sources of energy for the future energy plans

The Supreme Court's intervention through a Temporary Restraining Order (TRO) shouldn't even consider the higher cost as caused by the delay. If the Court persists in review and decides it's a valid increase, then the consumers suffer. If the Court denies the increase, that will lead to a more fundamental problem.

The Philippine government can't afford to build power plants so it made the sensible decision to tap the private sector to help. And with the private sector's ability to do things more efficiently and at lower cost (as the water concessionaires have shown), it does indeed make good sense. But with opposition like this, and courts interfering in something where they don't have the expertise, the Philippines will not going to get new power plants. Reserves are already far too low, meaning occasional blackouts are inevitable. But, much worse, most plants are over 25 years old; they can no longer run at rated capacity and eventually will break down irreparably. New plants will be needed.

Based on experts´ evaluation, high energy price in the Philippines is inevitable. As the implementation of policies for green development has been prolonged, the country suffered from energy supply shortage which leads to continue to import fossil fuels to meet high energy demand. Importation of conventional energy sources subject to inflation risks. On the other hand, the need of power plants also requires enormous amount of capital. Even the existing power plants in the country needs to be innovated, such as efficiency technology, which also requires huge amount of investments. These costs will be passed on to end-users.

5. Conclusion

The author derived propositions based on the literature review which brought to deeper investigation using Delphi method. These propositions were based on the consensus from 8 experts in the Philippine energy industry. Alternative scenarios were generated which are mainly influenced by the increasing energy demand and the environmental impact of energy consumption to support economic growth in the Philippines.

The description of each scenario, which is provided in the analysis chapter, reflects an interrelation between the trends. Findings showed that government will, the most dominant amog the trend, is the key factor for the development of the energy infrastructure in the Philippines. The change in the government perspective on the implementation of policies will greatly affect the future of energy market.

Literature review concluded the positive causal relationship of energy consumption and economic growth. However, the challenge in addressing high energy consumption due to the effect of the strong performance of the Philippine economy lies in its economic and energy policies as seen in the assessment of participants. The constant review and strong implementation of economic and energy policies will dramatically improve the energy sector in the country. In the long run, it will benefit both the supply and demand side of the market. This will also improve energy security, focusing on green development. A scenario for sustainability relies on the policy scenario for the Philippine energy sector which will have great impact to the energy price scenario. The interrelation of these trends develops a domino effect among the alternative scenarios.

The government intervention to the energy market during the oil crisis in the 1970s did not indicate an evidence of market failure alone. Winston (2006) suggested that the excessive government participation in the market when it is not required is referred to as government failure and not market failure. There were government-owned and controlled entities as big players in the Philippine energy infrastructure prior to energy reform which restricted private sectors participation and based on this market structure, government and market failure prevailed in the Philippine energy market. However, a huge transformation in the energy market started in the change in government in 1986 which allowed the participation of independent power producers (IPPs). This transition improved the energy sector, entry of private companies and the venture for green development began.

The change in the market structure by allowing private sectors in the power generation did not improve market performance due to the prolonged implementation of energy policies, the unclear process of acquiring permits for power projects due to the relevant participation of other government agencies, conflicting interests for the energy buyers and power project developers, and the ‘‘politically motivated’’ (Santiago & Roxas, 2010) energy price . Government intervention was needed to correct a serious market failure during the Marcos administration. However, the transition of the market structure which started during the Aquino administration in 1986 experienced a slow progress.

Therefore, alternative scenarios for the Philippine energy market is important for any energy investment decision-making because the market has a unique, yet, the most challenging energy structure in Asia. Political will is important to address the increasing energy demand and the environmental impact of energy consumption which contribute to economic growth.

The complexity and uncertainty of the market is best to be handled by the scenario analysis. The transformation from regulation to deregulation was the approach used to correct the market performance. However, it may take years to ‘‘efficiently correcting the market failure and maximizing economic welfare’’ (Winston, 2006).

Findings of this research concluded 3 alternative scenarios for the Philippine energy market:

Policy Scenario

Since the 1973 oil crisis, the Philippines aimed to reconstruct its energy industry mainly in the primary energy sources to minimize, if not totally free from, its dependency on imported conventional energy sources. NPC and Transco are government-owned companies which dominantly control the electricity supply chain. With the electricity industry reforms in 2001, transition on the energy infrastructure commenced which allowed private sectors to enter the market through long-term contract in the power generation.

The objective of the Philippine government to develop an energy infrastructure which will maximize its renewable energy potential by imposing renewable energy policies is very attractive to private investors. However, the delay of implementing these policies creates doubts to all players. Political will appears to be the key factor to put energy

policies into actions. The concern on the policy scenario of the Philippine energy market is the duration of policy implementation and constant review of policies.

The Aquino administration in 1986 realized the importance of a new energy policy to respond to the oil crisis. There was a need to start the reform in order to improve energy supply. However, the improvement of the market performance, as a whole, caused by this transformation has not improved as it is expected to be. Policy action has been delayed which may already have generated higher costs than benefits. Though there have been modifications in energy policy such as in relation to the participation of private sectors in the power generation, strengthening the BOT Law of 1990 (KPMG, 2013), government will to correct market failure has not been optimal.

There has been evidence on the slow implementation of the EPIRA through the introduction of net-metering scheme in 2013. After a decade, slowly the energy policies are set into reality. This showed a significant impact on the short-term scenario for policy. The continuous exertion of this willingness from the government, even if it is a slow process, is a good indication that the government has its focused on green development.

Political instability due to corruption is a big hindrance for green development in the country. Corruption has been a great factor in the market performance. Too much government participation in the early structure of the market resulted to market failure. Keeping an eye to the change in government, specifically the Presidential election would be an important element for strategic decision making.

Moreover, transparency and clarity in the policy, such as the provisions of EPIRA, and the exclusion of geothermal in FIT, were issues observed by the participants. A constant review of policies will improve the participation of private sectors and may benefit end-users in the long run.

Participants concluded that the Philippines is good in multi-stakeholder sharing but not in developing good policies due to a protective status quo of local companies. The Policy Scenario is the most crucial factor for any energy investment in the Philippines. However, ‘‘policy action’’ (Martinot, Dienst, Weiliang, & Qimin, 2007) to reach targets is important because no matter how good and promising the policy is if it has not fully

implemented or revised according to the market needs, it will hamper the improvement of market performance.

The studies conducted by Herzog, et al.(2001) and Curnow, et al. (2010) on addressing the increasing energy demand through green development suggested that effective energy policy is the most important factor to achieve sustainability goal. In the Philippine energy market, energy experts confirmed that in order to improve market performance to meet the increasing energy demand and to address environmental impact require effective implementation of energy policy, referred to as ‘‘commitment to growth by (Trainer, 2013) .

Sustainability Scenario

Energy efficiency measures and the increased use of renewable energy to address increasing energy demand and environmental impact of energy consumption are two important factors for sustainability scenario in the Philippines. The support of the government is needed in order to encourage private sectors because huge investments are essential for green development. However, the government experienced challenges with the international debts incurred by NPC. Inflation rates affect foreign debts which means that opting to encourage private investors, especially foreign, are essential to the sustainable energy transition of the Philippine energy market.

The dependency on imported oil is one of the causes for the market failure in the Philippine energy industry. It triggered excessive foreign borrowing to sustain energy supply. Government decision to restructure the energy sector opened renewable energy ventures. This has shaped the primary energy mix dramatically with emerging renewable sources becoming visible in the energy mix. Green development was considered to address the increasing energy demand in the country. But the success lies in the policy scenario of the energy market.

