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Development of Solar Energy In Turkey And World

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ABSTRACT: *One of the biggest problems of word is energy problem.In this study, of which Turkey and the subject of alternative energy sources solar energy from the sun as the percentage of the energy required by examining the development in the world has tried to be illuminated. In parallel with the rapid increase in the world population, modernization, developing technology and especially the economic development in recent years, the need for energy is increasing. People tend to seek energy from the sun, which has infinite energy from alternative energy sources, considering that energy resources in the world will be insufficient to meet the energy demand. In addition, solar energy is more environmentally friendly than fossil fuels. solar studies in Turkey continues to this day 1970. The limited reserves of fossil resources and the uncertainty in the prices and the continuous rise in the price of solar energy is one of the alternative energy sources.*
KEY WORD: *Alternative Energy, Solar Energy, Fossil Fuels*

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I. INTRODUCTION

Increasing energy demand in World and parallel to that consumption of existing energy sources forces World states to search for new energy sources. According to the estimations of World Energy Forum, in case of consuming reserves like petroleum, coal and natural gas which are fossil-originated energies, they will be extinct in the next century. [1]. Emission of poisonous gases with the consumption of fossil-originated fuels constituted a serious problem environmentally. [2]. As these energy sources cause global warming, they also cause air pollution, acid rains, ozone layer depletion and forest destruction. [3]. the main reason of CO2 (carbon dioxide) emission occurs from human activities. While this humansourced emission was 2,6 billion tons worldwide in 2002, it is estimated that this will reach to 4,2 billion tons in 2030. [4]. Usage of photovoltaic systems has increased significantly to increase the efficiency, decrease the costs and compensate the energy need in new generation photovoltaic systems over time. [5]. The tendency of existing energy producing sources to be consumed fast, the increasing prices of raw materials, its negative effect on humans and environment, some difficulties in its usage, have increased the researches on renewable energy sources in recent years. Firstly, photovoltaic energy is an energy type that is clean, has no harm to environment and the living and includes no waste. The harm of energy producing systems based on nuclear and fossil fuels like petroleum, neutral gas, coal etc. Is extremely high. As well as they are eco-friendly, they can be installed to wherever wanted by need. This is not the situation for other energy producing systems. Especially photovoltaic systems install near latest users reduces transmission and distribution device need and increases the reliability of local electricity services [6].
Solar Energy has become an industry sector since end of the 1970s in Turkey. Although there are many applications of solar energy, recently thermal applications and PV electricity have taken over in among solar energy applications.[7]

II. SOLAR ENERGY POTENT □AL OF TURKEY

Turkey is located in a geography quite lucky in terms of solar energy. Turkey's electricity production potential of solar energy, according to estimates from the 380-year TWh and an installed capacity of 56,000 MW potential. In 2014, the installed capacity of solar energy was 40 MW and it is foreseen to increase to 5,000 MW in 2023. Compared with other renewable energy sources and the potential value of total electricity consumption in 2014 (250 TWh) Given that Turkey's electricity production from solar energy potential is better it understood how high it was.As a result, Turkey, not only in economic terms it is seen that with renewable resources potential of 142,000 MW of installed capacity and electricity generation potential of 660 200 GWh-

year. According to these data, while Turkey has yet to 19.7 percent of potential installed capacity of renewable energy sources in electricity production in 2014, and it has realized the potential of electricity production by 7.9 percent. Reach of all renewable energy sources in the year 2023 61.000 MW installed capacity and 30 percent of Turkey's total electricity consumption is expected to be met from renewable energy sources. [8]

Table 1. Alternative energy sources

	Alternative Energy Type	Welding or fuel
1	Nuclear energy	Heavy elements such as uranium
2	Solar Energy	Solar
3	Wind Energy	Atmospheric movements
4	Wave Energy	Ocean and seas
5	Natural gas	Underground sources
6	Geothermal Energy	Underground Water
7	Hydraulic Potential	Rivers
8	Hydrogen	Water and hydroxides
9	Bio-mass, bio-diesel	Biological residues, oils

The sun is the energy source of the world. Renewable energy is one of the most important sources of renewable energy sources, either directly or indirectly due to its ease of use and cleanness. Turkey, the location as solar energy potential is one of the country can be considered quite high. [4]According to the Directorate General of Renewable Energy measurement and evaluation of his distribution by months of average daily solar radiation values of Turkey and the mean daily sunshine duration is shown in Figure 1 and Figure 2 respectively.

