Impact of solar energy application on warming, health caring and pollution prevention in Iran

Maryam K. Hafshejani[1], Alireza Baheri[2], Mojtaba Ojakeh[2], Amin Sedighpour[3], Armin Arad*[4], Sadegh Choopani[5]

[1]Shahrekord University of Medical Sciences, Shahrekord, Iran
[2] Dezful Branch, Islamic Azad University, Dezful, Iran
[3]Department of Engineering, Bam branch, Islamic Azad University, Bam, Iran
[4]North Khorasan University of Medical Sciences, Bojnurd, Iran
[5] Faraiand Sanat Sharif Co, Tehran, Iran
Corresponding author email: aarad1384@yahoo.com

Abstract: Solar energy is cited as a clean alternative to fossil fuels. Solar panels generate energy without producing ambient pollution. Therefore, there is no argument that pure solar energy is a clean, green energy source. The result in the present paper shows that by using renewable energy special sun light energy, considerable amounts of Greenhouse polluting gasses are avoided. The use of conventional energy in factories and vehicles in has been a major source of pollution health hazards. These hazardous pollutants, such as suspended particle, heavy metal, organic matter and carbon monoxide (CO) adversely affect health. Although solar energy has significant environmental benefits in comparison to the fossil fuel, some problems has be seen in this way. The important advantage is related to the reduced CO_2 emission and air pollution prevention and it can be said this method for producing energy which has some economic benefit. The supplies of the fossil fuels used to generate much of its shrink, the cost of this energy is increasing worldwide. Solar energy allows human to generate its own energy in cheap way. To the best of our knowledge, the comparison of two categories of energy and investigation in the benefits of solar energy as a new way in Iran are investigated to prevent our environmental and natural sources.
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1. Introduction

The sun is an essentially cleaning energy source which has the potential to satisfy a substantial fraction of the man's future energy needs. Solar energy from the sun is the produced power behind these life processes. Using solar energy has offered many environmental benefits that contribute to a healthy future. Sun light is the most significant resource which is converted into other energy. Using traditional energy such as natural gas, crude oil and all of fossil energy can spoil a huge amount of your energy source and money. Sun light energy is produced by using diversity technologies. This renewable source is used for industrial production, material testing, smelting, to heat up water, cook, distill and disinfect water for drinking purposes, and much more. The best thing, solar energy reduces the environmental impacts of pollutant industrials such as combustion of fossil fuel to generate heat and working which can produce green house gas and other air pollution emissions. The force to reduce CO_2 and other gaseous emissions according to the Kyoto congress is the main cause that countries try to use neat energy sources, nowadays. Global warming, greenhouse effect, climate change and ozone layer depletion are the worst effect on environment by using common energy. Solar energy applications have the wide area. One of the most important areas is the generation of electrical power [1]. Some of these applications are such as solar desalination using, solar heat, solar still method, solar water heating pipes and solar space heating and cooling [2]. In this paper, solar energy applications and their impressions on the environment are investigated and some of these applications are described in Iran as a developing country. In addition, the destructive effect of this renewable energy is represented.

2. Renewable and non-renewable sources of energy

Generally, energy sources are classified as renewable and non-renewable energy types. Renewable energy is defined by the fuel source, such as solar, wind, biomass, tidal, etc., that usually is called new resources. The capable of renewable energy is to provide cost-effective energy to remote communities without the added investment of providing fossil generation, which is shown in table 1. Another group is non-renewable energy such as coal, crude oil, gas well and fossil fuel which is called conventional resources. This category of energy has no effective economical and benefits for environment and usually causes much pollution in the ambient. [3]. Fossil fuels as a non- renewable

