ASSESSMENT OF SOLAR ENERGY, ITS POTENTIALS, POLICIES AND CURRENT DEVELOPMENTS IN TURKEY

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ABSTRACT

Thanks to its perfect geographical position, Turkey has a huge solar energy potential. According to Turkey’s Solar Energy Potential Atlas (SEPA), total sunshine duration is 2738 hours, annually and the quantity of average total incoming solar energy is 1527 kWh/m² year. Today there is great tendency towards clean, dependable and sustainable renewable energy productions to cover the increasing energy demands in all over the world. Renewable energy productions are subsidized by the governments and besides, these energy productions assure new employment opportunities. Renewables are accepted as an alternative solution to fossil fuels not only for the generation of clean energy, but also for the protection of the environment and the entire life on earth. In this study, present status of solar energy, its potentials, productions, government incentives and solar energy usage in Turkey have been examined according to the latest developments. In this way, it has been aimed to contribute to improvements in renewable energies and bring forth people’s awareness to the subject.

Keywords: Renewable energy, solar energy, incentives, Turkey

INTRODUCTION

As it is well known energy demand in Turkey and the world is constantly increasing each passing day. To meet this demand fossil fuel resources are being depleted rapidly. Moreover, due to the negative effects of fossil fuel use, the ambient temperature of the planet is rising, ice caps are melting and natural disasters are occurring dangerously. Also, soil, water and air pollution harm people, animals and plants, accordingly. Against all this negativity, renewable energies do not cause environmental problems, support the lives of the living and they are clean, reliable and sustainable. They have great importance for the future of mankind and the nature. Furthermore, renewable energy productions play an important role in eliminating the dependence on other countries for the supply of primary energies.

Turkey has huge solar energy potential compared to other renewable energy sources. Solar energy is one of the most eligible types of renewables in Turkey that can become widespread quickly as possessing environmentally friendly properties. However, it is necessary to overcome some technological and economic challenges of solar energy in Turkey, such as having high installation costs and relatively low efficiency and capacity factor. Along with solving these problems, solar energy productions will become much more attractive in the near future. Although Turkey has a quite lucky geographic position in the solar energy potential, the country has not been using this potential enough for today. This is an issue that should be dealt with strongly for Turkey’s energy future (World Energy Council Turkish National Committee, 2009).

As it is well known the sun is the main energy source for the whole universe, which is known as one of the cleanest and most inexhaustible of energy sources. The total energy amount that the world received from the sun is around 1.5 quadrillion (1.5 × 10^{24}) MW/h per year. This amount of energy is equivalent to 28,000 times the energy that consumed by the people in the world in a year (Republic of Turkey, Ministry of Energy and Natural Resources, 2016). According to the International Energy Agency (IEA), the sunlight that striking on earth for 90 minutes has the required amount of the energy to cover the
annual energy needs of the whole world. Also, IEA estimates that around 11% of global electricity production will be met solar energy by 2050. Also, by 2030, renewable energy sources will have the fastest growth rate among other energy resources with the growth rate of 7.6% per year. Investments in renewable energy projects in the world reached 310 billion US dollars in 2014, with an increase of 16% compared to 2013. The maximum share amount of these investments was carried out by China by spending 90 billion dollars in renewable energy. The United States is second country by investing 51 billion dollars, Japan is the third with 41 billion dollars. As for solar energy investments in worldwide, the numbers reached the value of 150 billion dollars in 2014 with an increase of 25%. Thus, for the first time solar energy investments, has risen to the largest share value among the renewable energies in the world (Republic of Turkey, Ministry of Energy and Natural Resources, 2016).