Table 2. Monthly average solar energy potential of Turkey

Aylar	Aylık Toplam Güneş Enerjisi		Güneşlenme Süresi
	(Kcal/cm^2-ay)	(kWh/m^2-ay)	(Saat/ay)
January	4.45	51.75	103.0
February	5.44	63.27	115.0
March	8.31	96.65	165.0
April	10.51	122.23	197.0
May	13.23	153.86	273.0
June	14.51	168.75	325.0
July	15.08	175.38	365.0
August	13.62	158.40	343.0
September	10.60	123.28	2S0.0
October	7.73	89.90	214.0
November	5.23	60.S2	157.0
December	4.03	46.S7	103.0
Total	112.74	1311	2640
Average	308,0 cal/cm^2-gün	3,6 kWh/m^2-gün	7.2 saat/gün

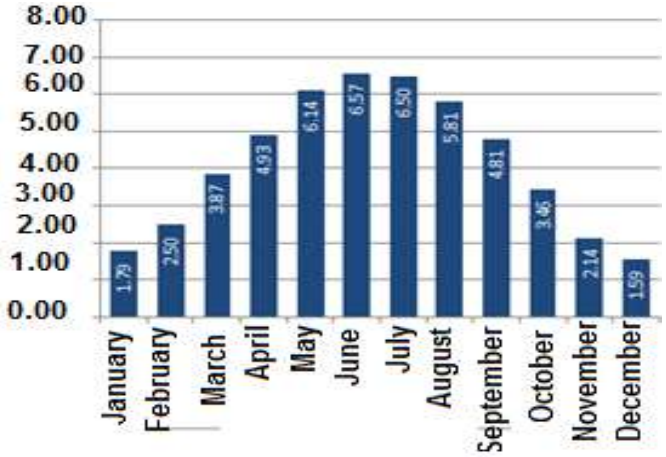

Figure 1. Radiation Turkey Global Value [9]. (Global Irradiation Values Average 3.6 KWh / m2 - day)

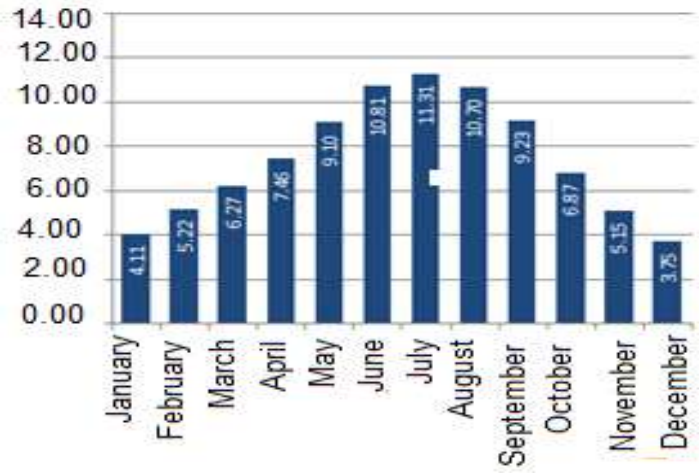

Figure 2. Turkey sun Time [9]. GM)(Sun time: 7.2 hours)

III. FOUND SOLAR POWER PLANTS AND PRODUCTİON CAPACİTY İN TURKEY

The total installed capacity of 1644 MW Solar Power Plants in Turkey are 1362.60. In 2016, the solar power plants generated 1,020,000,000 kWh of electricity.As the total consumption is calculated based on the energy value for consumption, we are able to find out how much of our electricity and electricity consumption are met. According to this, when the ve surplus ası electricity generation and total consumption realized with solar energy between 2014-2017 are calculated, the following graph appears. The year 2017 includes January - October period.

