Potential and Status of the Renewable Energy Technologies for Sustainable Energy Development in Organization of Islamic Conference (OIC) Countries

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Abstract: The paper reviews the socio-economic situation and potential energy supply utilization in (OIC) countries which vary considerably. The review indicates that growing energy consumption requirements are associated with economic development and population increasing. To understand the role of energy use at the national level, it is necessary to understand the relationship of energy use to economic activity and social well-being, and the relationship between energy consumption and (GDP) indicates the economic development of the countries. Renewable energy technologies utilization is indicated as an appropriate alternative for providing a considerable portion of future energy demand in certain energy consuming in all sectors, renewable energy has the potential to play an important role in providing energy with sustainability to the vast populations in developing countries who as yet have no access to clean energy. Despite, these countries enjoy a variety of energy sources such as hydro, solar, wind, geothermal and biomass. Finally, this paper details the status of renewable energy technologies developments in (OIC) countries as an essential element for the sustainable development in these countries, although their wealth in crude oil and gas in the some countries are enough but, they need to development this energy in right way.

Key-Words: Renewable Energy Technologies, (OIC) Countries, Gross Domestic Product (GDP), Energy Consumption, Energy Supply.

1 Introduction

Since times immemorial, energy has been a vital component for human life, in particular for economic activity. The link between energy and economic growth and development is beyond doubt. Close association has been confirmed between energy production and consumption levels on the one hand and between economic growth and economic development on the other [1]. In today's world, the conventional sources still dominate the commercial energy market scene with coal taking the highest market share. While having the least share among conventional sources, oil seems the most important, and movements of oil prices are among the most closely followed variables in the world. Oil variables continue to be at the centre of world international relations and policy making debates [1,2]. This is so, at a time when oil shares as a source of energy have declined significantly. Oil had the second largest market share worldwide in 1980 but the least share by 2000. With such a diminished contribution and weight, the interest and attention on oil should have dwindled. The reality is the contrary; they have risen and intensified [1, 2].

The majority data and the policy section of this study are based on the energy Section of the World Bank development indicators (WBDI) and the statistical, economic and social research and training centre for Islamic countries (SESRIC). Energy data from different sources is converted to a standard unit metric ton of oil equivalents (MTOE). Conversion factors are used to standardize countries. Data was unavailable for some of OIC member countries (MCs), all those countries of which belong to the low-income group. To ensure consistency, OIC MCs income data is also obtained from the same source. Using available data, MCs are classed by income and energy endowment. Income-wise, MCs are divided into four groups: (1) high-income group and (2) middle-income group and (3) low-income group and (4) No-income group on the GDP basis.

2 Energy as a basis for sustainable development

It is well known today that technological and industrial progress is heavily dependent on the readily available energy; the enormous technological and industrial advancement of that so called developed countries was primarily made through exploitation of earth's vast reservoir of fossil fuels. These fossil fuels, often imported from countries that themselves lacked the science and technology required for their effective utilization, helped the developed countries to attain affluence at an unprecedented pace. It also helped to control the destinies of other less developed countries of the world [3,4]. The Industrial revolution developed the countries in two main groups:

- Manufacturing industrially developed.
- Developing countries with primary raw materials.

Today, developed nations, with one fifth of world's population consume four-fifths of world's fossil fuels, in 1973 the oil producing countries decided to increase the price of crude oil by a factor of five from 2 dollars to 10 dollars per barrel. This created a sensation and chaos in the economic situation of both the developed and the non oil producing developing countries; since been greatly hampered by the ever increasing prices of oil as Fig. 1, which show the growing of the world energy consumption from 1970 to 2030. During 1970 the oil prices were well below the cost of living, Whereas they were well above it in the late nineteen seventies, and still continue to rise, although with some fluctuations from time to time substantial inputs of Power are needed for nearly all industrial development. For the developing countries generally, the effect of higher oil prices has been to make it difficult and, in some cases, nearly impossible to overcome power shortages by importing cheap oil, as they did in the past. The real cost of using oil by the developing countries is now many times higher in relation to the use of possible substitutes than it was before. Where alternative fuels exist, the change in relative costs is reflected in the prices of different fuels, so that consumers are encouraged to switch over from the more expensive to the cheaper ones [4].