Solar energy is quite advanced in Germany, the country’s installed capacity of solar power reached 38,200 MW at the end of 2014 and thereby, solar power installed capacity was increased up to the level of second place after the coal with a share amount of 21% in the country. At the same time Germany aims to meet 80% of its electricity needs from renewable sources by 2050. After Germany, Italy has also made significant investments in solar energy in recent years. For example, 5.1% of the electricity consumption was met by solar power in Italy in February 2015. As another example, Japan is aiming to cover the electricity and heating needs of 32,000 schools in its country from solar energy by establishing the new solar energy production plants by 2020. In addition to all these examples, it is known that Turkey's annual solar energy the potential is 380×10⁹ kilowatt-hours. In Turkey, solar energy was finally able to take its place in the share of total installed capacity in 2014, for the first time. On the other hand, there are unlicensed solar power plants with a capacity around 50 MW in Turkey (Republic of Turkey, Ministry of Energy and Natural Resources, 2016).

Solar energy can be used efficiently almost every region in Turkey. Today, solar energy systems are usually used to provide hot water, space heating and/or cooling for residential, industrial and commercial applications in Turkey. Also, solar energy systems are becoming increasingly popular, especially residential solar water heating systems are used to meet the requirements of hot water in various facilities in recent years, for example heating greenhouses, swimming pools, cooling buildings, drying plants, vegetables, fruits and other agricultural products and different kinds of materials. By increasing every year, it is also used to generate electricity (ECA, 2015).

The main energy policy targets of Turkish Governments are market reforms, energy security and environmental protection. Handling of country’s substantial solar energy potential will help to decrease dependence on imported fossil fuels and also protect environment. Nevertheless, lack of regulatory and financial supports for the improvements of solar power have considerably retarded, but The government has taken very important steps to subsidize the investments in solar energy. For this purpose, a new feed-in tariff policy was brought into force at the end of 2010 (Canka Kilic, 2011; Topkaya, 2012). Turkey’s solar power potential, the status of PV technologies and anticipation for solar energy and renewable energy productions in Turkey have been examined in many studies (Kaya and Canka Kilic, 2015; Bakirci, 2012; Basaran et al. 2015; Benli, 2013; Atilgan and Azapagic 2016, Cetin and Egrican 2011; Dogan 2015; Bascetincilik et al. 2009; Kaya et al. 2008; Canka Kilic and Kaya 2007; Kaya, 2006; Simsek and Simsek 2013; Adam and Apaydin, 2016).

For example, Benli (2013) investigated the potential of renewable energy resources in Turkey at the magnitude of their present and future contributions to the national energy consumptions. In the study energy politics were also dealt with in detail. Simsek and Simsek (2013) explored the availability and potential of renewable energy sources in Turkey and discussed the government policies and economic aspects. Bakirci (2012) dealt with finding the optimum tilt angle of solar panels for solar energy applications. The optimization of tilt angles was performed using solar radiation data measured for eight big provinces in Turkey. The optimum angle for tilted surfaces varying from 0° to 90° in steps of 1° was calculated by searching for the values of which the daily total solar radiation was at a maximum for a specific period. Cetin and Egrican (2011) investigated the employment effects of solar energy industry in Turkey. Using the capacity targets of the photovoltaic (PV) and concentrated solar power (CSP) plants in the solar road map of Turkey. The prediction of the direct and indirect employment impacts to Turkey’s economy is seen as it is possible. As a result, solar energy in Turkey would be the primary source of energy demand and would have a big employment effects on the economy. Adam and Apaydin analyzed (2016) how a 500 kWp solar photovoltaic (PV) system for electricity generation contributes significantly in the greenhouse gas (GHG) emission reduction. They also examined the potential impact of introducing CO₂ emission reduction cost in the solar PV electricity generation.
In this study, an overview of the solar energy, the current status of solar energy in Turkey, solar energy potential, production, government incentives, solar energy usages have been examined in detail. This study aims to increase the general awareness of these topics. In addition, it is emphasized that solar energy should be evaluated effectively to meet Turkey’s energy demands, ensure energy security and resolve the environmental problems especially by realizing proper solar power generation. Lastly, it is underlined that the solar power is very important not only for the Turkey’s future but also the world’s.

**CURRENT STATUS OF SOLAR ENERGY IN TURKEY**

Turkey is geographically located between 36-42° north latitude and between 26-45° east longitude in the northern hemisphere. Due to its excellent geographical location, Turkey has a great potential of solar energy, which assures the country in a much more advantageous position compared to many other countries (Fig. 1) (SolarGIS, 2011). Although Turkey is situated in the sun belt, solar energy production and use much less than anticipated. Therefore, it is very important for Turkey to generate solar energy and come to realize solar energy projects to cover the country’s energy requirements. This is also a significant solution for the environmental issues.