resources consist of deposits of once living organisms which takes centuries to form. Fossil fuels principally consist of carbon and hydrogen bonds. There are three types of fossil fuels which can all be used for energy provision; coal, crude oil and natural gas. China and India are major users of coal for energy provision [4]. Today the world daily non-renewable resources energy consumption is about 76 million barrels. Pollution depends on energy consumption. Problems associated with energy supply and use are related not only to global warming but also to other environmental impacts such as air pollution, acid precipitation, ozone depletion, forest destruction, water contaminant and emission of radioactive substances. One of the most important pollution in an ambient is the exits of NO_x and SO_x which are called acid rain. These pollutants are produced by the combustion of fossil fuels, such as industrial boilers and transportation vehicles. Another effect of these non-renewable sources of energy is Ozone layer depletion. A global environmental problem is the depletion of the ozone layer, which is caused by the emissions of organic gases from burning fossil fuels. Therefore, this problem can cause global climate change. Increasing concentrations of greenhouse gasses increase the amount of heat and temperature of the earth. Although these results of using conventional sources of energy can damage the world security but yet using of these category of energy is common. Nowadays, in some countries special in Iran the strong political will is to use the renewable energy not only for environmental effect but also the conventional resources is the prominent investment in each country that should be saved by the human. The benefits arising from the operation of renewable energy can be put into three categories: energy saving, generation of new work and decrease of ambient pollution [5].One of the best renewable energy is solar energy. By using solar energy instead of conventional fuel, large amount of pollutants are avoided. Iran is one of the biggest countries that have the wide energy resources in the world. Annually, in Iran, about 216 million tone crude oil was been producing and 98123 million cubic meters was been producing, too [6]. It is predicted that by 2030, the using of natural gas as a source of energy will be increased by the rate of 1.8%, annually. The most of these requests will be accrued in the developing countries such as India, China and special Iran. It can be said that until 2030, the consumption of natural gas and fossil fuels will be increased with rate of 21.5%. This is the main reason of ambient pollution in Iran and the other developing countries. Nowadays solar energy is used straightly for various aims. In Islamic religion, it is recommend using sun light for erasing the unclean material, which is called the neat energy resources so it is seemed that sun light energy is saint and is recommitted by some holly religions. It can be said even the first idea for utilization of renewable energy special solar energy is expressed by Muslims. Today in Iran more than 90% of power plants are using natural gas as their fuel. Annually, the amount of sun radiation is estimated 1800 to 2200 kWh that it is more than the world average. Therefore, some projects are done to produce useful energy by using of the country potential in this productivity.

Table 1. Main renewable energy sources and their usage forms

Energy source	usage options
Hydropower	Power generation
Geothermal	Urban heating, power generation, hydrothermal, hot dry rock
Solar	Solar home system, solar dryers, solar cookers
Wind	Power generation, wind generators, windmills, water pumps
Tidal	Barrage, tidal stream

3. Application of solar energy in Iran and its environmental effect

One of the solar applications is to provide the required heat energy of the generator of a single effect lithium bromide–water absorption cooling system. This experimental project has done in Ahwaz where the sun radiation is wider. The minimum required collector area was about 59.8 m^2 for the collector mass flow rate of 1800 kg/h with the initial temperature of the storage tank equal to ambient temperature during sunshine hours of the design day [7]. From this study, it can be found that one of the important conclusions is decreasing the using of fossil fuels for heating which can pollute environment. Another study in this way is about Yazd solar power plant [8]. Yazd solar power plant shows that the INTEGRATED SOLAR COMBINED CYCLE SYSTEM (ISCC-67) is the most suitable and economical project for construction of first solar power plant in Iran. The environmental effects are considered that the ISCC-67 will have the lowest Levelized Energy Costs, which is about 10 and 33% lower than combined cycle and gas turbine, respectively. It is shown overall technical and economic specifications of different cases for Yazd solar power plant in Table 2.

In Table 1, it is shown the fuel consumption in six cases. With comparison, the fuel consumption

of each power plants which has reported as m^3/MW h. The fuel consumption in traditional combined cycle is more than the others. The ISCC-67 has lower fuel consumption about 16% than combined cycle. Therefore, in this case more litter pollution emission can be released which are shown in Figure 2. In addition, it is gained by using solar system special ISCC-67 the house gases are eliminated from air which can destroy the Ozone layer.