Moreover, the sustainability scenario also includes the participation of other stakeholders. Awareness on the advantages and the disadvantages of renewable energy in the supply side of the market may encourage stakeholders to participate in the process of the implementation of policies through *public engagement* (Rowe & Frewer, 2005). End-

users are not exclusively part of the demand side in the energy market. They could also be part in the policy development through public engagement. The entry of green development in the Philippine energy market does not include educational support for Filipinos which may improve the technical expertise lacking in the country. Green development awareness for the public will have a great impact on the sustainability scenario of the Philippine energy market because it will improve the participation of other stakeholders in the sustainable development.

The important key element for the sustainability scenario is the policy action. One of the most essential implementation of energy policy was the awarding of 325 projects under the Renewable Energy Law (refer to Table 4). The realization of these projects depends on the result from the business negotiations with regards to the partnership ventures of a government entity, or a local private company with a foreign investment firm. Acquiring environmental clearance certificate could be a problem if other stakeholders, especially from the local government where a specific project is located, have limited knowledge on the impact of renewable projects.

Furthermore, the change in its policy direction from centralized generation and transmission to distributed generation is a long-term process to enable growth. The government and the local power generation companies still preferred coal as an option which is one of the hindrances for the sustainable development. But coal-fired power plants raised environmental concerns and old power plants have been the center of efficiency issues. The combined effort of government and private investors are needed to address these issues. These are concerns which are important to consider for the change in policy to enable competitiveness in the market to address the environmental impact and efficiency issues. Moreover, participants seemed to ignore energy conservation as one of the solutions for the increasing energy demand in the country.

The performance of the energy market in the Philippines has directed to a more sustainable industry. For more than 3 decades, the transition has been very slow. In 2013, there were already changes observed in the implementation of energy policy. The joint effort of the government, private sectors and other stakeholders will greatly benefit economic growth.

The literature review on energy efficiency and renewable sources concluded that investments in green energy development are essential to address carbon emission reduction caused by the increasing energy consumption. Herzog, et al. (2001) identified using renewable energy as an alternative solution to reduce dependency on imported fossil fuel. Pérez-lombard. et al. (2013) suggested that both energy efficiency and renewable energy are strategic instruments for sustainability. However, Gupta & Ivanova (2009) identified that energy efficiency has been given less importance in policymaking. The findings of this study stated the emerging renewable energy is the focus for sustainability in the Philippines. Participants identified renewable energy as the concern to improve the primary energy mix in the country. Energy efficiency was not fully addressed by participants; it could be that the focus of the Philippine energy policy is on renewable energy. Gupta & Ivanova (2009), Herzog, et al. (2001), and Curnow, et al. (2010) identified the lack of improvement for energy efficiency in the energy policy which is the case of the Philippine energy market.

Energy Price Scenario

Energy price in the Philippines is mainly influenced by how energy policies were formulated. However, increase in price somehow lacks basis when implemented. The unclear rationale when it comes to energy price increase may refer to what Pirrong (2010) called ‘‘market power manipulation .’’ Though the transformation of the energy market structure allowed the participation of private sectors, there are still unclear issues on the motivation of trade in the new market structure: from generation to WESM and to the transmission. This kind of activity caused the basis of energy price increase arguable. Pirrong (2010) also introduced the fraud-based manipulation scheme which is ‘‘spreading a false rumor that causes the price to move.’’ The participants outlined the causes of energy price increase in the Philippines (refer to Energy Price in the Analysis chapter). There were strong points which explained the existence of market power manipulation and fraud-based manipulation in energy price. Existing government-owned energy firms and local companies, which already earned their status quo, dominate the market. Santiago & Roxas (2010) pointed out that there was Presidential intervention on energy price in 2002 which

impaired the regulator´s credibility but market data showed that the ‘‘…market rates was a result of coping mechanism of new players trying to adjust to the restructured industry’’.

The high energy price continues to be a great concern and raises controversial issues when electricity retail price increases. Evidently, market performance did not help in addressing this matter. The restructuring of the market created more unrealistic basis of energy price to move. However, high energy price does not affect energy use in the country. Consumers were informed to benefit from the energy reform, such as affordable price and reliable supply. But it has been 3 decades that end-users, specifically the household, continue to experience misleading information on the advantages of the restructuring the market.

Energy, in the form of electricity, is a necessity in the Philippines. The high energy price does not hinder energy use, rather, consumers adapt to whatever available energy supply in the market. The introduction of net-metering scheme in 2013 opened an opportunity for end-users to choose the use of renewable energy from the distribution sector. Similarly, power generations does not compete with price in the spot market due to shortage of energy supply which is an advantage for power generation companies. Participants pointed out the shutdown of some power plants which added to the unreliability on power supply.

As much as the reliability of energy supply is important, the demand side of the market also creates concern specifically on the increasing demand for energy. The Philippine population is estimated to reach 100 million in 2020 and UN estimated a 37% rise in population in the capital city (refer to 1.3). In relation with this, participants identified factors that affect the increasing energy demand which includes the following: (1) population growth, (2) income growth, an increasing middle class of Filipinos and increase in transportation use, (3) economic development, the emerging business process outsourcing industry and the need to improve the agricultural sector. By the year 2020, energy supply should improve to meet this increasing demand.

The market is slowly aiming on green development which may trigger increase in energy price in the long run. Increasing demand is expected and unreliability in supply may continue but energy price will not affect energy use. Electricity is a necessity commodity, thus, it makes the demand to be price inelastic. Participants concluded that even there are

concerns on price volatility, consumers continue to use energy. Government and policymakers understand the importance of energy in both the supply and demand side of the market, whereas, economists overlooked the importance of energy in the market in the literature review. The study conducted by Azlina (2012) on the causal relationship of energy consumption and economic development showed that economists failed to examine the importance of energy in the supply and demand side of the market.

The study conducted by Dhawan & Jeske (2006), Williams et al. (2005), and (Barwell et al., 2007) on the effect of energy price to energy consumption showed a relatively small impact in the long-run. The examination revealed that, in the short-run, it will only affect consumers according to the current economy status such as strong labor market and when there is no recession. Ouedraogo (2013) also pointed out that price does not affect electricity usage. The energy price scenario in the Philippines, however, does not only include the impact of high energy price on energy use, but also effects on price caused by the restructuring of the energy market. The electricity reforms transform the energy market structure from regulation to deregulation. Santiago & Roxas (2010) concluded that the market restructuring transferred the cost ‘‘…from ratepayers to taxpayers’’ and Filipinos would be willing to pay premium for reliable supply in the short-run.

Egging (2013) identified that energy price is an important factor to consider for energy scenario. The energy price scenario for the Philippine energy market concluded that energy price has small impact to energy use in the short-run. In the long-run, it could be a different situation because of some factors, such as implementation of energy policy, which are important to reach the goal for sustainability in the country. The energy policy scenario will have a great impact on how the performance of the market will be and the consumers’ behavior when effective energy policy will be implemented.

6. Discussion and Recommendations

This chapter will discuss the findings and recommendations of the research.

6.1 Discussion of Results

The research findings showed a combination of market and government failure. The importation of conventional fossil fuel which has inflation risks resulted to massive international debt was accounted for market failure. Also, monopoly of government-owned entities in the early 1970´s contributed to energy market problem. The intervention of the government to correct market failure by pursuing for green development was needed. Although experts believe there was too much government intervention which resulted to prolonged policy implementations.

An energy policy was needed to correct market failure. There was reason for the government to intervene because most of the big players in the energy market are government-owned. However, energy policies which were initially imposed to improve market performance somehow delayed to put into reality.