Renewable Energy General Directorate (YEGM in Turkish) is responsible for the identification and evaluation of all types of energy sources, particularly, hydraulic, wind, geothermal, solar, biomass and other types of renewable energy sources in Turkey. This institution is under the management of the Ministry of Energy and Natural Resources (MENR). YEGM is also responsible for building opinions in regarding the applications that made for the purpose of obtaining a license based on wind or solar energy in the framework of Electricity Market Law (Date: 20.02.2001, Law No: 4628), Electricity Market Licensing Regulation (promulgated by the Ministry).

In order to promote the use of photovoltaic systems in Turkey, Renewable Energy Sources Act (Law No:5346) revised in December 29, 2010 and the legislative arrangement and the studies completed in 2013, which is an important step in solar energy in Turkey. The costs of photovoltaic systems have been lowered and their efficiencies have been increased in recent years and with these improvements, it is expected to increase their use in the country. It is also targeted that licensed solar power plants with an installed capacity of 3000 MW will be added to the grid, gradually. Moreover, the installation capacity of photovoltaic solar electric systems has reached 3.5 MW and this has been used for research purposes and to meet the need of small amounts of power especially in the public institutions (MENR, 2016).

In Turkey, the average total installed solar collector area was 18.64 million square meters at the end of year 2012. The production of annual flat plate solar collector value is 1.164 million square meters and almost half of this amount was used in Turkey. In addition, the vacuum tube solar collector productions were calculated as 57.6 thousand square meters and almost all this amount was used in Turkey. Again, according to data from the same year, approximately 768,000 TOE (Tons of Oil Equivalent) heat energy was produced by using solar collectors. About 500,000 TOE of this energy was used in residential purposes and the rest 268,000 TOE was used in the industry in 2012 (Republic of Turkey, Ministry of Energy and Natural Resources, 2016).

In 2010, General Directorate of Electrical Power Resources Survey and Development Administration (EIE) published the Solar Energy Potential Atlas of Turkey (SEPA) to provide information for the evaluation of the solar potential of the country and to contribute solar energy production. This atlas is also helps to use solar energy effectively and efficiently not only for solar investors, but also for solar energy users. According to Turkey’s Solar Energy Potential Atlas (SEPA), total sunshine duration is 2738 hours annually (7.5 h/day) and the quantity of average total incoming solar energy is 1527 kWh/m² year (4.2 kWh/m²·day). SEPA ensures monthly variation of average daily insolation duration and solar radiation level for all cities in Turkey. Fig. 2 shows Turkey’s Solar Energy Potential Atlas (GEPA, 2016).

As it can be seen in Fig. 2, Turkey’s annual solar radiation level changes between 1400 kWh/m²·year in the Black Sea Region and 2000 kWh/m²·year in the South East and the Mediterranean regions. Compared to Europe with average solar energy of 1200 kWh/m²·year and the Middle East with average solar energy of 1800–2300 kWh/m²·year, Turkey has one of the best positions for solar power generation in the world. Fig. 3 and Fig. 4 show monthly variation of average daily solar radiation and insolation duration in Turkey (Canka Kilic, 2015; Topkaya, 2012). By using SEPA and PV technology, Turkey has a technical solar power generation capacity of 380 TWh/year, corresponding to 56 GWp of gas powered stations. Turkey has a high solar energy potential as 110 days in a year. If the necessary investments will be implemented, Turkey can produce 1100 kWh of solar energy per square meter in a year. The monthly solar energy potential of Turkey can be seen in Table 1 (Canka Kilic, 2015).
In Turkey, the smallest and largest value of average annual total solar radiation are 1120 kWh/m²/year in the Black Sea Region and 1460 kWh/m²/year in the Southeastern Anatolia Region, respectively. With these radiation intensities, solar water heaters work with full capacity throughout the year in the section around 17% of Turkey's Southeast and Mediterranean regions. Solar water heaters work 90% of a year in 63% of the surface area of Turkey. In the following Table 2 shows the distribution by region of the solar energy potential in Turkey (UCTEA, 2014).

