

Consequences of Global Demand and Supply of Fossil Energy and the Need to use Wind Energy as a Potential in Iran

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Abstract: The developments of industry and technology caused by Industrial Revolution increased the consumption and demand of fossil fuels to sustain economic life. As energy consumption continued to increase in the world, its effects emerged for the first time in the 1970s, necessitating the need for access and planning for the supply of world energy consumption that was put on the agenda of economic development planning worldwide. Accordingly, the purpose of this paper is an attempt to access renewable resources in support of the earth taking into account the increasing energy consumption and use of limited fossil energy resources in the world and the consequences of their use in the future. The results show that considering the increasing demand and supply of energy and a variety of factors such as the limitation of fossil energy resources and the environmental constraints resulting from their consumption and considering the capabilities available in Iran, wind energy can be considered as a renewable energy and a good alternative.

Keywords: Energy, Wind, Consumption, New Energy, Iran.



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1. Introduction

The scarcity of fossil energy resources and environmental problems resulting from their use have affected global programs, particularly industrial development, for more than half a century (Alayi et al., 2020). The developing world needs energy and its consumption as one of the indicators of development for the sake of its existence and therefore, the rate of utilization of renewable energies according to the needs of developing countries is increasing in the world (Alizadeh et al., 2020). In this paper, energy consumption and its various sources are analyzed using energy supply and demand statistics, which show that these crises are increasing with current trends and future prospects. Also, the share of wind energy and its potential for energy consumption in Iran will be addressed through exploring various types of energy throughout the world, energy consumption statistics, and forecasting the future.

History of energy consumption reduction management in architecture

Since the industrial revolution has been the source of major industrial developments in the world, control of energy consumption in architecture and

managing energy consumption worldwide became important since its occurrence and development, especially after the oil crises of the 1970s due to environmental pollution and stricter environmental laws.

2. Materials and Methods

The research and methodology is based on the use of scientific, legal, and logical sources, which is further illustrated by converting official data and statistics into charts in an effort to obtain rational results by comparing the results.

3. Results

The importance of energy

Energy plays an underlying role in the life of industrialized economies, meaning that economic growth will be possible if energy is available in a timely manner. A look at the past dilemmas shows that there has always been great competition around the world for energy conservation because national security and the stability of government systems depend to a large extent on these resources. Fortunately, Iran is one of the richest countries in the world in terms of having diverse sources of energy (Evins, 2013).

Types of energy

In general, the world's energy resources are divided into two categories.

A. Non-renewable energy sources, including fossil fuels (oil, gas and coal) and nuclear energy.

B. Renewable sources of energy, including solar, wind, hydro, geothermal, biomass and tidal.

Forecasting energy demand in the future

Statistics show an increase in demand and an increase in energy consumption, while energy production compared to its consumption is inadequate due to the limited underground resources available, which ultimately results in a crisis of energy supply.

According to World Energy Organization statistics, the total amount of non-renewable energy sources is 2.5×10^{24} joules, of which a high percentage is fossil and nuclear sources, but for renewable energy sources, it is equivalent to 3.8 quadrillion joules per year,

or 580 times the Earth's total annual energy needs (Seif, 2019).

However, reality shows that humans have been less successful in understanding energy-related knowledge. If humans have made significant advances in technology, they are undoubtedly extremely poor in policy, security, and energy rights sectors (McKeown, 2017).

More than 1.5 billion people around the world are suffering from energy poverty and are unable to access clean energy sources (Bhattacharyya, 2015).

The graph of total energy consumption in (Figure 1) shows an increase in the amount of energy required over time as compared to the amount of energy carriers from 1990 to 2035 and considering the balanced growth compared to the energy demand.