Slow implementation of electricity reforms created doubts in the market. The proposed net-metering for 100 kWh or less renewable energy projects which attracts solar energy investors is ideally a great event that government policies may improve the performance of the market in the long-run. The proposed net-metering introduced in 2013 was part of EPIRA which was originally imposed in 2001.

The three alternative scenarios, which are the main findings of this research, are interrelated. Most elements in the sustainability and energy price scenario lean on policy scenario. Policy scenario depends mostly on the government will to implement policies which has an objective to meet energy demand and address the environmental impact of energy consumption. The study conducted by Martinot, Dienst, Weiliang, & Qimin (2007) showed policy action and description of policies are essential for the energy market. By recognizing the importance of policy action and how much government will exert effort to energy development in the Philippines; energy market may see better future

in addressing the increasing demand and the environmental impact of energy consumption to economic growth. The possibility of these two scenarios, policy and sustainability, will have effects on energy price scenario. However, experts believe that due to inflation risks for continually purchasing imported fossil fuels and the enormous amount required for green development, high energy price is evitable and may greatly affect consumers.

The market and government failure which prevail in the Philippine energy market also provide rationale to price manipulation. Makin (2009) concluded that the fewer the players in the market, the higher the risks for price manipulation, Participants identified that the energy market structure in the Philippines have less players in the supply chain, specifically, in the generation and transmission of the electricity sector.

6.2 Recommendations

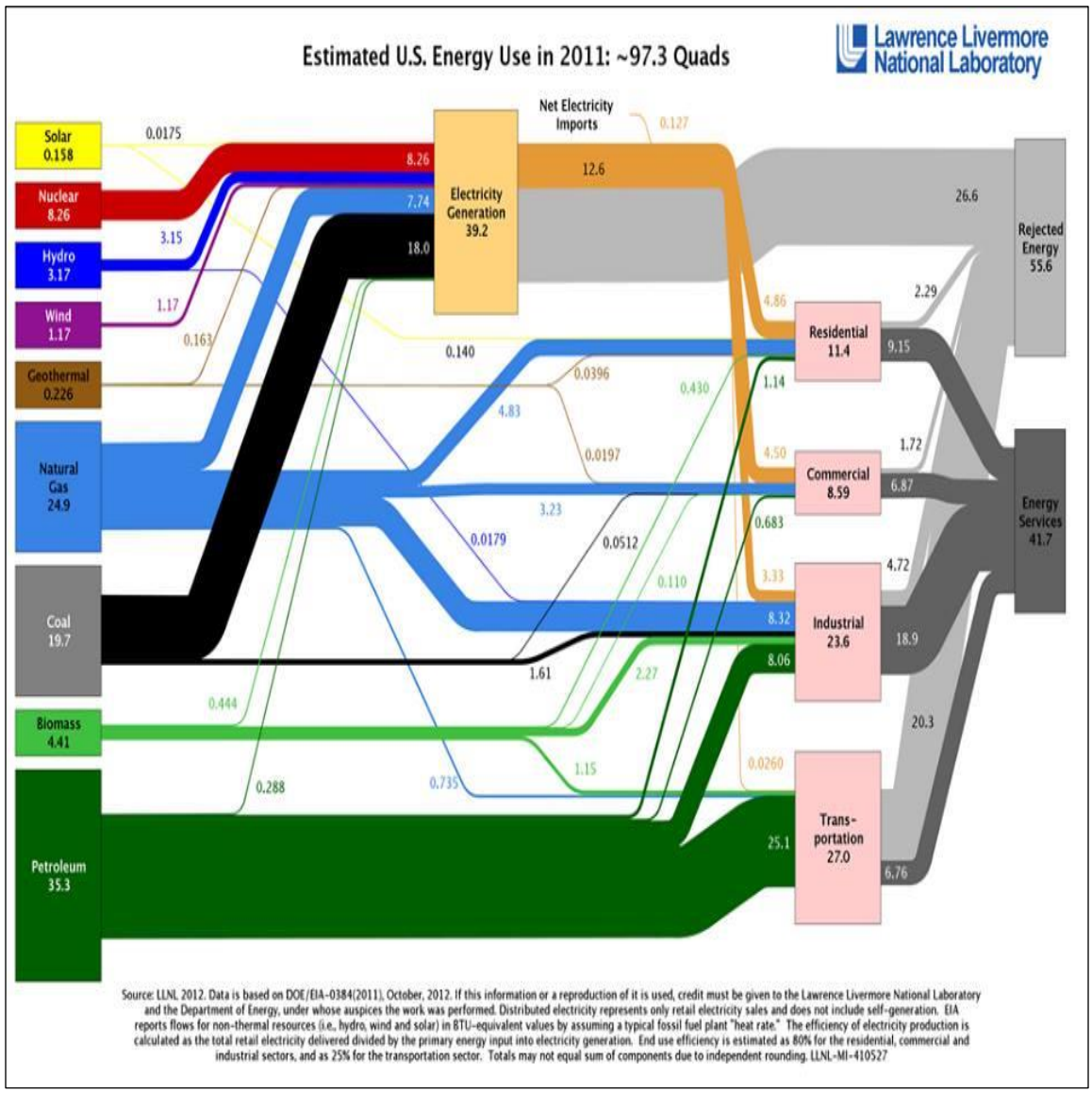
Based on the research results, the author recommends the following:

1. Private sectors engaged in the energy investment in the Philippines should consider all three alternative scenarios: Policy, Sustainability, and Energy Price Scenarios which are important factors for the short and long-term investments in the energy market. In the event that the government will focus on reviewing energy policies to reduce economic inefficiency to correct market failure, energy venture should be paralleled to the design of Philippine energy policies. However, inefficiency of implementing Philippine energy policies will incur opportunity costs for energy companies. Therefore, risk management and knowledge in the local business value are necessary investment tools in the Philippine energy market.
2. Government and policymakers should constantly review the existing energy policy in order to improve the market performance and reach the sustainability goal in the country. Energy policy implementation must be improved. Energy efficiency is also an important factor to consider for energy policy.
3. International companies engaged in heavy machinery and equipment for harnessing renewable energy should focus on the energy projects in the Philippines with cautious. A thorough market research is needed in order to know the right companies to partner with in the energy venture.

4. End-users and other stakeholders in the energy industry should be informed and educated of emerging renewable energy sources to provide awareness on the advantages and disadvantages of these sources. Public participation in green development should be encouraged through public engagement.
5. Individuals in the energy sector should consider to investment in green development education to develop knowledge and skills.
6. Future researchers should consider the willingness of the government on implementing and revising, if needed, the energy policy in the country. Currently, natural disaster which hit the Philippines in 2013 influenced DOE to update their energy plan for 2013-2030 (Olchondra, 2014). There is also a need in understanding the existing power plants in relation to its environmental impact. Furthermore, an in-depth investigation on energy price and its effects to energy consumption in the Philippines is also a very interesting topic to consider.