3 Rising of the energy consumption

Before the industrial revolution, humans relied on natural energy flows and on animal and human power for heat, light and work. Mechanical energy sources were confined to draft animals, wind and water. The only form of energy conversion (from chemical energy to heat and light) came from burning various forms of biomass. Energy use per capita did not exceed 0.5 tons of oil equivalents (TOE) per year. Between 1850 and 2005, overall energy production and use grew more than 50 fold from a global total of approximately 0.2 Billion toe to 11.4 Billion toe [2,3]. As societies have the

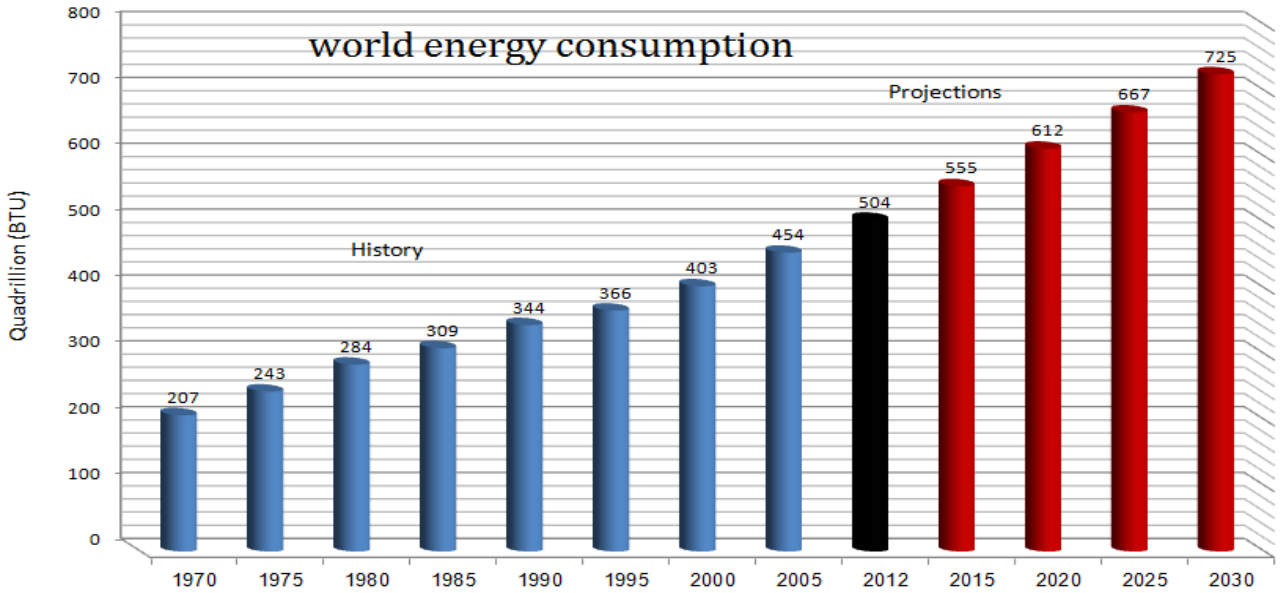

Fig. 1 International Energy Outlook

industrialized, they have not only used more energy but they have used energy in different forms, typically switching as household incomes rise from

such traditional fuels as wood, crop residues and dung to such commercial forms of energy (i.e., fuels that can be bought and sold) as oil, natural gas, propane and electricity. Reliable estimates for the use of traditional waste and biomass are difficult to obtain, but these fuels are estimated to account for approximately 10 % of overall primary energy use at present. Much of this use is concentrated in the rural areas of developing countries [4,5]. More reliable statistics are available for the consumption of commercial energy, which grew rapidly during the second half of the 20th century. Because most commercial forms of energy are derived from fossil fuels (notably, coal, oil and natural gas), consumption of these fuels grew even faster increasing roughly 20-fold in the 20th century alone as showing in Fig. 2. Non-renewable, carbon-emitting fossil fuels now supply approximately 80% of the world's primary energy needs.