Table 2. Overall technical and economic specifications of different cases for Yazd solar power plant [8].

Cases / Parameters and units	ISCC-33	ISCC-67	ISCC-67 AF	SEGS(Solar Electric Generating System)
Investment cost (million $)	206	251	255	110
Saving fuel (million $) in 30 years	29	59	59	59
CO_2 emission reduction (million ton) in 30 years	1.2	2.4	2.4	2.4

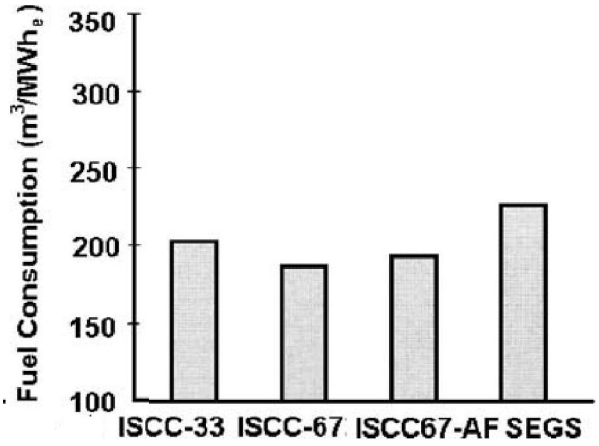

Figure 1.Natural gas consumption per unit of produced energy for different cases [8].

Since Iran is a developing country with an increasing rate of electricity of consumption, so it is better to produce by renewable sources of energy like solar energy. Many regions in Iran have a potential for using to install the solar power plant. These areas are shown in Figure 3.

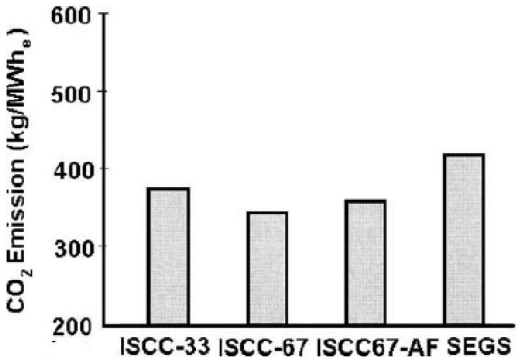

Figure 2. CO_2 emission per unit of produced energy for different cases [8].

Figure 3.The regions which have the potential to produce solar power plant [3].

By establishment of power plant for generating electricity it will be decreased the emission of pollution which is caused from fossil fuels such as crude oil and natural gas. Amount of pollutants and greenhouse gases emitted from burning fossil fuels in Iran during 2007 can be seen in Table 3. These pollutants can cause very terrible illness [9].

Another research has been investigated the application of solar energy in four climate regions in Iran. In this study, it can be seen that by using the sun light as a renewable energy, the investment and the usage of conventional energy will decrease. Figure 4.Shows divided region into four different climatic regions: cold, Temperate-humid, hot-dry and hot-humid [10]. It can be seen that all of areas in Iran have a suitable potential for using sun light and to can save much of fossil fuel and money annually. But the important result is to produce the new resources

of energy for avoiding of ambient pollution. Table 4 expresses the benefits of solar energy in four-climate condition in Iran.

Table 3. Amount of pollutants and greenhouse gases emitted from burning fossil fuels in Iran during 2007[9].