Appendices

Appendix A Estimated U.S. Energy Use in 2011



Appendix B Primary Energy Consumption by Region 2002-2012

Million tonnes oil equivalent	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Change 2012 over 2011	2012 share of total
US	2295.5	2302.3	2348.8	2351.2	2332.7	2372.7	2319.8	2205.8	2281.2	2265.2	**2208.8**	-2.8%	17.7%
Canada	305.1	312.1	315.5	324.1	321.4	327.5	326.1	311.7	315.6	328.6	**328.8**	-0.2%	2.6%
Mexico	140.5	147.6	153.4	164.5	168.8	167.8	170.8	171.7	173.9	180.5	**187.7**	3.7%	1.5%
Total North America	2741.1	2762.1	2817.7	2839.8	2822.9	2867.9	2816.7	2689.2	2770.8	2774.3	**2725.4**	-2.0%	21.8%
Argentina	56.7	61.1	64.4	68.8	71.8	74.7	76.5	75.7	77.3	80.4	**82.1**	1.9%	0.7%
Brazil	186.1	189.7	199.9	206.5	212.4	225.9	236.0	235.2	257.5	269.7	**274.7**	1.6%	2.2%
Chile	25.2	25.7	27.3	28.3	30.3	30.7	30.4	30.6	29.9	33.3	**35.5**	6.4%	0.3%
Colombia	25.5	26.2	26.8	28.2	28.8	29.5	30.4	31.9	33.3	35.9	**36.5**	1.3%	0.3%
Ecuador	8.6	8.9	9.2	9.7	10.3	10.9	11.6	11.5	12.8	13.6	**14.4**	5.7%	0.1%
Peru	12.1	12.0	12.8	13.4	13.6	14.9	16.2	16.6	18.9	20.6	**22.3**	7.9%	0.2%
Trinidad & Tobago	12.1	13.2	14.5	15.9	20.5	21.4	21.0	21.7	22.8	22.4	**21.2**	-5.8%	0.2%
Venezuela	69.4	61.4	68.6	71.0	77.1	76.0	83.0	82.3	83.2	84.7	**86.8**	2.3%	0.7%
Other S. & Cent. America	79.2	82.8	83.3	82.9	84.6	86.9	85.1	84.7	87.3	89.0	**91.8**	2.9%	0.7%
Total S. & Cent. America	474.9	480.9	506.8	524.8	549.4	570.9	590.3	590.2	623.0	649.5	**665.3**	2.2%	5.3%
Austria	33.3	34.0	34.7	35.2	35.0	34.2	34.8	34.1	35.2	32.0	**33.1**	3.2%	0.3%
Azerbaijan	10.9	11.8	12.6	13.8	13.6	12.3	12.3	10.9	10.7	11.9	**12.2**	2.5%	0.1%
Belarus	21.7	21.3	23.4	23.8	25.3	24.4	25.7	24.0	25.2	25.6	**25.9**	1.1%	0.2%
Belgium	62.3	65.2	65.0	64.6	64.7	65.0	67.2	62.7	66.4	63.7	**60.6**	-5.1%	0.5%
Bulgaria	18.2	19.3	19.0	19.6	20.0	19.4	19.5	17.0	17.8	19.1	**17.9**	-6.4%	0.1%
Czech Republic	41.6	43.7	45.3	45.3	46.1	45.5	44.5	41.8	43.5	42.8	**41.9**	-2.3%	0.3%
Denmark	19.9	21.4	20.5	19.8	21.9	20.9	20.0	18.8	19.6	18.3	**17.0**	-7.6%	0.1%
Finland	28.2	30.4	30.4	28.1	29.4	29.4	28.7	26.7	28.9	26.9	**26.4**	-2.0%	0.2%
France	255.8	259.9	264.3	263.0	261.3	257.9	258.9	245.0	253.1	244.7	**245.4**	*	2.0%
Germany	334.0	336.8	337.1	333.1	339.6	324.5	326.8	307.7	322.4	307.5	**311.7**	1.1%	2.5%
Greece	33.0	32.7	34.2	33.9	34.9	34.9	34.5	33.1	31.1	30.4	**28.8**	-5.7%	0.2%
Hungary	23.6	24.2	24.3	26.0	25.8	25.5	25.2	23.0	23.7	23.0	**21.9**	-4.9%	0.2%
Republic of Ireland	14.5	14.2	14.6	15.1	15.5	15.9	15.7	14.4	14.4	13.3	**13.0**	-3.1%	0.1%
Italy	175.4	181.0	184.6	185.1	184.6	181.8	180.4	168.1	173.2	169.6	**162.5**	-4.4%	1.3%
Kazakhstan	40.9	44.6	44.6	47.2	50.7	52.4	53.3	50.1	50.0	55.7	**58.1**	4.1%	0.5%
Lithuania	8.5	8.9	9.0	8.3	8.0	8.6	8.6	7.8	5.9	6.1	**6.0**	-2.4%	*
Netherlands	91.2	92.0	95.0	96.7	96.1	95.6	93.6	92.3	96.5	91.9	**89.1**	-3.3%	0.7%
Norway	43.6	39.2	39.9	46.0	42.4	46.1	47.1	43.9	42.1	43.2	**48.1**	11.1%	0.4%
Poland	87.7	90.1	91.4	91.2	94.7	95.7	96.2	92.1	99.5	99.8	**97.6**	-2.4%	0.8%
Portugal	25.5	25.8	25.4	25.6	25.5	25.4	23.8	24.2	25.4	24.1	**22.7**	-6.1%	0.2%
Romania	38.6	37.8	39.0	39.8	40.6	37.5	38.5	34.0	34.3	35.4	**33.6**	-5.2%	0.3%
Russian Federation	628.2	642.2	649.2	647.9	675.6	680.1	683.5	647.8	674.0	696.5	**694.2**	-0.6%	5.6%
Slovakia	18.7	18.1	17.6	18.8	17.9	17.2	17.7	16.0	17.0	16.5	**16.9**	2.2%	0.1%
Spain	137.5	145.3	151.2	153.7	155.1	159.6	155.5	145.1	146.6	145.6	**144.8**	-0.8%	1.2%
Sweden	50.7	48.3	52.1	53.8	50.7	51.8	51.5	47.2	50.7	50.5	**52.9**	4.7%	0.4%
Switzerland	29.3	29.1	28.8	27.7	28.9	28.6	29.7	29.7	29.0	27.5	**29.0**	5.5%	0.2%
Turkey	73.1	78.1	82.9	86.0	96.2	103.1	102.7	102.8	110.4	118.1	**119.2**	0.6%	1.0%
Turkmenistan	15.4	17.2	17.8	18.8	20.7	23.8	23.6	22.6	24.8	27.1	**25.8**	-5.3%	0.2%
Ukraine	133.0	136.6	137.5	136.1	137.5	135.4	131.9	112.2	120.9	125.6	**125.3**	-0.5%	1.0%
United Kingdom	221.7	225.4	227.3	228.2	225.5	218.3	219.8	207.7	213.8	200.5	**203.6**	1.2%	1.6%
Uzbekistan	55.0	51.8	49.6	46.1	45.9	48.7	52.3	46.7	48.0	51.6	**50.5**	-2.3%	0.4%
Other Europe & Eurasia	80.7	84.3	89.4	89.4	87.2	89.5	91.1	88.1	93.9	92.4	**92.7**	*	0.7%
Total Europe & Eurasia	2852.0	2910.9	2957.7	2967.7	3017.0	3009.2	3014.6	2837.8	2948.0	2936.6	**2928.5**	-0.5%	23.5%
Iran	144.3	152.2	158.6	179.5	189.8	195.7	202.1	214.3	221.5	227.0	**234.2**	2.9%	1.9%
Israel	20.1	20.7	21.0	21.6	21.8	22.9	23.8	23.1	23.4	24.0	**24.8**	3.2%	0.2%
Kuwait	21.7	25.5	28.5	30.5	28.9	28.8	30.4	31.5	34.8	35.7	**36.4**	1.8%	0.3%
Qatar	13.0	14.1	16.9	20.8	22.2	22.6	23.4	24.1	24.9	27.5	**31.6**	14.3%	0.3%
Saudi Arabia	127.6	135.8	147.4	152.4	158.6	165.0	179.2	186.4	202.4	207.5	**222.2**	6.8%	1.8%
United Arab Emirates	52.8	56.2	60.1	62.3	65.3	72.5	82.9	81.3	84.8	88.1	**89.3**	1.0%	0.7%
Other Middle East	84.9	80.9	85.9	91.6	90.2	91.6	103.2	107.7	116.3	117.7	**123.5**	4.7%	1.0%
Total Middle East	464.3	485.4	518.4	558.7	576.7	599.1	645.1	668.3	708.0	727.4	**761.9**	4.5%	6.1%
Algeria	28.6	30.0	31.1	32.6	33.5	35.4	37.5	39.6	38.6	40.7	**44.6**	9.3%	0.4%
Egypt	53.5	56.9	59.6	62.5	65.8	69.9	74.1	76.9	81.2	82.7	**87.1**	5.0%	0.7%
South Africa	103.7	109.4	115.5	115.0	116.8	122.9	128.5	124.0	123.1	122.2	**123.8**	1.0%	1.0%
Other Africa	106.2	107.8	116.6	123.0	121.6	126.3	133.1	131.3	142.8	138.4	**147.8**	6.5%	1.2%
Total Africa	291.9	304.1	322.7	333.1	337.7	354.5	373.1	371.9	385.7	384.0	**403.3**	4.7%	3.2%
Australia	113.5	112.6	115.2	119.0	125.1	125.4	125.2	124.3	123.2	126.5	**125.7**	-0.9%	1.0%
Bangladesh	14.8	15.7	16.4	17.4	18.7	19.3	20.4	21.4	23.1	24.4	**26.3**	7.5%	0.2%
China	1073.8	1245.3	1466.8	1601.2	1764.7	1878.7	1969.9	2101.5	2338.0	2540.8	**2735.2**	7.4%	21.9%
China Hong Kong SAR	20.8	21.2	24.3	22.9	24.7	26.2	24.5	27.0	27.7	28.6	**28.1**	-2.0%	0.2%
India	310.8	320.8	345.1	366.8	390.0	420.1	446.5	484.1	511.6	534.8	**563.5**	5.1%	4.5%
Indonesia	107.5	116.4	115.4	118.8	121.5	129.4	123.3	133.6	148.7	158.6	**159.4**	0.2%	1.3%
Japan	513.3	514.6	526.8	531.4	530.1	526.7	520.7	477.9	506.7	481.1	**478.2**	-0.9%	3.8%
Malaysia	53.1	55.7	55.7	61.3	65.9	69.6	71.0	70.6	76.1	74.9	**76.3**	1.6%	0.6%
New Zealand	19.3	18.7	19.5	18.8	19.0	19.0	19.1	19.1	19.7	19.5	**19.6**	0.6%	0.2%
Pakistan	47.4	52.4	56.8	58.9	61.8	65.2	64.9	67.0	68.0	68.1	**69.3**	1.4%	0.6%
Philippines	25.8	26.5	27.4	27.6	25.9	27.3	27.1	27.5	27.9	28.8	**30.2**	4.7%	0.2%
Singapore	41.6	39.4	44.2	49.6	53.1	58.5	61.3	64.8	70.8	73.9	**74.0**	-0.2%	0.6%
South Korea	203.0	209.8	213.8	220.8	222.9	231.9	236.4	237.4	254.6	267.8	**271.1**	1.0%	2.2%
Taiwan	94.5	98.9	104.2	106.5	108.0	112.9	106.8	104.4	110.6	109.8	**109.4**	-0.6%	0.9%
Thailand	72.1	77.1	82.4	86.5	88.9	92.7	95.5	99.3	105.0	111.1	**117.6**	5.5%	0.9%
Vietnam	21.4	22.5	28.7	29.8	32.3	34.9	36.7	42.1	43.7	48.4	**52.0**	7.1%	0.4%
Other Asia Pacific	41.1	42.9	43.9	46.5	49.6	48.1	49.7	50.3	52.5	56.1	**56.3**	0.2%	0.5%
Total Asia Pacific	2773.7	2990.4	3286.5	3483.7	3702.0	3885.9	3999.0	4152.4	4507.9	4753.2	**4992.2**	4.7%	40.0%
Total World	**9597.8**	**9933.8**	**10409.9**	**10707.7**	**11005.6**	**11287.5**	**11438.7**	**11309.8**	**11943.4**	**12225.0**	**12476.6**	**1.8%**	**100.0%**
of which: OECD	5454.4	5517.7	5627.9	5676.4	5684.2	5723.1	5669.4	5399.5	5593.1	5538.3	**5488.8**	-1.2%	44.0%
Non-OECD	4143.4	4416.1	4782.0	5031.3	5321.5	5564.4	5769.3	5910.3	6350.3	6686.6	**6987.8**	4.2%	56.0%
European Union	1743.1	1778.5	1807.5	1810.3	1818.2	1790.9	1788.0	1683.9	1745.6	1687.4	**1673.4**	-1.1%	13.4%
Former Soviet Union	937.7	959.8	970.4	969.8	1004.9	1015.6	1019.6	948.3	988.5	1030.3	**1029.3**	-0.4%	8.2%