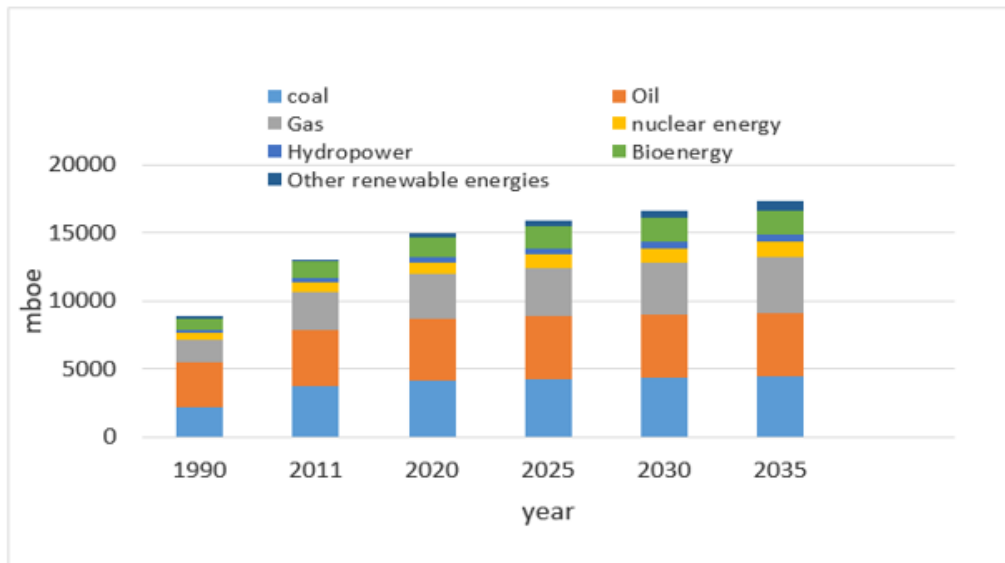


Fig.1- The Future of Energy in the World (Source: Author with the help of (Bilgen et al., 2018))

Comparison of the global status of renewable energies with non-renewable energies

Global statistics show an increase in the world's population and an economic boom, resulting in energy demand and consumption globally. Accordingly, the paper deals with the energy status of from a statistical point of view. Changes in population and their effect on

global energy status is addressed statistically. For this reason, the outlook of the world primary energy demand is compared with the sources of non-renewable energy and renewables compared to the total demand in (Figure 2).

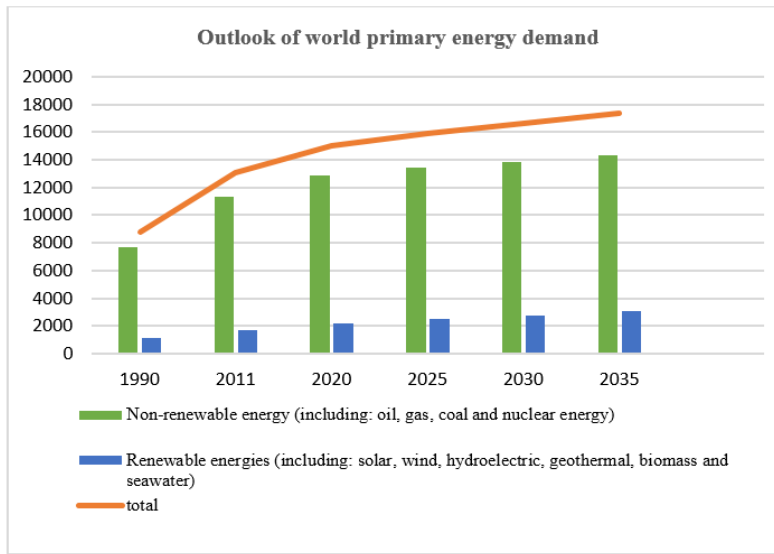


Fig.2- Outlook of the World Primary Energy Demand (Source: Author with the help of (Bilgen et al., 2018))

Prospects of energy consumption and greenhouse gas emissions

From consumers’ perspective, energy security means, first of all, easy and risk-free access to world oil and gas resources. Second, these resources are logically diversified in terms of geographical area of resources as well as transmission routes. Third, oil and gas flows are generally provided by points whose governments may be stable for a long period (Scheepers, 2017).

According to the 2016 International Energy Outlook report, (Figure 3) shows that carbon dioxide gas emissions from the energy sector are projected to rise from 32.3 billion metric tons in 2012 to 35.6 billion metric tons in 2020 and 43.2 billion metric tons in 2040. Much of this carbon footprint is related to fossil fuels and developing countries outside the OECD.

