

# The Role of Energy Policy on Sustainable Development in Iran

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At the current age, energy plays a vital role in moving toward sustainable development and prosperity of the society. To achieve sustainable development, increase in efficiency of sustainable energy resources plays a key role. Moreover, role of renewable energies is considerable for sustainable development and improvement of economic stagnation. That is why there is an intimate connection between renewable energy and sustainable development. A comprehensive planning for sustainable development can provide a new opportunity to overcome the challenges and barriers of the new era. Understanding these barriers and challenges can lead us find suitable analysis and better decision making to move towards sustainable development. Therefore, this study has tried to precisely evaluate the challenges and barriers to develop renewable energies in Iran. Moreover, the status of renewable energies in Iran is discussed and finally, some suggestions are presented to move toward a sustainable future. © 2017 Journal of Energy Management and Technology

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## 1. INTRODUCTION

The concept of sustainable development has been investigated widely considering different aspects. This concept has been developed by the World Commission on Environment and Development. The commission has considered sustainable development as an integrated and comprehensive approach of economics, society and environmental processes [1,2]. The goal of sustainable development is supplying services to provide fundamental needs of people in clean way and using efficient and sustainable methods [3]. At current era, energy plays a vital role in moving toward sustainable development and prosperity of the society. To achieve sustainable development, increasing the efficiency of sustainable energy resources plays vital role [4-6]. Therefore, renewable energies could be considered as an effective solution to achieve sustainable development.

Financial crisis in the world can lead to reduction of economic growth and as a result, reduction of tendency to invest in sustainable energy sectors. Also, multinational companies are becoming dominant in the energy market and majority of hydrocarbon resources exist in few countries. Sustainable energy resource as a fundamental prerequisite of improvement of economic stagnation should be protected as an easy target against false pricing and political and geopolitical games. To achieve this, use of renewable energy resources more than before

seems essential. Moreover, it should be noted that moving toward sustainable and decentralized energy resources can cause considerable reduction of poverty. Numerous countries have regulated new energy policies with emphasis on reduction of fossil fuels and enhancement of energy efficiency [7]. In this field, although Iran has been introduced as a country full of fossil fuels, development of renewable energies has not been neglected as a driver of sustainable development. Anyhow, there are some barriers, challenges and of course some opportunities in developing renewable energy. Understanding the parameters involved in this issue could lead us to find appropriate analysis and better decision making to move towards sustainable development. This study has tried to evaluate the barriers carefully. Moreover, the status of renewable energies in Iran has been discussed and some suggestions are also provided to move toward sustainable future.

## 2. CHALLENGES AND BARRIERS OF DEVELOPING RENEWABLE ENERGIES IN IRAN

### A. Oil

Iran, with a population of more than 75million people, has possessed rank 16 among other countries in terms of area [8]. Iran is the second largest country in terms of natural gas resources and the third member country of OPEC in terms of supplying

**Table 1.** Probable scenarios till 2025 for the amount of oil production and consumption in Iran [12]

Through replacement of gas in transport sector, oil consumption is remained fixed or is increased a little. Oil production is increased and this has led to increase in exports and increase in regional powers.	Increase	Increase	Thunder
The status of oil production and consumption in Iran is like a hippopotamus. It means that although oil production is increased, oil consumption is also increased to the same level and this has led to heaviness and passiveness. Hence, the country has lost its speed and growth.	Increase	Increase	Hippopo-tamus
Because of sanctions, oil export has experienced decreasing process. On the contrary, the country could maintain the production level to about 9.2million barrels per day. On the other hand, consumption could have rising process constantly in Iran, so that the production and consumption rate could be equal; just like a snowman that is melted in a relatively warm weather and leaves no effect.	Decrease	Increase	Snowman
In this case, the status of country is like a poor addicted person who suffers from addiction. The need and consumption of such person without the ability to gain more money is increased day by day. As a result, conditions of such person are worsened every day and he/she becomes	Decrease	Increase	Poor Addicted Person

oil [9]. Despite to the variety of energy resources at the country, Iran's economy is highly dependent on income caused by oil exports [10]. Currently, oil export has possessed 80% of total exports and this amount is about 50% of budget revenue and 23% of country's GDP [11]. Favorable oil market conditions increased the Iran's revenues considerably. However, as a bitter and undeniable reality these market conditions will not be permanent. Moreover, production and consumption of oil in Iran has been evaluated. The summary of the 4 scenarios for production and consumption of oil till 2025 is presented in Table 1. [12]