*In this review, primary energy comprises commercially traded fuels, including modern renewables used to generate electricity.
*Less than 0.05%.
Notes: Oil consumption is measured in million tonnes; other fuels in million tonnes of oil equivalent.
Growth rates are adjusted for leap years.

Source: http://www.bp.com/content/dam/bp/pdf/statistical-review/statistical_review_of_world_energy_2013.pdf

Appendix C Share of Agriculture to Economy (% of GDP) for 1985-2011

Countries	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Vietnam	40.2	38.1	40.6	46.3	42.1	38.7	40.5	33.9	29.9	27.4	27.2	27.8	25.8	25.8	25.4	24.5	23.2	23.0	22.5	21.8	21.0	20.4	20.4	22.2	20.9	20.6	22.0
Indonesia	23.2	24.2	23.3	22.5	21.7	19.4	18.3	18.7	17.9	17.3	17.1	16.7	16.1	18.1	19.6	15.6	15.3	15.5	15.2	14.3	13.1	13.0	13.7	14.5	15.3	15.3	14.7
Philippines	24.6	23.9	24.0	23.0	22.7	21.9	21.0	21.8	21.6	22.0	21.6	20.6	18.9	14.8	15.2	14.0	13.2	13.1	12.7	13.3	12.7	12.4	12.5	13.2	13.1	12.3	12.8
Thailand	15.8	15.7	15.7	16.2	15.1	12.5	12.6	12.3	8.7	9.1	9.5	9.5	9.4	10.8	9.4	9.0	9.1	9.4	10.4	10.3	10.3	10.8	10.7	11.6	11.5	12.4	12.4
Malaysia	19.9	19.8	20.0	20.1	18.1	15.2	14.4	14.6	13.8	13.7	12.9	11.7	11.1	13.3	10.8	8.6	8.0	9.0	9.3	9.3	8.3	8.6	10.0	10.0	9.2	10.4	11.9