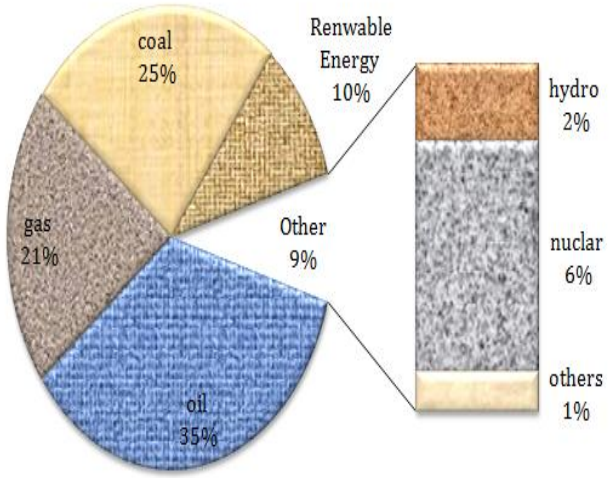

Fig. 2 Share of World Primary Energy Potential in 2008

Some of the projecting forward from current trends suggests that overall energy use will continue to grow strongly doubling or even tripling by 2050. More troubling from a sustainability perspective, fossil fuel consumption could grow nearly as strongly as total energy consumption, meaning that fossil fuels would continue to dominate the overall supply mix again, assuming a continuation of current business as usual trends [5].

4 The Energy Supply in (OIC) countries

4.1 Selection of Countries & Population

There is no undisputable criterion for defining the Muslim countries. In the present paper, we are take approach of acceptance Muslim countries all the countries that identify themselves with the Organization of Islamic Conference regardless of the percentage of Muslims in their population, and also we add to them countries that are known as having Muslim majority in their population [6,7]. Among 154 developing countries as defined by the World Bank and according to the statistical 2010, there are 57 Muslim countries, which constitute the vast majority of the total population of developing countries. Selected socioeconomic and energy data are given for 57 country of OIC countries as explained in Fig. 3, the energy supply per capita in each of OIC countries, but due to insufficient data, there is a few indicators and data of these countries have not been included. So, there are a few important factors to explain some information in OIC countries. At present data, Muslims account for 22% of the total world population, which are at least 1.5 Billion people. Total world population in 2009 was estimated to be 6.6 Billion, with an overall rate of increase of 1.8% during the period 2000 to 2005. Muslim nations have much faster rates of population growth than western nations for the same period; the rate of population increase averaged over 57 OIC countries was 3.3% [7].

4.2 Economic growth

Gross domestic product (GDP) is a highly descriptive economic indicator of a nation, which measures the total domestic and foreign output [7,9]. in accordance data of the World Bank and the classification in this study, among the 57 OIC countries reviewed (14) belong to the group of low-income economics, (30) to the middle-income economies, and (12) to the high-incomes economies and then (1) to the No-incomes economics, Table. 1 explaining those countries thus covers a wide economic range.

Table 1 .The structure of OIC countries regarding to GDP/PPP per capita (USD$) 2009

Economics Groups	
High economies group: (GDP/PPP > 8000 USD)	12 countries
Middle economies group: (800 USD < GDP/PPP > 8000 USD)	30 countries
Low economies group: (GDP/PPP < 800 USD)	14 countries
No-income economies group: (GDP/PPP = 0.0 USD)	1 countries

4.3 Energy Situation and Potential in OIC countries

At the both of them from the fossil fuel reserves (coal, oil and natural gas) and renewable energy potentials as biomass, wind, hydrothermal and geothermal [8]. Before the starting in the analyzing;