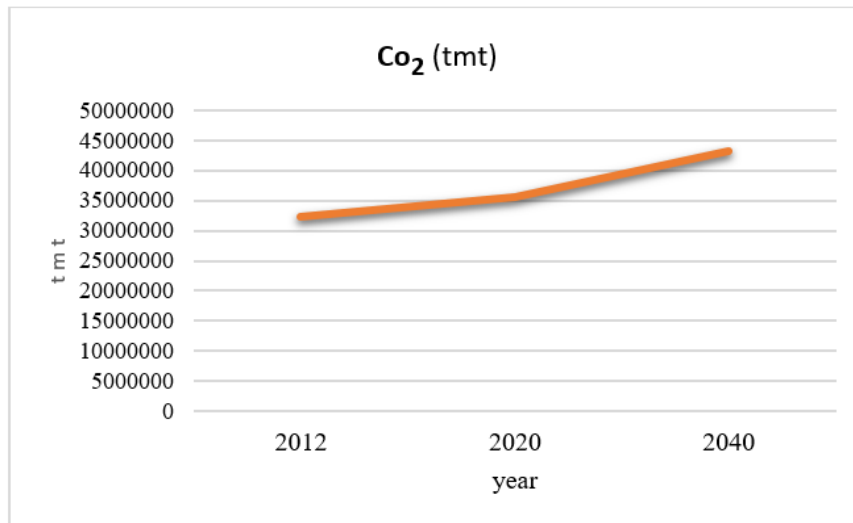


Fig.3- Carbon dioxide levels and projections to rise by 2040 (Source Author with the help of (Walde Thomas, 2014))

In recent years, issues such as sustainable development, environmental protection and greenhouse gas emission control have led many countries to pursue renewable energy development policies (Matzenberger, 2015).

Primary energy consumption in Iran and the world in 2016

Russia and Iran hold about 40 percent of the world's proven gas reserves. While many countries around the world are turning to natural gas for energy use

with less environmental impact (Blyth and Nicolas, 2016). (Table 1) shows the energy consumption in 2016 from different sources of production in Iran compared to

global consumption. According to these statistics, Iran's share of the use of renewable energy is relatively low compared to the world share.

Table1: Primary energy consumption in 2019 (million tons of crude oil equivalent) (Richard, 2019).

Title	oil	gas	coal	nuclear energy	Hydropowe	renewable energy	total
Iran	82	17.8	1.32	1.35	1.36	0.47	270.7
World	4497	3261.6	3838.3	706.8	1327.1	495	14126

Wind energy in the world

The strategy of the World Wind Energy Association is to supply about 10 percent of the world's energy consumption by (Zhang and Li, 2020). To illustrate the global status of wind power and electricity generation from this source in the form of statistics and diagrams, the global wind power capacity

and its annual increase from 2006 to 2016 is shown in (Figure 4). The chart has been steep over the 14 years of consumption, indicating the increased use and investment capacity of this important energy source.

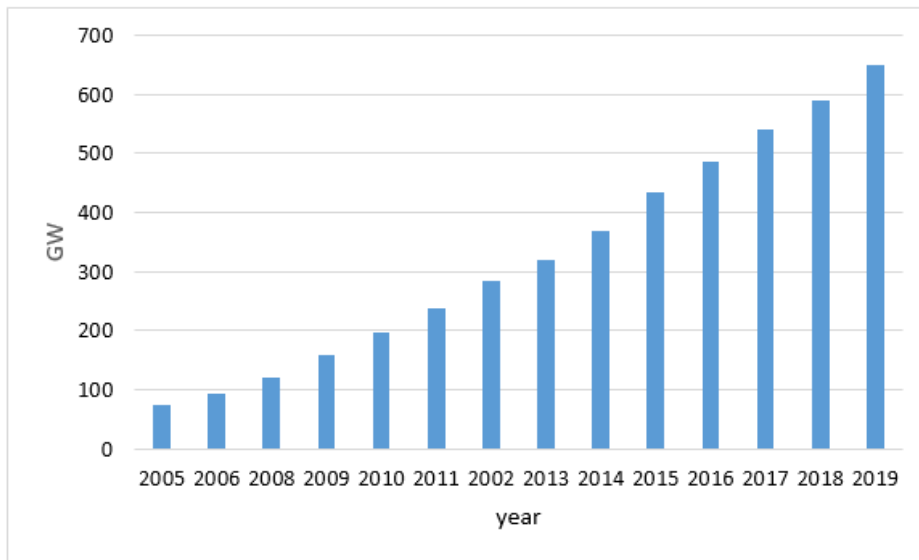


Fig.4- Global wind power capacity and its annual increase from 2006 to 2020 (Abbaszadeh, 2020)

Energy production and consumption in Iran

One of the key pillars of any nation's development is the existence of well-developed infrastructure and access to energy resources, because today energy is one of the essential needs for sustaining economic development, social welfare, improving the quality of life, and security of communities. The figure of

primary energy production and energy imports compared to total primary energy supply and final energy consumption for a period of 17 years is plotted in (Figure 5).