Source: Worldbank

Appendix D Philippine Power Statistics 1991-2012

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Power Consumption by Sector In Gwh																						
Residential	6,249	6,053	6,368	7,282	8,223	9,150	10,477	11,936	11,875	12,894	13,547	13,715	15,357	15,920	16,031	15,830	16,376	16,644	17,504	18,833	18,694	19,695
Commercial	4,847	4,910	4,725	5,865	6,353	7,072	8,013	8,725	8,901	9,512	10,098	10,109	11,106	11,785	12,245	12,679	13,470	14,136	14,756	16,261	16,624	17,777
Industrial	9,339	8,859	9,395	10,684	10,950	11,851	12,531	12,543	12,444	13,191	14,452	13,628	15,188	15,012	15,705	15,888	16,522	17,031	17,084	18,576	19,334	20,071
Others	952	823	721	762	1,067	1,167	1,267	934	921	957	1,042	1,172	1,069	1,359	1,177	1,275	1,641	1,395	1,523	1,596	1,446	1,668
Electricity Sales	**21,387**	**20,645**	**21,209**	**24,593**	**26,593**	**29,240**	**32,289**	**34,138**	**34,142**	**36,555**	**39,140**	**38,624**	**42,720**	**44,076**	**45,159**	**45,672**	**48,009**	**49,206**	**50,868**	**55,266**	**56,098**	**59,211**
Utilities Own Use	1,086	1,154	1,132	1,132	1,226	1,340	1,471	1,590	1,536	2,390	2,196	1,928	3,410	4,654	4,591	4,227	3,994	3,935	3,524	4,677	5,398	5,351
Power Losses	3,176	4,071	4,238	4,734	5,735	6,128	6,037	5,849	5,754	6,345	5,713	7,915	6,810	7,228	6,817	6,885	7,608	7,680	7,542	7,800	7,680	8,360
Total	25,649	25,870	26,579	30,459	33,554	36,708	39,797	41,578	41,432	45,290	47,049	48,467	52,941	55,957	56,568	56,784	59,612	60,821	61,934	67,743	69,176	72,922
Power Generation by Grid In Gwh																						
Luzon	19,511	19,967	19,902	23,290	25,206	27,688	30,084	31,755	31,745	34,679	36,184	36,387	37,535	39,854	40,627	41,241	43,620	44,200	44,975	50,265	50,017	52,312
Visayas	2,376	2,566	2,813	3,036	3,652	3,991	4,347	4,481	4,441	5,147	5,163	6,099	8,842	9,016	8,698	8,129	8,102	8,650	8,724	9,075	10,456	11,483
Mindanao	3,763	3,337	3,864	4,133	4,695	5,029	5,365	5,343	5,245	5,464	5,703	5,982	6,564	7,087	7,243	7,414	7,890	7,972	8,235	8,403	8,703	9,127
Total	25,649	25,870	26,579	30,459	33,554	36,708	39,797	41,578	41,432	45,290	47,049	48,467	52,941	55,957	56,568	56,784	59,612	60,821	61,934	67,743	69,176	72,922
Power Generation by Source In Gwh, Total Philippines																						
Oil-Based	12,804	13,939	13,867	16,929	19,078	18,288	19,116	18,190	11,799	9,185	9,867	6,293	7,170	8,504	6,141	4,665	5,148	4,868	5,381	7,101	3,398	4,254
Oil-Thermal	9,910	10,057	7,341	7,582	7,904	8,083	8,670	7,207	5,392	2,560	3,528	947	1,180	1,431	309	274	324	658	909	1,364	512	695
Diesel	874	1,181	2,074	4,440	7,044	6,855	6,736	7,169	4,326	5,028	4,473	4,561	5,509	6,253	5,717	4,152	4,162	3,660	3,771	4,532	2,762	3,332
Gas Turbines/CC	2,020	2,701	4,452	4,907	4,130	3,350	3,709	3,814	2,080	1,597	1,865	785	481	821	116	239	662	550	700	1,205	124	227
Hydro	5,145	4,440	5,030	5,862	6,232	7,030	6,069	5,066	7,840	7,799	7,104	7,033	7,870	8,593	8,387	9,939	8,563	9,843	9,788	7,803	9,698	10,252
Geothermal	5,758	5,700	5,667	6,320	6,135	6,534	7,237	8,914	10,594	11,626	10,442	10,242	9,822	10,282	9,902	10,465	10,215	10,723	10,324	9,929	9,942	10,250
Coal	1,942	1,791	2,015	1,348	2,109	4,855	7,363	9,388	11,183	16,663	18,789	16,128	14,939	16,194	15,257	15,294	16,837	15,749	16,476	23,301	25,342	28,265
Other Renewble(Wind,Solar,Biomass)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A						19	55	59	63	79	90	205	259
Natural Gas							12	20	16	17	848	8,771	13,139	12,384	16,861	16,366	18,789	19,576	19,887	19,518	20,591	19,642
Total	25,649	25,870	26,579	30,459	33,554	36,708	39,797	41,578	41,432	45,290	47,049	48,467	52,941	55,957	56,568	56,784	59,612	60,821	61,934	67,743	69,176	72,922
Installed Generating Capacity In MW																						
Oil Based	3,341	3,399	4,296	5,335	5,425	5,844	5,973	5,568	4,839	4,987	3,905	3526.57	3,604.1	3,669.2	3,663	3,602	3,616	3,353	3,193	3,193	2,994	3,074
Hydro	2,155	2,257	2,259	2,254	2,303	2,303	2,303	2,304	2,304	2,301	2,518	2518.07	2,867.1	3,217.1	3,222	3,257	3,289	3,291	3,291	3,400	3,491	3,521
Geothermal	888	888	963	1,074	1,154	1,446	1,886	1,856	1,931	1,931	1,931	1931.48	1,931.5	1,931.5	1,978	1,978	1,958	1,958	1,953	1,966	1,783	1,848
Coal	405	405	441	550	850	1,600	1,600	2,200	3,355	3,963	3,963	3963	3,958.3	3,967.1	3,967	4,177	4,213	4,213	4,277	4,867	4,917	5,568
New RE							NA	NA	NA	NA		-			26	26	26	34	64	73	117	153
Natural Gas								3	3	3	1,063	2763	2,763.0	2,763.0	2,763	2,763	2,834	2,831	2,831	2,861	2,861	2,862
Total	6,789	6,949	8,014	9,212	9,732	11,193	11,762	11,931	12,431	13,185	13,380	14,702	15,124	15,548	15,619	15,803	15,937	15,681	15,610	16,359	16,162	17,025

Note: *IPPs generation included in the utility
Generation data includes grid connected, embedded and off-grid generator.
Off-grid generator not included in the Installed Capacity.

Appendix E Sample Invitation Letter to Participants

HÁSKÓLINN Í REYKJAVÍK
REYKJAVIK UNIVERSITY

30 December 2013

Participant´s Fullname
Position
Company´s Name

Dear _____,

My name is Fe Amor Parel Gudmundsson, a graduate student from Reykjavik University (RU). I am currently working on my master thesis entitled: **Scenario Analysis of the Philippine Energy Market.** The master thesis is a requirement to complete my MSc in International Business from RU in January 2014.

The project aims to provide alternative scenarios for the energy market in the Philippines using the Delphi method for data gathering. I am inviting a list of experts in this field to participate in a two-round data gathering. In each round, panel of experts are requested to read statements and provide longer, free-form reactions on the statement or may also do revisions of the statement.

For the confirmation of your participation, kindly reply on or before 4 January 2014. The questionnaire will be sent on the 5th of January.

Your time is very much appreciated.

Respectfully,

Fe Amor Parel Gudmundsson
MSc in International Business Student
Reykjavik University
Reykjavik, Iceland

Appendix F Sample Questionnaire for Round 1

HÁSKÓLINN Í REYKJAVÍK
REYKJAVIK UNIVERSITY

8 January 2014

Participant´s Full Name
Position
Company´s Names

Dear _____,

Thank you for agreeing to participate in this study, *Scenario Analysis on the Philippine Energy Market*. I appreciate your willingness and value your feedback.

The main objective of this study is to generate alternative scenarios for the energy market in the Philippines using the Delphi method for data gathering. The two-round data gathering will require experts, such as you, to provide their opinion on the given statements. There are 3 main topics in this questionnaire: (1) **Energy Consumption and Economic Growth**; (2) **Renewable Energy and Energy Efficiency**; and (3) **Energy Price**. For each topic you will find statements based on reviewed literature. At the end of each page, you will be required to write your assessment.