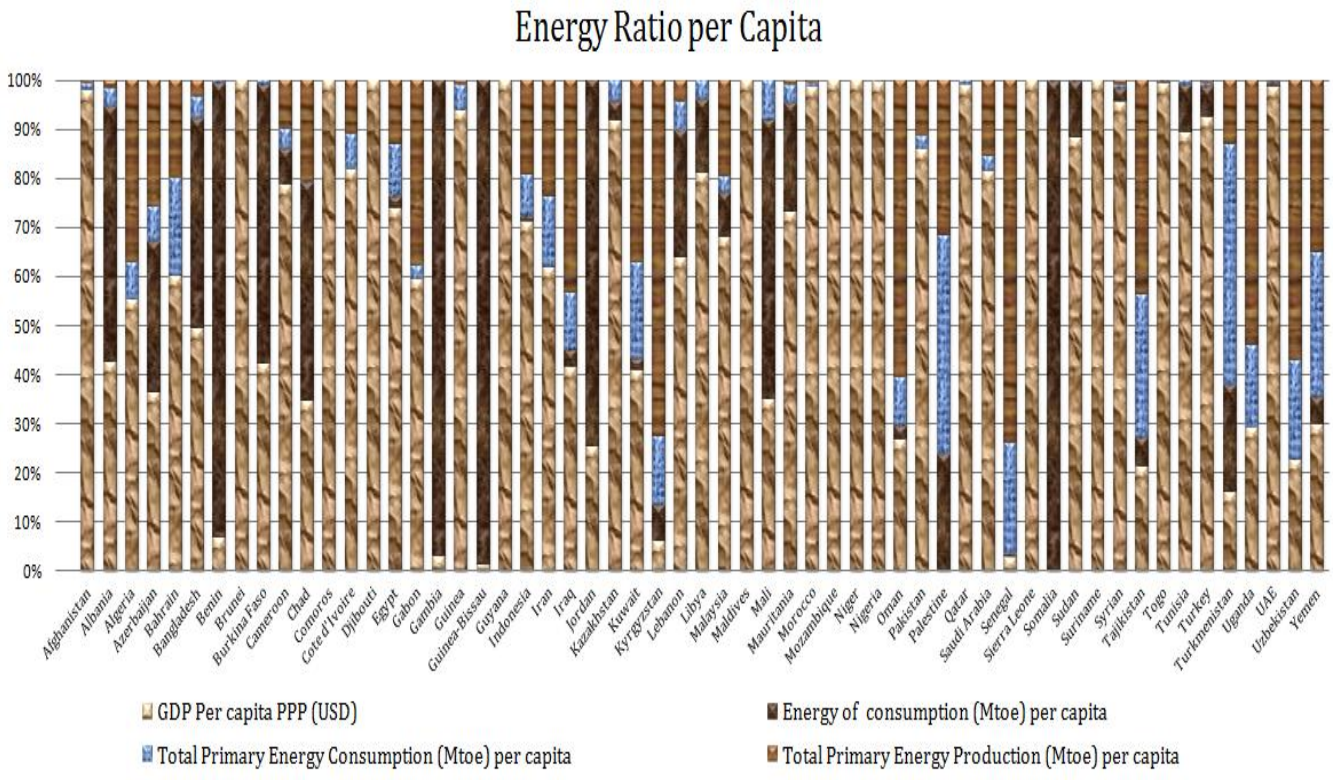

Fig. 3 Energy potential supply per capita in OIC countries [11-13]

it is need to know globally situation as regards the use of alternative energy sources in the OIC countries, there are some crucial points which must be considered as principles in this paper and these including a few point:

- Suitability of the application in each country
- Existing researches and their applications
- Availability of technical consultancy & experiences
- Economic accessibility and applicability.

In Table 2, the 57 countries of the OIC countries are classified with respect to their energy positions, including to the total of crude oil used in these countries and also the total of oil exporter and the importer. The table indicates that 9 OIC countries are net oil exporters, and the others 12 countries also they have oil exporters, but with some other resources and those other 14 countries they depend to varying degrees on imported oil. The table also shows that there is an acute crude oil problem in 15 countries; these are mostly the low-income group countries. Moreover, the vast majority 30 countries of these countries totally dependent on oil important, in other words they face a double energy crisis.

Table 2. An energy categorization of OIC countries relation to the export, import and pure oil situation

Net oil Exporters		**Oil Importers**	
OPEC	Non-OPEC	0% : 50%	50%:100%
Algeria	Oman	Bangladesh	Albania
Iran	Kazakhstan	Benin	Sierra-Leone
Iraq	Indonesia	Cote d'Ivoire	Morocco
Kuwait	Yemen	Mozambique	Syrian
Libya	Gabon	Pakistan	Jordan
Nigeria	Malaysia	Senegal	Lebanon
Qatar	Egypt	Tajikistan	Chad
Saudi-Arabia	Brunei	Togo	Maldives
UAE	Sudan	Tunisia	Uganda
	Azerbaijan	Turkey	Gambia
	Cameroon	Turkmenistan	Niger
	Bahrain	Uzbekistan	Guinea
		Djibouti	Guinea-Bissau
		Kyrgyzstan	Mauritania
			Mali

5 Development of Renewable Energy Technologies & fossil fuels in OIC countries

Presently, as the above review verifies that increasing energy demands are tied to economic growth and social change in almost non-linear way. They are also influenced by the industrialized countries. Meeting this future demand will necessitate a continuous depletion of indigenous resources. It is obvious that fossil fuels cannot alone provide the needs of the world. Accordingly, research into new energy alternatives has been intensified throughout the world [9]. The alternative to depletable fuels is renewable energy sources those sources origination from the course of the annual solar cycle, and having a short period of renewability. Solar energy, wind, hydropower, tidal power, waves, ocean thermal gradient and biomass are various forms of renewable energy [8]. The vital importance of renewable energy resources in meeting future energy needs is perceived by all nations, and has been stressed by many authoritative professionals, agencies commissions, etc. thus the energy conservation commission of the world energy conference (WEC) fully supports this case in Table 3 and explained in Fig. 4. The WEC projected a twofold growth in renewable energy sources by 2020 and threefold growth by 2030, if appropriate technological developments were used and appropriate policy measures implemented. However, considering current national energy policies and constraints on the deployment of renewable energy technologies, it appears that this projection was optimistic [8-10].