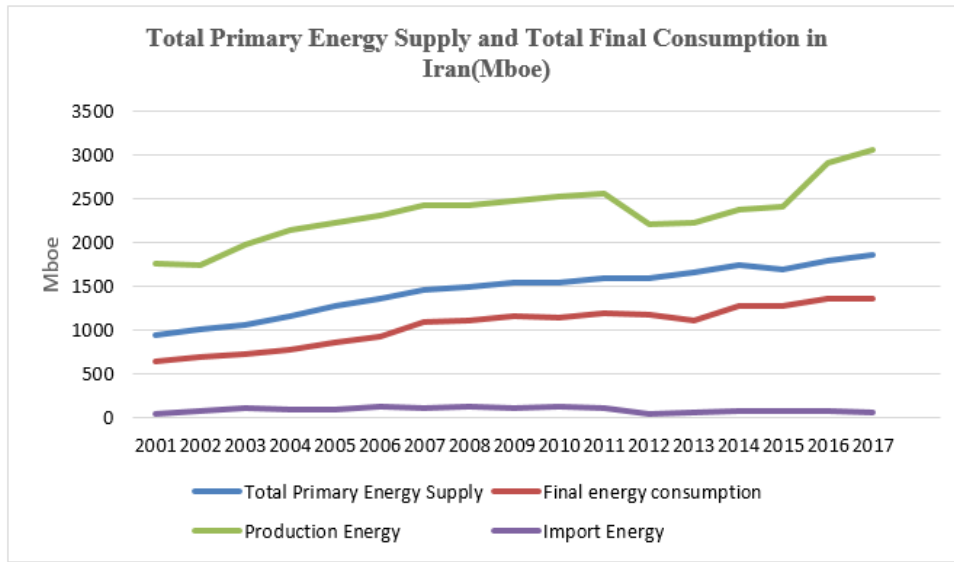


Fig.5- Primary Generation, Import, Total Supply, and Final Energy Consumption of 17 Years in Iran (Source: Author with the help of (Steamers, ۲۰۱۷))

Continuing the current state of energy consumption in the not too distant future will make it difficult for Iran to supply the energy it needs. One of the factors affecting the effectiveness of policies that will be implemented in the coming years to control the energy crisis is the review of past experiences. The three most important factors in the current situation appear to be the three factors of price policy inefficiencies, inefficiencies of optimization programs and productivity gains, as well as significant losses in transmission and distribution networks.

The necessity of using renewable energies in Iran

Global reserves at the end of 2008 were about 1258 billion barrels. World crude oil consumption was about 84.5 million barrels per day on average in 2008, and so it would have to end the world's crude oil reserves by another 42 years (Vijayalakshmi, 2018).

According to statistics released by the International Energy Agency, Iran is the ninth energy producing country, the tenth most energy consuming country, and the eighth most CO₂-producing country in the world. Iran is one of the top 10 countries in the world with 850 million tons of greenhouse gas production annually. Under the commitments required by the COP, Iran will seek to reduce its greenhouse gas emissions by about 190 million tons by 2030. Achieving this commitment and legal requirement puts renewable energy utilization as a viable solution for energy policy makers (Besarati et al., 2016).

Figure 6 shows the trend of increasing greenhouse gas emissions in Iran over a period of 11 years that indicates an increase in emissions.

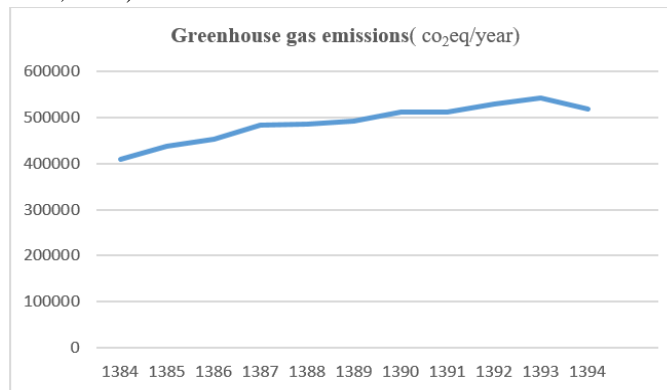


Fig.6- Greenhouse Gas Emissions in Iran over an 11-year Period (source: author with the help of (Ebrahimi and Rahimi Mogooyi, 2011))

Capacity to utilize renewable energy in Iran

According to statistics released by official sources in Iran that are shown in (Table 2), despite the

abundance of renewable energy sources in Iran, the share of these types of energy is as follows.