Feedback from experts are not yes or no answer, rather, these are in-depth descriptions of their assessment. Responses are confidential and will be compiled together to achieve consensus among experts.

This is the first round of the Delphi method. Please complete the 3 main topics and send your feedback **on or before 15 January 2014**.

Respectfully,

Fe Amor Parel Gudmundsson
MSc in International Business Student
Reykjavik University
Reykjavik, Iceland

Energy Consumption and Economic Growth

The relationship of energy consumption and economic growth is an important factor used to understand energy market. This helps to explain the demand side of the equation. To provide alternative scenarios for the energy market in the Philippines, the relationship of these two variables creates a long-term path for the energy industry.

The causal relationship of energy consumption and economic growth suggests that an increase in energy demand contributes to the prosperity of the Philippine economy as a whole. This means that the commonly accepted conclusion is that energy consumption has positive impact to the well-being of the economy. The key ingredient to promote economic growth, in this aspect, is the focus on human development through the improvement of energy utilization on daily activities. Energy plays an important role to electricity generation, transportation, household, commercial and industrial sectors. The Energy industry must be given attention in order to secure supply, environmental impact of supply and consumption are acceptable and increase accessibility. In the Philippines, political instability hinders the advancement of the energy industry. There is still a need of tremendous work for energy policy transition to improve accountability, reduce risk and increase efficiency.

Therefore, economic growth scenario for the Philippine energy market depends on the willingness of the government to advance the energy industry by improving energy policies.

To what extent do you agree with this statement? Please explain why you agree / disagree. If you have additional thoughts, contexts, or information, please provide it. You may also rewrite the statement if you wish.

Renewable Energy and Energy Efficiency

The significance of the availability of energy sources provides long-term direction to energy industry. In 2011, the primary energy supply in the Philippines is composed of 41% renewable energy. To provide alternative scenarios for the energy market in the Philippines, market trend shows challenges in the use of renewable energy and energy efficiency in the supply side of the equation. These challenges are lack in advanced technology, capital investments and technical expertise.

Energy consumption contributes to the advancement of the economy. However, the increasing energy consumption using unhealthy fossil fuel also contributes to the emerging environmental issues. Energy conservation may negatively affect economic growth. The alternative solution is the promotion of renewable energy and energy efficiency. The Philippines has long been dependent on imported fossil energy. With the environmental impact of the increase in energy consumption through the continuous use of fossil fuel, the Philippine government needs to address the following: 1.) Improvement of energy policy to advance the use of renewable energy in the country, 2.) Concentration on energy efficiency in the electricity production as it is the most technical part of the energy supply chain, 3.) Promotion on transparency in the energy sector to attract energy investors, and 4.) Development on educational program to impart and advance technical expertise. The population growth in the Philippines will cause increase in energy consumption which may continue the use of fossil fuel if the government fails to address those four factors mentioned.

The sustainability scenario for the energy market in the Philippines relies on the government intervention to advance energy infrastructure of the country.

To what extent do you agree with this statement? Please explain why you agree / disagree. If you have additional thoughts, contexts, or information, please provide it. You may also rewrite the statement if you wish.

Energy Price

Energy price does not reflect basic forces of supply and demand. Thus, in the Philippines energy price manipulation exists because of this. Industry players, from suppliers to end-users, are aware of the importance of energy. Therefore, energy suppliers are not competing with price in the market and end-users are more concern on the availability of energy rather than energy price. With this, the effects of energy price increase to energy use helps provide an idea for a long-term path of the energy market in the Philippines.

In the energy market, price volatility develops when there are economic and political instability. This greatly affects the energy market in the Philippines because the country is dependent on imported fossil fuel. This would result problems to meet energy demand.

The energy price scenario for the energy market in the Philippines illustrates that the increase in energy price will not hinder energy use in the country, even imposing energy tax and energy-saving technology regulations will not affect energy consumption.

To what extent do you agree with this statement? Please explain why you agree / disagree. If you have additional thoughts, contexts, or information, please provide it. You may also rewrite the statement if you wish.

Appendix G Sample of Questionnaire for Round 2

HÁSKÓLINN Í REYKJAVÍK
REYKJAVIK UNIVERSITY

20 January 2014

Participant´s Full Name
Position
Company´s Name

Dear _____,

Thank you for your time in the first round of the data gathering for this project, *Scenario Analysis on the Philippine Energy Market*. To complete the two-round data gathering, kindly find the questionnaire on the succeeding pages.

Again, the main objective of this study is to generate alternative scenarios for the energy market in the Philippines using the Delphi method for data gathering. The two-round data gathering will require experts, such as you, to provide their opinion on the given statements. There are 3 main topics in this questionnaire: (1) **Energy Consumption and Economic Growth**; (2) **Renewable Energy and Energy Efficiency**; and (3) **Energy Price**. For each topic you will find statements based on the feedback from the first round. At the end of each topic, you will be required to write your assessment.

Feedback from experts are not yes or no answer, rather, these are in-depth descriptions of their assessment. Responses are confidential and will be compiled together to achieve consensus among experts.

This is the **second and last round** of the Delphi method. Please complete the 3 main topics and send your feedback **on or before 25 January 2014**.

Thank you very much for your time!

Respectfully,

Fe Amor Parel Gudmundsson
MSc in International Business Student
Reykjavik University
Reykjavik, Iceland

Energy Consumption and Economic Growth

The relationship of energy consumption and economic growth is an important factor used to understand energy market. This helps to explain the demand side of the equation. To provide alternative scenarios for the energy market in the Philippines, the relationship of these two variables creates a long-term path for the energy industry.

The causal relationship of energy consumption and economic growth suggests that the commonly accepted conclusion is that energy consumption has positive impact to the well-being of the economy. In the Philippines, economic growth was hampered by the high prices and limited supply of electricity and fuel. Luzon´s power rates have rocketed in recent months due to the short supply of base and mid-merit loads. Visayas power supply is still limited. Mindanao had been experiencing 6-8 hour brownouts for more than a year. Industries in off-grid areas are almost non-existent due to the lack of power. The results were one of the highest power rates in the Asia.

Furthermore, economic growth is also crucial for the development of energy supply. Energy demand, in this aspect, is the result of economic growth. It is fuelled by the rising economic growth, population growth and lifestyle. In the Philippines, energy access is still a major issue in the country with about 20% of households without access. The Energy industry must be given attention in order to secure supply, environmental impact of supply and consumption are acceptable and increase accessibility. Energy plays an important role to electricity generation, transportation, household, commercial and industrial sectors. The increasing energy demand from all sectors and the limited energy supply lead to the focus on economic and energy policy to meet demand.

There is still a need of tremendous work for energy policy transition to improve accountability, reduce risk and increase efficiency. The government needs to formulate a more deliberate, long-term vision in partnership with the different sectors of the society. It means to have integration with the national and local government, the business sector, the academe and other stakeholders which can define a sustainable and inclusive energy future. Although the Philippine government is still corrupt, it does work. It prolonged the energy policy implementation, e.g. Renewable Act of 2008, net metering rules were implemented only in 2013 and Feed in Tariff (FIT) expected to start in 2014. EPIRA needs to be reviewed to provide an improved framework to advance. Strict monitoring and implementation of the penalties and cancellation of the renewable energy contracts is necessary.