Table 3. Potential of world primary energy production

The Potential of world primary energy production per Terajoule (TJ)					
Years / Resource	1990	2000	2010	2020	2030
Coal	103	115	170	259	345
Oil	195	216	195	106	240
Gas	68	77	143	125	231
Nuclear	31	23	88	314	264
Hydraulic	28	24	34	56	73
Renewable, Biomass	35	33	56	100	98
Total	460	488	690	960	1250

Notes: Terajoule: (1.00) TJ = ($2.38*10^{-5}$) Mtoe [16,17].

Presently prices, the relative competitiveness of renewable energies as comparing with fossil fuels is obviously different for each nation. The economics involved are somewhat complex, because so many different factors must be included. The situation in each country should be carefully evaluated, considering all of these factors, before indicating whether renewable can be viable substitutes for fossil fuels for a given nation [9,10].

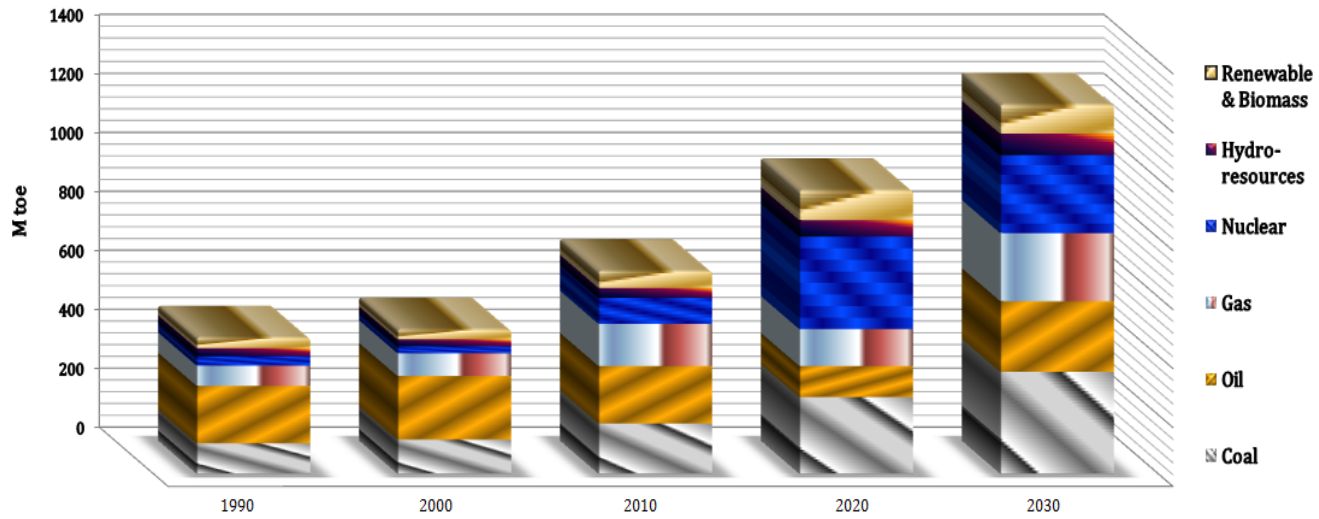

Fig. 4 Totally of world primary energy production

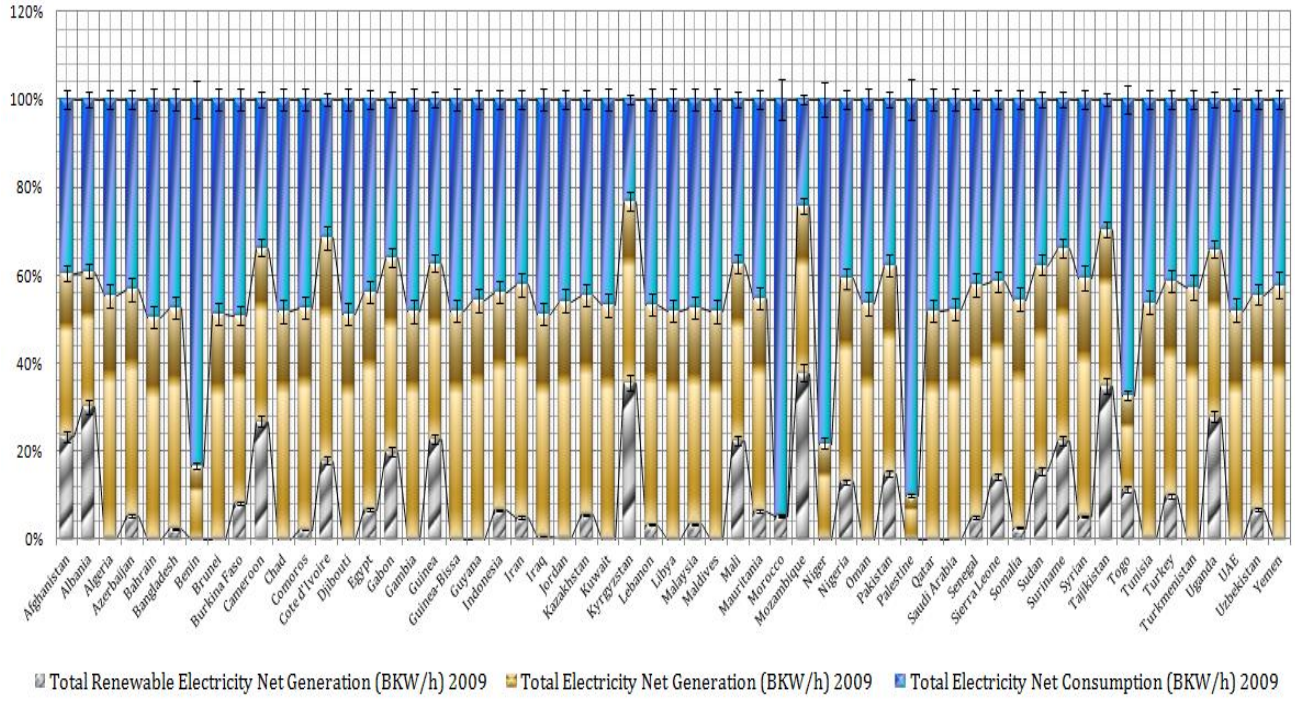

Fig. 5 The electric generation and energy consumption in OIC countries [12,14,16]

6 Energy Consumption

Energy per se is among the basics of socio-economic activity. Consumption energy is one of the pillars of modern life. The production and consumption of commercial energy give rise to a number of important contemporary issues. In that regard, the OIC region has a Strategic global importance for both current and future energy prospects. Many OIC Member Countries (MCs) are blessed with ample energy potential, while other MCs are not so fortunate. Yet for both, energy issues pose serious challenges. Accordingly, Energy related issues hold a very special position for OIC Member Countries [1,3].

6.1 Energy consumption with (GDP per capita)

The economic growth of domestic is strongly correlated with increases in the level of per capita energy consumption, which is plotted for 57 OIC countries in Fig. 3. Which an increase in per capita energy use corresponds to an increase in per capita GDP, although they are not exactly proportional, these variances in GDP energy ratios may