Solar water heaters can work fully operational in a period up to 70% of a year in many parts of the Turkey. For this reason, it appeared that all of the solar water collectors are used extensively in order to produce hot water particularly in the Aegean and Mediterranean coasts. In some industrial applications, the use of photovoltaic cells for electricity generation and space heating applications is becoming increasingly common. (Canka Kilic, 2011).

Solar energy usage in Turkey is basically comprised of hot water generation systems which turn solar energy into thermal energy. Solar energy is mainly used in the Mediterranean and Aegean regions in Turkey. Total installed area of solar collectors is around 12,000,000 m², annual production capacity is 750,000 m³ and 1,000,000 m³ and a portion of this production is exported. While annual thermal energy production from solar energy was around 210,000 TOE (Tons of Oil Equivalent) in 1998, it reached 420,000 TOE in 2007. Considering last decade's developments, Turkey is regarded as an important solar collector producer and solar energy user. In Turkey the share of solar energy utilization is planned to be increased at the maximum level, within the scope of increasing renewable energy production in energy supply. By finalizing the legal necessities and technical regulations, the Energy Market Regulatory Authority (EMRA) took 496 the license applications for the production of electricity from solar energy in June, 2013. These applications correspond to 9000 MW installed power, approximately (Eyidogan et al., 2016).

When installed electrical energy power in Turkey is analyzed, an important capacity increase can be seen in regard to installed capacity, which was 6948 MW with the addition of electricity power plants that commissioned in 2013. While the number of the electricity generation plant was 300 in 2002, this number reached 907 at the end of 2013 and increased to 1059 at the end of September 2014. The existing power plants numbers are shared as hydraulic power plants in total is 504, coal is 30, wind is 87, geothermal is 14, natural gas is 231, renewable and waste sourced is 49. In addition to these numbers there are also other power plants, which in total 9 is multi-fueled sourced (solid and liquid), 42 is multi-fueled sourced (liquid and gas) and 20 is liquid fueled and 73 is solar power plants (unlicensed). At the end of September 2014, an important increase in capacity realized as the value of 4222 MW (MENR, 2014).

The share of electricity generation from renewable energy sources will be increased to 30% by the year 2023 (Canka Kilic, 2016). Also the studies for the increasing the share of renewable energy sources in the electricity supply work is still ongoing. The installed capacity of new commissioning power plants that based on renewable energy sources has been around 2,002 MW for the first nine months of 2014. The power plants that created this value can be listed as follows; 724.3 MW of wind, 1166 MW of hydro power, 47.6 MW of geothermal, 64.1 MW of landfill gas, biomass, waste heat, waste oil and solar sourced electricity generation power plants. In Turkey, 11,170 MW capacity of power plants have been put in service in 2013 and 2014 and 50% of this value has come from renewable sources. The potential of renewable energy sources in Turkey is seen in Table 3, as of 2013 (MENR, 2014).

When an inspection carried out due to work in the energy market liberalization, a total of 4488 MW of private sector growth can be seen at the end of September 2014. In this context, 163 new plants have been commissioned with the power capacity of 4457 MW and 77 plants (unlicensed) was commenced with the power capacity of 30.9, MW. The distribution of these plants can be listed as is 2576.4 MW of thermal, 1119.6 MW of hydraulic, 724.3 MW of wind, 20.3 MW of solar and 47.6 MW of geothermal resources. As of at the end of 2014, the studies that conducted under the energy investment and diversification of supply, some sources in the power distribution board can be seen in Table 4 (MENR, 2015).