In regards to analysis of these scenarios, political and geopolitical, technological, social and other effective factors are considered. An important issue in all of the above scenarios is the considerable increase in oil consumption in Iran. This issue could be explained due to developing status of Iran, increased demand, low efficiency of power plants and increasing population. Moreover, according to more probable scenarios (Snowman and Poor Addicted Person), oil production would have decreasing process in next 10 years and as a result, the country would face intense shortage of energy. It could be understood easily that oil is the most important parameter to change the attitude to other energy resources. Additional consideration of oil is not only a barrier to sustainable economic development, but also it is a challenging and highlighted barrier to political development. Considering all of these conditions, turning to other new energy resources (such as renewable energies) is unavoidable. Regardless of environmental, cultural or even economic issues; need for energy supply can decrease country's dependency on fossil fuel resources. In this regard, making a comprehensive policy to move toward sustainable development could be a solution for this issue. Hence, along with decline in attention to fossil fuels, investment in new and sustainable energy resources should increase.

**B. Government, university, industry and private sector**

**B.1. Government**

Clearly, the government plays a key role in overcoming the problems that new energy resources are facing as well as a progressive force; it could play a key role for progress of infrastructural measures. Activities taken in this field have not been able to meet the plans in Strategic Planning Document and the poten-

tials of Iran till now. The main reason could be lack of financial resources and lack of required dynamicity in providing the supports. It is clear that from primary investigations to supply of products and development of renewable technology infrastructures (solar cells, fuel cells, etc) to mass market; the supports of the government could be considered as a necessity. The issue of renewable energies development is the current issue of all sectors of industry in Iran and it is lack of security in research and development. It means research and development situation in every construction and production sector could changes without prediction of economic statements. Two solutions could be considered as:

- Facilitation of the regulations related to fundamental researches and technologies such as regulations related to formalities of project referral and change in nature of the budget allocation into researches
- Providing supporting solutions in contracts that could cause easy progress and reduction of pressure on the last ring of research and development chain for all activities related to creation and transfer of technical knowledge of production.

**B.2. University**

Some works are conducted over the years in different levels of BA to PhD in some universities in different field of renewable energy. In majority of these researches such as the fuel cells, the topics are investigated generally, and only the outputs are presented for different experimental cases. In these cases, the main parts with high technology been imported from overseas and simple parts are produced in domestic market and assembled. Although these types of activity could be useful for general familiarity of the academic community with new technologies; they couldn't certainly conduct the country toward gaining technical knowledge. Here, a considerable issue is lack of certain plans for academic researchers to follow special topics and move to achieve predetermined goals. However, it seems along with lack of certain universities' programs, financial problems have also intensified the issue. Another issue is the lack of education and training of skilled workforces. Unfortunately, no systematic solution is taken in this field.

**B.3. Industry and private sectors**

private companies and even public companies have no tendency to participate in carrying out renewable energy projects. It should be noted that some industrial centers of Iran have potentials to implement projects with high technology due to taking benefit of special facilities and experienced workforces. Hence, big projects need government support and large companies, and it has not been existed yet. In the following, the most important root cause of lack support for private sectors are referred, as:

- One of the problems with development of private sector is inappropriate regulations; for example, extra administrative processes can waste large amount of energy in addition to of the time and cost of people and organizations. As a result, it could reduce private sector's motivation to enter this field.
- There is no competitive market in Iran for the private sector to be able to compete against the public sector in production, transfer and distribution of electricity.

- Unfortunately, no appropriate information about assignment of power plants is provided therefore, private companies are not able to make appropriate decisions. Moreover, it is not clear that who is responsible to provide information to buyers.
- Construction of renewable energy power plants need significant investment which reduce tendency of private sectors to invest in this field. Also, due to lack of low interest investment loans, their presence even has declined more.
- Many technologies and assembly parts are imported from overseas and instability of currency exchange market has also caused additional problems and difficulties for private sectors.
- Guaranteed purchase rate of electricity by SANA is not also attractive enough for the private sector.

### C. Other main challenges

Through comparing Iran with world records, underdevelopment of the processes of using renewable energies could be inferred clearly. Several other barriers are also existed for development of renewable energies in Iran and the most important barriers are summarized as follows:

- High rate of subsidies on energy supplied by the government (even after execution of the Iranian Targeted Subsidy Plan)
- Underdevelopment of required technologies
- Insufficient number of experts in the field of renewable energies
  - Lack of training courses related to renewable energies to attract researchers and students in this field.
- Poor knowledge about importance of energy and insufficient advertising by the government that can cause little motivation for energy consumers, which can have no great growth as a result of using renewable energies.
  - Insufficient financial credits to complete the projects
  - Slow process to regulate the contracts
  - Lack of sufficient and efficient plans in this field by the executive sector
  - Poor management and insufficient legal supports