be accounted for by several factors, such as climate (in cold climates, more fuel is used in residential and commercial sectors for heating purposes), energy efficiency (efficiency of the energy generation plants and variations in consumption due to the use of different primary energy forms), and industrial structure (since the energy requirement of different industries vary enormously) [10,11].

There is relationship between energy consumption and economic growth has led to the emergence of two opposite views. One point of view suggests that energy use is a limiting factor to economic growth. The other point of view suggests that energy is neutral to growth. This is known in the literature as the 'neutrality hypotheses' which proposes that the cost of energy is a small proportion of GDP, and so it should not have a significant of impact on output growth. It has also been argued that the possible impact of energy use on growth will depend on the structure of the economy and the stage of economic growth of the country [10]. At present about 35% of the world's total energy consumption is supplied by crude oil. Sixteen of the 57 OIC states are net oil exporters, making important contribution to the world oil market. (About 62% of the world's population is in the developing countries, but they are responsible for only 15% of the world's annual consumption of commercial energy). However, the majority of the OIC countries are oil importers, to varying degrees. Unsteady change of oil prices will continue to affect their economic situations. Most of them are well endowed with a considerable amount of renewable

energy, especially solar energy and biomass while the wind energy and hydropower may be promising sources in some countries [11,12]. The fossil fuel should not be the only factor to determining the generation sources. The environmental impact of fossil fuels is now under close scrutiny and will become more strictly regulated in the future. The harmful effects of exhaust gas release and ozone depletion are also becoming area of great concern [12].