One of the latest developments in the solar energy in Turkey is that 35 power generation projects have been carried out last year (28 of them for solar power plants), they were supported and given incentives by the Ministry of Economy in February 2015. The process for first stage of licensed solar power plants is currently underway with the capacity value of 600 MW. In this context, 500 projects applications have been received with the capacity of 8000 MW. As of March 2015, the letter of request was given for the power production plant with a capacity of 2100 MW and 388 MW of projects approval was realized. In addition, by making provisional acceptance of 72.4 MW production plant was put into operation (Enerji ve Tabii Kaynaklar Bakanlığı, 2015). Figure 5 shows electricity production plants distribution by years (MW) (MENR, 2015).
There have been new studies for Konya Karapinar to evaluate the province’s rich solar potential and contribute to Turkish economy. There is a new solar power plant is planned to be as the world's largest solar power plant, scheduled for 3000 MW. The investment cost is projected as about 6 billion US Dollars. This project will contribute to Turkey's energy security, significantly. It is planned that the energy production will begin in 2018. For the production, it is also planning to receive the support from Konya industry for the power plant systems and domestic solar panels will be used to a large extent. With establishing the panel factories, the industrial zone of the region will be developed and the employment is expected to increase substantially. In addition, the use of additional equipment incentive can be used if it is domestically produced (Enerji ve Tabii Kaynaklar Bakanlığı, 2015).

In Turkey, there are 17 domestic manufacturers has made investments for solar panel production in the solar energy industry with the capacity of 382.5 MW. These are the only for panel production. The studies for the production of photovoltaic cells is still ongoing. In recent years, it is expected domestic manufacturers of photovoltaic cell production to take their place in the country’s solar energy market. By 2020, it also is expected new solar power plants to be implemented worth of 10 billion Turkish Liras worth.

Turkey is conducting extensive studies to increase the share of renewable energy sources in energy supply in sectors and reorganize the legal infrastructure. Energy generation facilities based on renewable energy sources have been provided for the incentives, on the basis of the new Law (No: 6094). The Renewable Energy Law, aims to encourage energy production from renewable energies with supporting mechanisms. The legislative framework arranges the prices for the sale of electricity to the state depending on the production method. According to the law, renewable energy plants will be subject to prices from 7.3 USD cents to 13.3 USD cents per kWh. A hydroelectric power plant will be able to sell electricity at a cost of 7.3 USD cents, the same as the amount for a wind farm. The geothermal energy suppliers can sell their electric energy at a higher price of 10.5 USD cents. Companies that use biomass (including landfill gas) and solar power are subsidized the most at a rate of 13.3 USD cents per kilowatt-hour. The law also ensures additional support for companies with performs that use locally produced equipment and components (from 0.4 USD cents to 3.5 USD cents) (Canka Kilic, 2016).

Turkey does not have a divided legislation that administers electricity generation from solar energy. In legislative terms, the utilization of solar energy in electricity generation and incentives to encourage investment in solar power are broadly considered together with other renewable energy resources. The Electricity Market License Regulation and the Renewable Energy Law with its consecutive amendments set the legal framework for electricity generation from renewables comprising of solar energy (Topkaya, 2012).

Another important steps that taken in the fields of solar energy in Turkey are the new studies for using sunlight intensive, inefficient and barren areas to generate energy to contribute to the national economy. By the decision of the Council of Ministers in July 16, 2012, Karapinar was declared as an Industrial Zone Qualified in Energy, which will be given further incentives in addition to the current incentive system, will be available to solar energy investors. the surface area of the region is 59,586.876 square meters and the installed capacity of region's potential for solar power plants is projected is 3000-4000 MW. Also, the similar studies for Ayranç and Karaman as Energy Zones (with in almost the same physical characteristics) have been carried out (Republic of Turkey, Ministry of Energy and Natural Resources, 2014).
Figure 1. Global horizontal irradiation of Turkey

Figure 2. Turkey’s Solar Energy Potential Atlas (SEPA) (GEPA, 2016)

Figure 3. Monthly variation of average daily total solar radiation
Figure 4. Monthly variation of average daily insolation duration

