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The status of renewable energy in Iran and the world

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Abstract

Due to the development of human societies, growing demand for energy sources, and the challenge of shortage or lack of them, industrial developed countries and developing countries have begun many studies on renewable energy sources in nature, especially solar energy, wind, waves, geothermal, hydro, biomass, etc. Moreover, by using these energy sources, some problems such as environmental pollution, changes in the Earth's climate, and deterioration of resources will be removed. But with all these interpretations, the process of making these energy resources compatible with the current system of world energy consumption is followed by some problems; in recent decades, the world's most important scientific studies have been done on the review and resolve of them. The purpose of this paper is to determine the Iran's place in the use of these energy sources compared to international standards, and Iran's available potentials for employing these sources properly for an optimal usage.

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Introduction

Three groups of energy sources for humanity are fossil fuels (coal, oil, natural gas, etc.), nuclear fuel, and renewable resources (alternative energy). Renewable energy mistakenly called alternative energy and they have always been in human processing. Throughout history, aside from the daily common uses of solar energy, wind, biomass, water, and geothermal, some industrial activities in the form of windmills and watermill, etc. have been seen in Iran, Greece, Egypt, and Ancient China. (Derakhshan and Mohammadi, 2013). However, the growing world energy demand has caused an increase in the use of fossil fuels and alternative energy. It should be noted that developing countries are in dire need of energy, because more than 1.6 billion people were living without the use of new services until recently. Due to this number of requests, the dominance of fossil fuels over patterns of economic and social growth will continue strongly (Rafiei Tabatabaei, 2010).

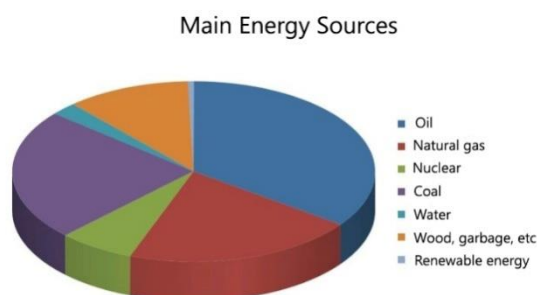


Fig. 1. The main sources of energy in the world in 2002 (Rafiei Tabatabaei, 2010).

According to statistics recorded, the world's energy needs has increased over the past 30 years. In 1960, the world energy consumption was 3 GTOE/year, and in 1990 it reached 8 GTOE/year. These Figs. were up to 12 GTOE/year in 2010, and it is predicted that they will be increased up to 14 GTOE/year in 2020.

These Figs. indicate that the world energy consumption will be very high in the next century, and here is the question: will these sources be enough for the world's need to survive and develop in the future?

Iran is one of the biggest and most important countries of the world that has energy sources. According to the statistics of 2005-2006, Iran with a share of 5.5 percent tons of exports and 3.3 percent share of natural gas production (98123 million cubic meters) is one of the main businesses of the world. (Arabnia and Barati Malayeri, 2009). It is predicted that the growth rate of natural gas will be 3.2% in 2025, the highest growth among the supporters of energy. In the field of wind energy in Iran, the nominal capacity of sites is about 6500 MW, meanwhile, the real potential is ten thousand megawatts. The installed capacity of Binalood wind farm is 28.3 MW. Regarding solar energy and topology, sun exposure during a year is 233 to 2360 hours in Iran, it is one of the sunniest countries in the world. So that the sun provides energy for the country up to 300 days per year. This amount is equivalent to 4.8 billion barrels of crude oil and in fact, it is equivalent to 6 million barrels of oil a day. Moreover, reliance on fossil fuels will increase pressure on the environment. Reduced oil and gas, along with political instability in oil and gas production areas will cause a major increase in the use of coal followed by increased carbon dioxide (Galavi and Galavi, 2010). The average of the world's energy intensity is about 0.4, it is estimated that it is more than 0.6 in the current Iran. Therefore, the need to study and apply alternative energy is tangible in Iran, moreover, it will improve economic growth in rural areas and it will lessen the pressure of migration from the countryside to the major cities (Galavi and Galavi, 2010).

Materials and methods

Biomass and biochemical processes

Brazil's production of alcohol that is ethanol production from sugarcane is the largest business system that was established in 1975 and its production reached 15 billion liters per year. Most cars worked with gasoline containing 26 percent ethanol. America has a long history in the production of bioethanol from maize, but like other biofuels, cheap oil ruined their market.