Fuels (Ton)	NO_x	SO_x	CO	CO_2	CH_4	N_2O
Kerosene	3734	17923	8525	19,446,284	811	162
Gas oil	607,460	542298	145,804	92,632,989	4481	4481 7642
Fuel oil	131,339	822796	62	58,322,366	2148	2148 429
Natural gas	283,701	745	15,521	245,452,905	6820	441

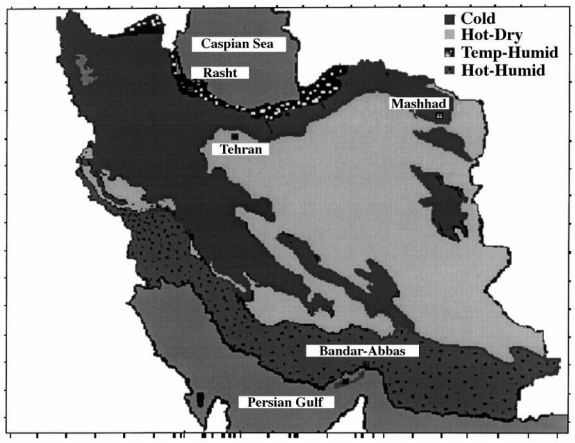

Figure 4.climate map of Iran [10].

Table 4. Annual fossil fuel savings in Iran [10].

regions	Annual fossil fuel energy saving (Gj)
Cold	109,440
Hot-dry	63,000
Temperate-humid	25,920
Hot-humid	19,440

The thermo siphon solar water heater is one of the prominent applications of sun light energy [11]. The results show that by using solar energy considerable amounts of greenhouse polluting gasses are saved. For the domestic solar heating system considered here, with electricity or diesel backup the saving, compared to a conventional system, is about 70%.

Table 5. Shows the effect of using solar energy instead of fossil fuels for heating water on environmental. In the table the eight most important greenhouse gasses are considered. The amount of emissions depends on the type of fuel used as auxiliary.

4. The negative environmental impact of renewable energy

Many types of renewable energy exist in the world that there are no emissions to the air, water, or soil, because there is no burning of fossil fuels. For example every power plant which generates from wind prevents the emission of certain amount of pollution by burning fossil fuels. This renewable energy usually is done by wind turbines which can have a bad effect on environmental such as damage of birds as a result of collisions with towers and blades. Another problem is the noise produced by wind turbines [12]. Also the negative environmental impact of solar energy system is existed which is important to select the suitable instruments. The most important of these negative impacts are land displacement, and possible air and water pollution resulting from the manufacture, normal maintenance operations and demolition of the systems. But the land displacement can be solved by using the roof of building for installing solar energy system instruments [11]. It can be mentioned to emit the air pollution and water contaminants from the manufactures where the incumbent instruments have been produced. According to the vantages of renewable energy it can be imparted they are only proper resources of energy for human and his environment because of eschewing of burning fossil fuel.

Table 5. Environmental impact of the thermo siphon solar water heater with diesel and electricity backup [11].

Emissions	Units	Conventional (electricity backup)	Conventional(diesel Backup)	Solar System(electricity backup)	Solar system(diesel Backup)
Carbon dioxide	tons/year	1.546	0.889	0.449	0.293
Carbon monoxide	g/year	374.6	1688	109.7	581.3
Nitrogen oxides	g/year	56.3	1636	16.3	544.8
Nitrous oxide	g/year	6.3	6.1	2.1	1.2
Methane	g/year	9.3	13.6	2.7	3.3
Sulfur dioxide	g/year	562.7	651.4	164.5	169.9

5. Conclusion

In the present study, the potential benefits that solar systems offer are discussed in detail, in Iran. Additionally, in the study the environmental protection offered by the most widely used renewable energy system. The results show that by using solar energy considerable amounts of greenhouse polluting gasses are saved. Ambient toxic emissions during solar system were very low, and blew detection limits. The application of such fuel system in industry of country offers a wide range of ecological and, in many cases, economical advantages like conservation of fossil fuel resources, utilization of reduction of emission of harmful species from fossil fuel burning, and minimization of waste disposal. The negative environmental impact of renewable energy is also expressed such as damage of animals like birds and land displacement by solar energy systems. However, it is clear that using of these sources of energy is more useful special for environment than conventional energy.

Corresponding Author:
Armin Arad
North Khorasan University of Medical Sciences
Bojnurd, Iran
E-mail: aarad1384@yahoo.com

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