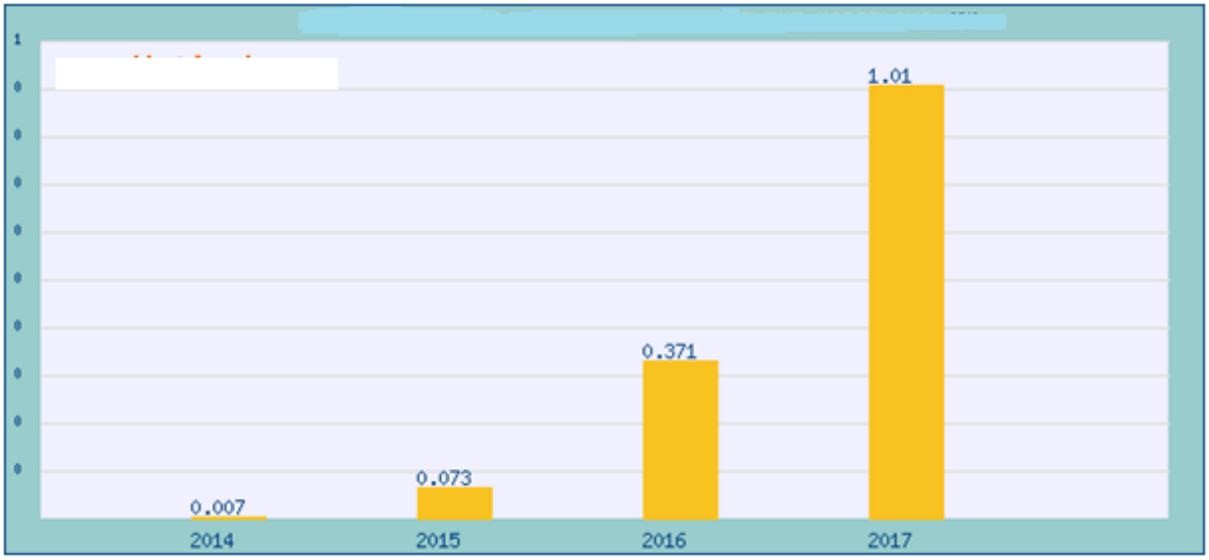

Figure 3. Electricity Consumption by solar energy[10].

IV. NEW PV INSTALLATİONS BY COUNTRY İN 2016 AND TOTAL PV CUMULATİVE CAPACİTY BY COUNTRY İN 2016

The development of large solar power markets in Asia (China, India and Japan) and in the United States has demonstrated that solar is no longer Europe-centric. Far from it. In 2016, Asia-Pacific surpassed Europe to become the largest solar power region in the world with 147 GW of total installed capacity, equal to a 48% global market share. In 2015, Germany surrendered its position as the #1 country by total installed capacity to China. During 2016, the Chinese installed a whopping 34 GW of new PV systems up from 15 GW the year before. As of year end 2016, the country had amost 78 GW cumulative capacity installed.

China is expected to grow its cumulative installed capacity from 77.9 GW in 2016 to 197.9 GW by the end of 2021, an increase of about 120 GW or more than 154%. China was officially targeting 100 GW by 2020, then upped that to 143 GW and is now aiming for 213 GW. By the end of July 2017, China's solar PV capacity topped 112 GW after installing an impressive 35 GW in the first seven months of the year. The United States is expected to grow its cumulative installed capacity from 42.4 GW in 2016 to 112.3 GW by the end of 2021, an

increase of almost 70 GW or 165%. At 112 GW in 2021, the U.S. will be in second place after China, 36 GW ahead of India, and almost 40 GW ahead of Japan. Over the next 5 years, we can expect to see Germany fall to fifth place with 54 GW ahead of Italy's 23 GW, United Kingdom (16 GW), France (15 GW), Australia (14 GW), and South Korea (12 GW).

China installed 34.5 GW of PV in 2016, a 128% increase over 2015. This level of growth came as a surprise to many and was triggered by a feed-in tariff cut in the middle of the year. China is also the world's largest producer of PV modules (since 2007) and produces almost half of all PV grade poly-silicon. In second place, Japan installed 11.0 GW of new PV systems in 2015 - also supported by feed-in tariffs. The United States was the world's second largest solar power market in 2016. At 14.7 GW, the country's annual installed capacity was up almost 100% from the year before. In the U.S., solar power was the #1 source of new electric generation capacity added in 2016 with a share of 39%[11].

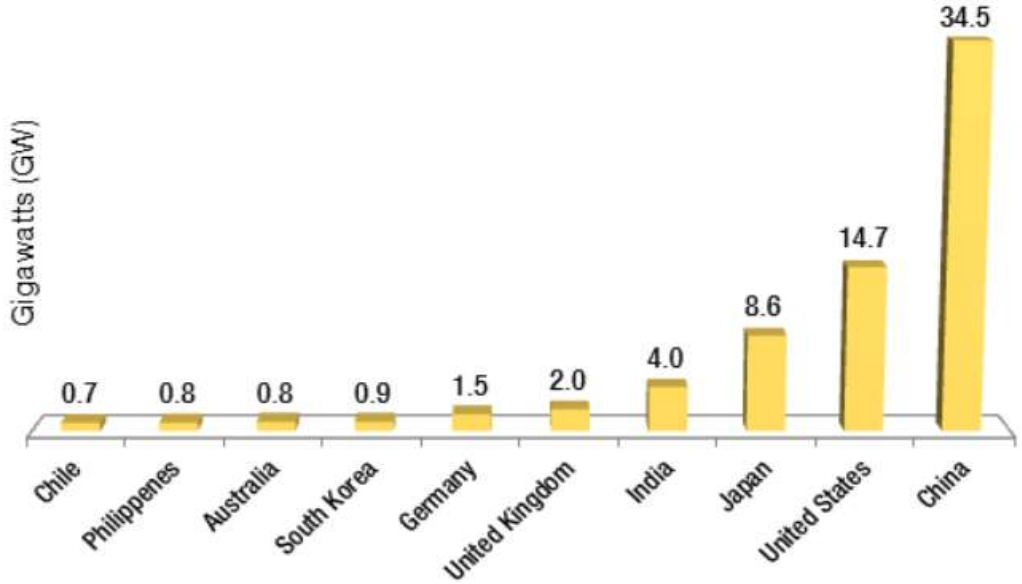

Figure 3. New PV Installations by country in 2016[11].