World's energy intensity

The average of the world's energy intensity is about 0.4, it is estimated that it is more than 0.6 in the current Iran. Therefore, the need to study and apply alternative energy is tangible in Iran, moreover, it will improve economic growth in rural areas and it will lessen the pressure of migration from the countryside to the major cities.

Result and discussion*Solar energy*

Understanding solar energy and ways to use it for different purposes dates back to prehistoric times. An Egyptian pharaoh built a temple that it was opened by the sunrise and closed by the sunset. With reference to the subject mentioned above, we could say Ryza city in China, Abu Dhabi in UAE, and Sevilla in Spain are sun cities. Spain with 150 MW, United Arab Emirates with 100 MW, China with 225 MW, and Germany with 166 MW annual use of this energy are the main beneficiaries of this clean source in the world. Although Iran is located in solar belt and its annual average energy received is 14 to 220 kilo calories per square centimeter, only a few activities have been carried out in this field in our country; some of them are as follows:

250 Kilowatt Parabolic Trough Concentrator in Shiraz that is a research center with 300 thousand square meters area and 60 thousand square meters infrastructure, its design and construction process began in 1999.

- Central receiver solar power plant in Taleghan Pho-tovoltaic water pumping in many parts of the country for the supply of water for agriculture, this pump is required.
- Photovoltaic street lights—the first sample of such lights was created based on a complete domestic technology and it was tested in 1997.
- Parabolic trough solar collector it is being tested and operated in Mehrshahr, Karaj. [8]



Fig. 2. Photovoltaic lights in Sirjan.

Biomass

Centralization and easy-to-use feature of this energy source followed by protection of the environment, preservation of national resources, business opportunity, urban dilemma solved, and development of remote areas are main reasons of many countries to replace this source of energy instead of other resources. In the scope of this policy, there are bioethanol and biofuel. In 1997, almost 13 to 14 percent of world primary energy were supplied by biomass. Biomass resources provide more than 22%, 25%, and 27% of total energy of Nepal, Brazil, and Egypt and Morocco respectively. In 2008, 79 billion liters of biofuels, ethanol and biodiesel were created worldwide, they were used as a fuel for vehicles.

In 2010, almost 62 gigawatts of energy capacity of the biomass were used worldwide. These Figs. show biomass alone is equivalent to about 3.1 billion tons of crude oil per year, and it is almost 37% of world oil consumption in 1998.

Status of biomass in Iran

Environmental problems have always been in Iran and many of them have reached their peak. On the other hand, Iran possesses rich biomass sources and it should start using this energy source. Niazabad in Lorestan City took the first step towards employing this source in 1975. This device used a capacity of 5 cubic meters of cow dung of the village to provide

biogas consumption of adjacent bathroom. In 1980, two small experimental units were established in Bu-Ali Sina University in Hamedan and their fuels were slaughterhouse waste. In 1982, Sharif University of Technology examined a 3 m³ unit and it was loaded by cow manure (Engineer Moayeni *et al*, 2010).

Moreover, Biogas Research Center of Saveh, affiliated with Iran's Alternative Energy Organization was launched in 2000. The purpose of this center was to use the waste of Saveh City to produce biogas and help its environment. Since 2004, construction of

Iran's first biogas plant with a capacity of 600 kilowatt has been begun and continued.

Geothermal

In Iran, the use of geothermal energy has spread by people's use of hot springs. World energy consumption of this energy source was 0.3 × 10²¹ in 1997, Iran's share of this Fig. is minimal. We could say the only activity in this regard is a project that defined by Iran's Alternative Energy Organization in Meshkineh in 2010. Moreover, areas such as Naybod, Tokab, Khour, Bandar Abbas, Boushehr, and Lar have high potentials. (Razaghi, 2013).

Table 1. Biomass power plants in Iran.

Name of company presenter	Location	Type of power plants	Opportunities installed in terms of MW	Row
Water and Wastewater of Tehran Municipality	Tehran	Biogas from sewage sludge	5	1
Mashhad Organization of recycling and conversion of material of Mashhad	Shiraz	Biogas incinerator	102	2
Municipality	Mashhad	Biogas incinerator	0.6	3
Municipality	Tehran-Isfahan	Digester – incinerator - biogas	12	4

Conclusion

Since oil and gas resources are declining and they are state and national valuable assets, non-optimal use of these resources will cause countless environmental pollution in addition to political instability of the country. Therefore, specialists believe through renewable energy we could overcome the above problems. Due to our high capacity in all energy sources, it is necessary to consider and study solar energy and biomass.

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