6.2 The Electric Generation and Energy Consumption

In this paper we focused on the use of indicators to examine patterns and trends of energy consumption and electric generation and also, in the end use sectors. However, indicators can also be used to examine the energy supply. This part will be presents a number of indicators that are used to analyses the levels and trends of energy supply in public electricity production (also known as main activity production) in OIC countries and the technical potential for fuel and CO_2 savings resulting from improved efficiency [2]. The OIC countries are Producing 1,622 Billion (kW/h) in year 2006, the OIC Member Countries supplied 8.5% of the total electricity of the world while OIC share was 7.1% in year 2000 with 1,015 Billion (kW/h). In year 2006, 44% of the world's electricity production, around 18,982 Billion (kW/h) was supplied by the developing countries. This means that the share of developing countries in global pie grew approximately by 8% points in nine years. However, the compared between the electric net generation and energy consumption to year 2000, it was decrease the share of the OIC Member Countries in developing countries declined after making a peak in year 2002 by 20.4%, as the growth rate of developing countries were higher after that year [14,16].

6.3 The Relationship between the Electric Net Generation and Energy Consumption in OIC Countries

Among the member of OIC countries, Iran was the top producer in year 2006 and accounted for 12.4% of the total OIC production with almost 200 Billion (kW/h) of electricity. It was followed by Saudi Arabia, Turkey, Indonesia, and Egypt and in the last biggest production country it is Malaysia [12,14]. In Fig. 6, each producing of these countries is more than 100 Billion (kW/h) of electricity. The electricity produced in these six countries constituted nearly half of the total OIC electricity production in during of year 2006 and 2007.

7 Energy Balance of OIC Countries

A companion volume to Energy Statistics of OIC Countries, the present standardized energy balances expressed in Million Tons of Oil Equivalents (Mtoe). And then the Energy supply and consumption data are divided by main fuel: coal, oil, gas, nuclear, hydro, geothermal and solar electricity/heat [3]. This allows for easy comparison of the contributions each fuel makes to the economy and their interrelationships through the conversion of one fuel to another. All of this is essential for estimating total energy supply; forecasting, energy conservation, and analyzing the potential for inter fuel substitution [14,15]. Finally, historical tables summarize key energy and economic indicators as well as data on production, trade and final consumption. Each issue includes definitions of products and flows and explanatory notes on the individual country data as well as conversion factors from original units to tones of oil equivalent.

8 Prospective Strategies For OIC Countries

In this study, the enormous potential of renewable energy sources can meet many times the world energy demand. These can enhance diversity in the energy supply contribute to long-term sustainable energy supplies, reduce harmful emissions and create new job opportunities, as well as, offering manufacturing opportunities, especially in the developing world. And also, that the Renewable energy technologies have a significant role to play in improving the lives of people around the world. These technologies provide modern energy services that contribute to greater employment and income opportunities (GDP), technological advancement, cleaner environment, energy security, improved health care, secure water supplies, educational advancement, equal rights and gender equality, and overall, enhanced economic and social well being.

In the next decades, the availability of energy and the cost of energy are likely to remain the two most widespread issues facing both of developing and developed countries. Renewable energy resource utilization should focus on a future looking systems approach to deliver abundant, clean energy to all sectors. This would yield maximum national impact by reducing imports of resources, improving