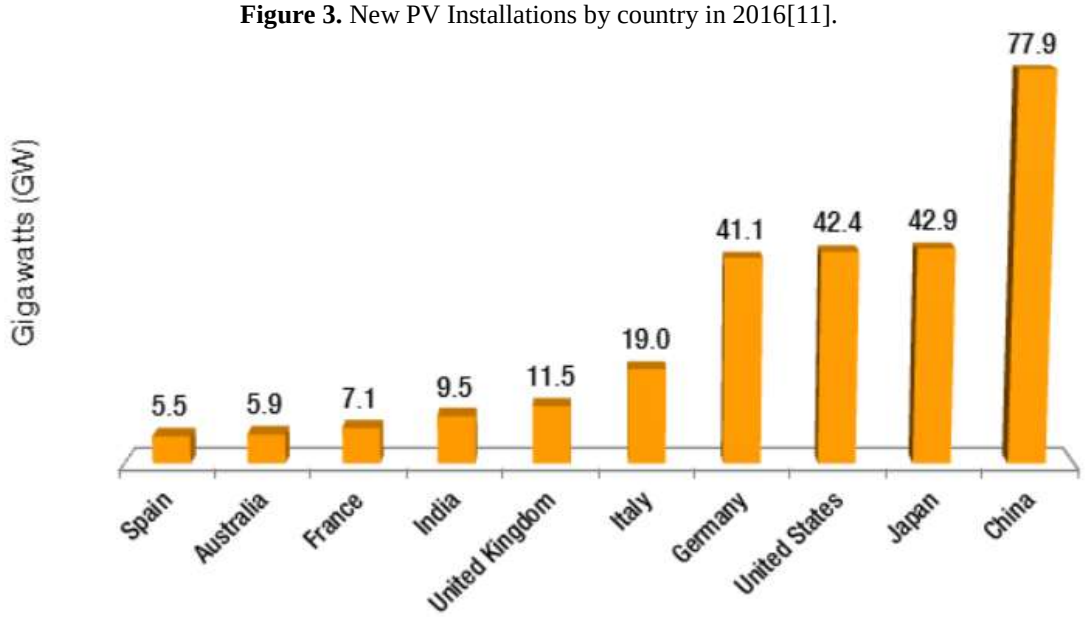

Figure 4. Total PV cumulative Capacity by country in 2016[11]

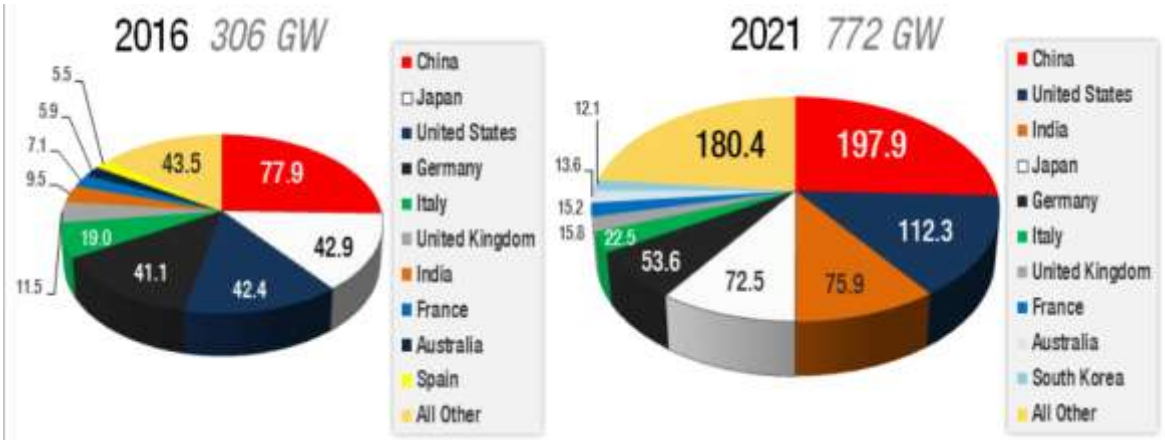

Figure 5. Total PV cumulative Installed Capacity by Country (top 10) in 2016 and 2021[11].

V. RESULT

External dependence on energy is a problem especially for the countries that import most of the energy needs from abroad. That use the solar energy potential of Turkey with Turkey will reduce the dependence on foreign energy. At the same time, due to the huge amount of money from the budget due to energy imports, the budget balance will be intact. With the budget allocated for energy, the country's welfare level will be increased by meeting the many needs of the country. Figure 3, as seen AIM Turkey consumption is only 1% met by solar energy. This rate is around 35% in countries such as Chine, Japan, United States, Germany, Italy.

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