### 3. DEVELOPMENT OF RENEWABLE ENERGIES

Due to increase in environmental concerns caused by greenhouse gas emission, use of renewable energy has become into one of the most important policies in most countries across the world [13]. Renewable energies are derived from resources which could be renewed and replaced by the nature such as water, wind, solar energy and biomass [14]. The resources should meet the following features: sustainable development, appropriate alternatives for fossil fuels, achievable technology, and maximum adjustment with environmental standards and finally, meeting energy requirements of Iran. To achieve these goals, renewable energy as a powerful resource has the ability to provide these parameters and has gained many attentions over the years [15]. In international level, Energy International Agency [16] has predicted that the portion of using renewable energies will increase to 840-1900 Mtoe (more than double of current level) and 3250 Mtoe (almost more than 4 times) in 2035 depending on the previously discussed scenarios [17].

### 4. STATUS OF RENEWABLE ENERGIES IN IRAN

In early 2012, 118 countries in the world, set the goals to develop renewable energies till 2020 [18]. Among these countries, Iran is also following its ambitious goals in development of these energies due to huge renewable resources in this country. Due to environmental issues and exhaustibility of fossil fuels, countries like Iran with huge resources of gas and oil should not rely on these resources. They should consider comprehensive policy with no delay in the field of energy and take measure to codify plans to use alternative energies [19]. In the rest of research, a summary of the most important types of renewable energies in Iran are discussed.

#### A. Wind Energy

Due to Iran's good geographical location and being located in the direction of various wind flows in different seasons, Iran has high potential of wind energy. Because of existence of good regions in Iran, the design and production of wind farm increased since 2000. The studies show nominal estimated capacity of only 28 areas of Iran is almost higher than 6500MW (compared to total nominal capacity of Iranian power plants). Capacity of 163 wind turbines embedded in Iran is higher than 92MW.

#### B. Solar Energy

Iran takes benefit of 2800hrs of sunlight per year and the average sunlight coverage in Iran is estimated about 2MWh/m<sup>2</sup> per year [20]. 60% of area of Iran is covered by barren farms and lands with reasonable radiation of sunlight. If Iran uses only 1% of these areas, it could provide total energy for the country. Now, 11 projects of solar energy are being used by the Ministry of Energy. Total power generation rate of solar cells in 2004 has been 14.020MW and this value has reached 67MW in 2010.

#### C. Geothermal Energy

The geothermal energy is usually gained in regions with volcanoes. This type of energy could be used to keep houses warm and to generate power. As Iran is located on thermal belt of the world, it has high potential to generate this type of energy [21]. According to relevant studies, 14 regions of Iran for this type of energy are specified and the capacity of one region reaches 250MW.

#### D. Biomass and biogas

Nominal capacity of Iranian power plants for biomass is equal to 1.86MW. Moreover, the practical capacity is about 1.665MW and the GDP is estimated as 5967\*103MW/h. With increased amount of construction of disposal sites and complete the installation of equipments, the achievable rate of energy could increase significantly. The potentials and advancements are more and less observable in other new energies.

In general, Iran has high potential in the field of renewable energies like water power, wind power, solar power, geothermal energy and wave power. The results of studies in the field of renewable energies in Iran show that achieving 20000MW target is possible by 2025. However, achieving this goal only within 8 years need determination and collection of data, achievement of technology capacity and planning with details, and accurate implementation of plans.

### 5. CONCLUSION AND SUGGESTIONS

The development process in Iran shows that during 20 years, renewable energies could supply 5% of total electricity needs

of the country. It seems vital in regards to moving toward sustainable development. To achieve this goal, the regulations of the government for renewable energy development should be considered and come into force. The following operational steps are suggested to move toward a sustainable future with less environmental problems:

- Considering cultural and educational issues in macro scale of energy planning to educate the society about the environmental problems and necessity of using renewable energies
- Portion of renewable energies should be specified in Iran's energy portfolio and some measures should be taken for this purpose
- Required resources to purchase the electricity generated from renewable energies should be supplied adequately. For this purpose, some goals should be considered as follows:
  - Allocation of some portion of public resources in annual budget to guarantee purchase of the electricity generated by renewable energies
  - Determining a percent of electricity consumed by the subscribers (e.g. 1%) and calculating its price in bill of subscribers using guaranteed price of renewable energies
  - Formulation of green electricity tariffs and estimating electricity price of all public institutes using this tariff and the advertisements of optional acceptance of electricity by pro-environment subscribers with the support of nongovernmental pro-environment organizations
  - Allocating a portion of the consumption cost, and establishment of renewable energy power plants with the grants of the government and allocation of special stock and portion to reduce construction costs of these power plants

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