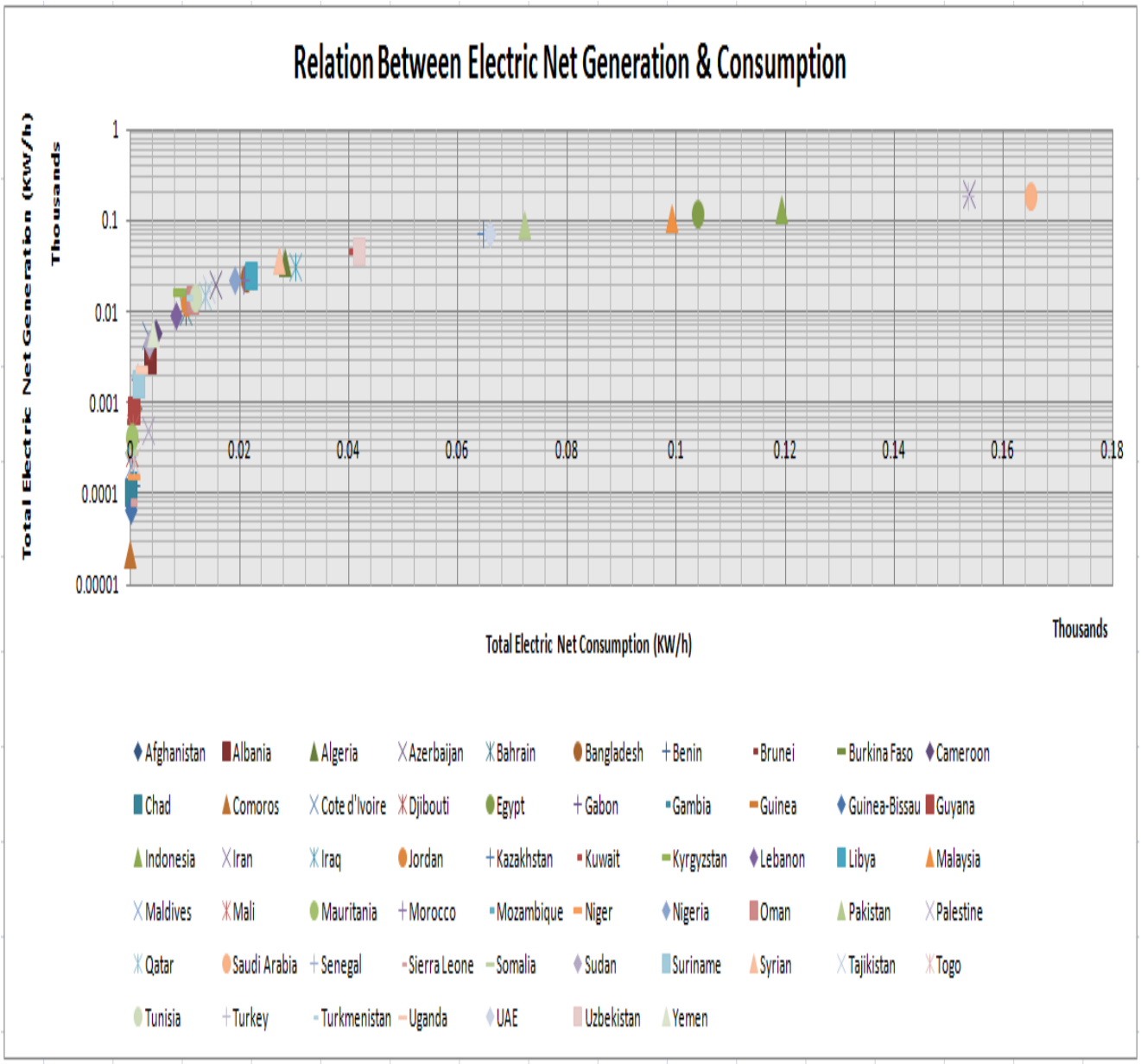

Fig. 6 The relationship between electric net generation and electric consumption [14-16]

the balance of payments, preserving the environment from pollution and providing the better protection of consumers [19]. Indeed, the social impacts from the effects of the rise in energy prices on the different income groups of households could be mitigated by separate transfers to the low level income people in those countries have low income. Furthermore, not only national factors such as energy supply infrastructure, energy efficiency considerations or institutional constraints, but also sustainable development should be taken into account in the future [19,20].

9 Conclusion

This study discovering the following conclusion:

1. Some members of the OIC countries are blessed with the wealth of crude oil and natural gas. The oil and gas industry in these countries has contributed tremendously to the development of their respective countries as reflected in the high values of GDP/PPP.
2. The countries with very much lower GDP/PPP have to import crude oil and petroleum products. However, the use of renewable energy resources such as biomass, biogas, hydro, solar photovoltaic

and solar thermal, wind, tidal and waves, and geothermal is still not fully exploited.

3. Although some countries were able to generate energy for export, yet they were not able to supply electricity to all areas especially the remote areas due to insufficient transmission and distribution infrastructure, causing groups of population there being deprived of modern energy services.
4. Most of those countries they have less than (1 kW/h) as totally for electricity net generation, that's mean these countries have only not more than (1,000 kW/h) in TPES per GDP/PPP in that statistical year.
5. The OIC countries do not have any acquired intensive experience with regard to design, development, operation and testing of various renewable energy technologies, for that purpose, developed appropriate human resources, institutional set ups and the necessary infrastructures and contribution of renewable energy to meeting energy demand is still a lot to the developments.

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