Therefore, policy scenario for the Philippine energy market depends on the political will to advance the energy industry by improving economic and energy policies with main concern on addressing environmental and sustainability issues. These two policies need to go hand-in-hand and should be under constant scrutiny and be evaluated on a regular basis. The thorough evaluation on economic policy with regards to energy sustainability is crucial because renewable energy sources are domestic sources. In the Philippines, EPIRA provisions should be reviewed and the full implementation of Renewable Energy (RE) Act of 2008 must commence. The five year delay of the implementation of RE Act meant lost opportunities in renewable projects and

investments. However, the Net-Metering Resolution under RE Act which took effect on July 24, 2013 may encourage Filipinos and companies to shift into renewable energy in the Philippines. This could be the start of a big transition in the electricity generation-transmission-distribution scheme. Through the Net-Metering, end-users become more involve in satisfying their electricity demand which makes them active participants in the energy supply. Furthermore, the implementation of caps to FIT by technology hinders expansion which also contributes to the slow development of renewable energy in the country. The released FIT rates in 2012 are, hydro, P5.90; biomass, P6.63; wind, P8.53; solar, P9.68; compared to the original rates proposed by the Renewable Energy Board in 2011 (hydro, P6.15; biomass, P7.00; wind, P10.37; solar, P17.95). Currently, Philippine FIT program does not include geothermal which the country may experience opportunity cost from project developments in this particular renewable energy source.

Do you agree with everything in this statement? If yes, are there any areas of the statement that look particularly important to you. Why? If no, please explain why you disagree. If you feel that there are important ideas or important information that would enrich this brief analysis, please share them with me.

Renewable Energy and Energy Efficiency

The significance of the availability of energy sources provides long-term direction to energy industry. In 2011, the primary energy supply in the Philippines is composed of 41% renewable energy, in terms of capacity. The three major regions in the country experienced electricity shortage, especially in Mindanao. During summer, energy consumption grows mostly in Luzon and Visayas islands.

To provide alternative scenarios for the energy market in the Philippines, market trend shows challenges in the use of renewable energy and energy efficiency in the supply side. These challenges are lack in advanced technology, capital investments and technical expertise. The increasing energy consumption during peak season is hard to meet as there is no new power plant on grid. Energy efficiency on demand side is a huge issue despite the high costs of electricity. The old generation plants, e.g. hydro plants, contribute to a reduction in the overall capacity in the Philippines. The country consists of more than 7,100 islands, visited by more than 20 typhoons per year, causing heavy damages due to heavy rains and wind exceeding 200 kph, with blackouts lasting for weeks due to the time required to restore fallen transmission and distributions lines. The challenges of connecting islands and isolated communities by transmission lines require huge investments, which will result to higher power rates. By this, renewable energy is ideally suited to distributed generation and must be developed in lieu of big power plants.

The increasing energy consumption using unhealthy fossil fuel also contributes to the emerging environmental issues. The alternative solution is the promotion of renewable energy and energy efficiency. The Philippines has long been dependent on imported fossil energy. With the environmental impact of the increase in energy consumption through the continuous use of fossil fuel, the Philippine government needs to address the following: 1.) Improvement of implementing energy policy to advance the use of renewable energy in the country, 2.) Concentration on energy efficiency of the energy supply chain, 3.) Promotion on transparency in the energy sector to attract energy investors, and 4.) Development on educational program to impart and advance technical expertise. The population growth in the Philippines will cause increase in energy consumption which may continue the use of fossil fuel if the government fails to address those four factors mentioned. In addition, the participation of the private sectors plays an important role to the transition of the energy industry to enhance efficiency, reliability and sustainability.

The sustainability scenario for the energy market in the Philippines relies on the (1) government intervention through investment incentives and changes its policy direction from centralized generation and transmission to distributed generation; and (2) the interest and willingness of private sectors to participate in advancing energy infrastructure of the country (3) the criteria of success against which the Philippines will measure the effects of more RE power plants on climate change. Transparency is important as much as eradication of corruption on other government agencies with relevant participation, e.g. granting permits and certificates, in the development of renewable sources of energy. In addition, educating the communities about renewable energy will provide better understanding on its advantages and disadvantages. Stakeholders may be able to participate more in the energy development through public

engagement. Moreover, government should also look at into securing energy supply by improving the implementation of safeguards to avoid monopoly by few players of the power generating assets. The joint effort of the government, the private sectors and other stakeholders is the key for the development of renewable energy sources to address environmental and economic sustainability.

Do you agree with everything in this statement? If yes, are there any areas of the statement that look particularly important to you. Why? If no, please explain why you disagree. If you feel that there are important ideas or important information that would enrich this brief analysis, please share them with me.

Energy Price

Energy price does not reflect basic forces of supply and demand. Thus, in the Philippines energy price manipulation exists because of this. The current energy supply chain has no differentiation in the cost of the sources of energy; meaning that whether the source is through fossil fuels or through renewable energy, the power producers tend to price electricity in the same way.

The energy price and availability of energy are huge issues in the Philippine energy market. It has shown in the Visayas that industry follows energy supply. After the completion of the new coal-fired plants, the additional supply was completely utilized within a short period. More capacities are needed to cover the increased demand. In Panay for example, the initial tariff granted by the Energy Regulatory Commission to Panay Energy Development Corporation was Php 7.40 per kWh, which was several pesos higher than the grid rate. And yet the end-users paid for it, only with token resistance and grumblings. Filipinos would have no choice but to continue energy use even at skyrocketed prices because energy is a basic commodity. Industry players, from suppliers to end-users, are aware of the importance of energy. Therefore, energy suppliers are not competing with price in the market and end-users are more concern on the availability and reliability of energy rather than energy price.

In the energy market, price volatility develops when there are economic and political instability. This may be observed in the changes in the cost of fuel which is passed through the customer. This greatly affects the energy market in the Philippines because the country is dependent on imported fossil fuel.

The energy price scenario for the energy market in the Philippines illustrates that the high energy price will not hinder energy use in the country, even imposing energy tax and energy-saving technology regulations will not affect energy consumption. Power supply has been unreliable which lead for consumers to ultimately be forced to use the costliest form of power. In Asia, Philippine electricity prices are the highest due to (1) no subsidies in the system apart from rural electrification sites, (2) Energy generation is concentrated in an oligopolistic structure in which 3 company control the market, (3) Almost complete privatization of electricity generation, (4) full pass through of changes in the cost of fuel by the generation companies and full pass through of changes in the generation charges to the end-users, (5) slow implementation of RE Act of 2008, (6)Feed in tariff (FIT) expected to start in 2014, (7) implementation of caps to FIT by technology which hinders expansion, (8) the current energy set up relies heavily on foreign sources of energy which raises energy costs, (9) high generation costs with the main culprit blamed on the high cost of contract with independent power producers entered by the government at the height of the energy crisis. Those factors mentioned which affect electricity prices in the Philippines have no impact on electricity use in the country. Reliability on supply is essential to end-users. The Philippines is already experiencing power shortage throughout the year. Factors affecting energy demand such as: (1) population growth, (2) the emerging business process outsourcing which requires

electricity for their daily operations, (3) the increasing middle class Filipinos who are now investing in the real estate which require energy for their appliances and other daily energy-related household maintenance, (4) transportation and (5) the need to improve the agricultural sector, e.g. drying of crops are indicators that energy demand will increase in the near future. With unreliability in supply and the increasing energy demand, energy price will be the least to be considered by end-users. Furthermore, in relation to environmental impact of energy consumption, high energy cost does not have a direct impact on energy use but it can sustain the increase in efficiency by imposing carbon tax.

Do you agree with everything in this statement? If yes, are there any areas of the statement that look particularly important to you. Why? If no, please explain why you disagree. If you feel that there are important ideas or important information that would enrich this brief analysis, please share them with me.

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