Table2: Capacity of Renewable Power Plants by Type of Plant by the End of March 2015 (in MW) (Besarati et al., 2016)

Type of power plant	Windy	Solar	Biomass	Hydropower	Total
Capacity (MW)	155	7.96	10.5	62.44	235.9

Wind energy in Iran

Based on the importance of the research subject in this paper, the capability and capacity of wind energy in Iran is investigated here. One of the most important projects in the field of wind energy has been the preparation of the wind atlas of Iran. The project is being implemented by the Iranian New Energy Organization and is considered as one of the national projects in the wind energy industry. Based on wind atlas and information from 60 stations in various parts of the country, the nominal capacity of the sites is approximately 60,000 MW. According to forecasts, Iran's

wind energy is estimated to be economically over 18,000 MW, confirming its significant potential for wind power generation and the cost-effectiveness of investment in the wind energy industry (Ebrahimi and Rahimi Mogooyi, 2011). The German Lahmeyer Company has also been involved in the implementation of the wind potential assessment project in Iran as a consultant. Based on the studies of the company mentioned in (Figure 7), the potential of wind power available in Iran is estimated to be 100,000 MW.

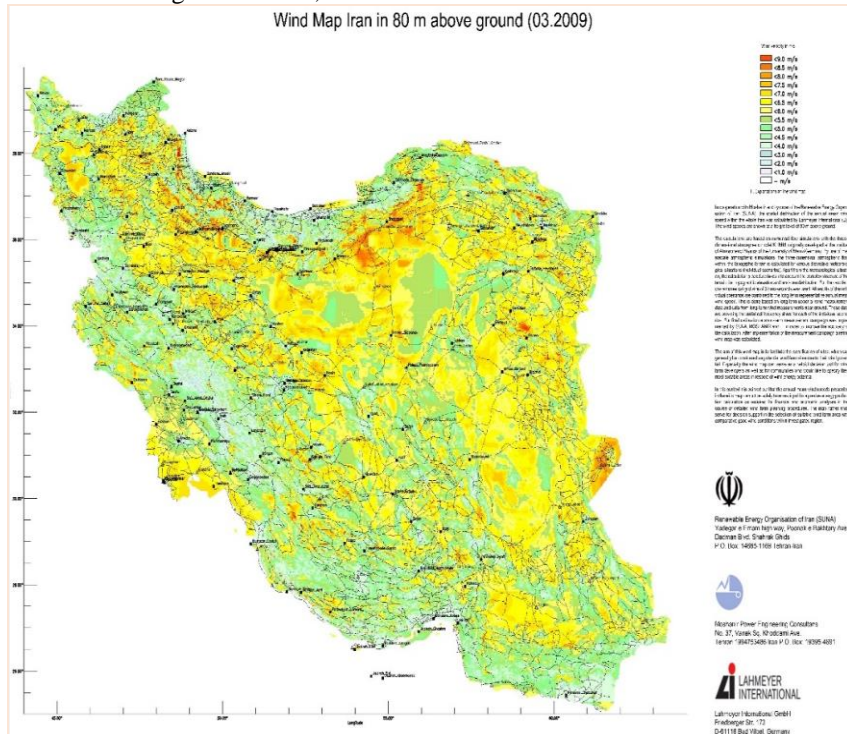


Fig.7- Wind Potential in Iran with the help of German Lahmeyer Company (Source: (Ebrahimi and Rahimi Mogooyi, 2011))

4. Discussion

In order to use wind turbines in a geographic area, wind speeds should be at a height of 50 meters per acre or at least between 4 to 5 meters per second. The above map indicates that Iran has a favorable capability to develop and operate wind turbines considering its windy areas.

There are good potentials for the installation and commissioning of wind power turbines in Iran. Given its justification and research and investment in this field, the

development and application of this technology has a clear perspective for Iranian energy sector policymakers (Hotelling, 2018).

5. Conclusions

Fossil fuels in Iran, like many other countries in the world, have a high share in the energy basket, which, while reducing groundwater resources, has increased greenhouse gases, environmental threats, and pollution, especially in metropolitan and industrial cities. Existence

of Alborz Mountains in north and Zagros in south of Iran, access from north and south to sea, as well as results from wind potential studies in Iran, presence of windy areas, considering appropriate wind speed at altitude of 50 m, surveying the maps and statistics, and also forecasting wind energy resources in the region, Iran has the potential to use this type of energy, which creates a good field for research and recognition of local capabilities. The results show that Iran has a favorable environment for the construction, expansion and utilization of wind energy as renewable and new energy source. Using this energy source while protecting and preserving fossil energy sources, improves environmental quality.

6. Conflict of interest

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The authors declare that they have no conflict of interest.

7. Additional Information And Declarations

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Competing Interests

The author declare there is no competing interests, regarding the publication of this manuscript

Author Contributions

Allahbakhsh Kavooosi: Proposed the plan, conceived the experiments, analyzed the data, authored or revised drafts of the paper, approved the final draft.

Ethics Statement

Razi University, Kermanshsh

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