Table 1. Monthly average solar energy potential of Turkey

<table>
<thead>
<tr>
<th>Months</th>
<th>Monthly Total Solar Radiation (kcal/cm²-month)</th>
<th>(kWh/m²-month)</th>
<th>Sunshine Duration (hour/month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>4.45</td>
<td>51.75</td>
<td>103.0</td>
</tr>
<tr>
<td>February</td>
<td>5.44</td>
<td>63.27</td>
<td>115.0</td>
</tr>
<tr>
<td>March</td>
<td>8.31</td>
<td>96.65</td>
<td>165.0</td>
</tr>
<tr>
<td>April</td>
<td>10.51</td>
<td>122.23</td>
<td>197.0</td>
</tr>
<tr>
<td>May</td>
<td>13.23</td>
<td>153.86</td>
<td>273.0</td>
</tr>
<tr>
<td>June</td>
<td>14.51</td>
<td>168.75</td>
<td>325.0</td>
</tr>
<tr>
<td>July</td>
<td>15.08</td>
<td>175.38</td>
<td>365.0</td>
</tr>
<tr>
<td>August</td>
<td>13.62</td>
<td>158.40</td>
<td>343.0</td>
</tr>
<tr>
<td>September</td>
<td>10.60</td>
<td>123.28</td>
<td>280.0</td>
</tr>
<tr>
<td>October</td>
<td>7.73</td>
<td>89.90</td>
<td>214.0</td>
</tr>
<tr>
<td>November</td>
<td>5.23</td>
<td>60.82</td>
<td>157.0</td>
</tr>
<tr>
<td>December</td>
<td>4.03</td>
<td>46.87</td>
<td>103.0</td>
</tr>
<tr>
<td>Total</td>
<td>112.74</td>
<td>1311.00</td>
<td>2640</td>
</tr>
<tr>
<td>Average</td>
<td>308 kcal/cm²-day</td>
<td>3.6 kWh/m²-day</td>
<td>7.2 hour/day</td>
</tr>
</tbody>
</table>
Table 2. The distribution of Turkey's solar energy potential by region (UCTEA, 2014) [11].

<table>
<thead>
<tr>
<th>Region</th>
<th>Total Solar Energy (kWh/m²-Year)</th>
<th>Sunshine Duration (hour/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southeastern Anatolia</td>
<td>1460</td>
<td>2993</td>
</tr>
<tr>
<td>Mediterranean</td>
<td>1390</td>
<td>2956</td>
</tr>
<tr>
<td>East Anatolia</td>
<td>1365</td>
<td>2664</td>
</tr>
<tr>
<td>Central Anatolia</td>
<td>1314</td>
<td>2628</td>
</tr>
<tr>
<td>Aegean</td>
<td>1304</td>
<td>2738</td>
</tr>
<tr>
<td>Marmara</td>
<td>1168</td>
<td>2409</td>
</tr>
<tr>
<td>Blacksea</td>
<td>1120</td>
<td>1971</td>
</tr>
</tbody>
</table>

Table 3. The potential of renewable energy sources (As of 2013) (MENR, 2014)

<table>
<thead>
<tr>
<th></th>
<th>Installed Power (MW)</th>
<th>Electricity Generation (GWh)</th>
<th>Heat (Thousand TOE)</th>
<th>Target of the year 2023 (MW)</th>
<th>Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>22 289</td>
<td>59 420.5</td>
<td>-</td>
<td>36 000</td>
<td>36 000</td>
</tr>
<tr>
<td></td>
<td>2759.6</td>
<td>7557.5</td>
<td>795</td>
<td>20 000</td>
<td>48 000</td>
</tr>
<tr>
<td></td>
<td>8.5</td>
<td>-</td>
<td>3000</td>
<td>48 000</td>
<td>15 270</td>
</tr>
<tr>
<td></td>
<td>224</td>
<td>1171.2</td>
<td>1500</td>
<td>2000</td>
<td>2307.0</td>
</tr>
<tr>
<td></td>
<td>310.8</td>
<td>1363.5</td>
<td>600</td>
<td>2000</td>
<td>2000.0</td>
</tr>
</tbody>
</table>

Table 4. As of at the end of 2014, some sources’ share in the power distribution (MENR, 2015).

<table>
<thead>
<tr>
<th>Source Types</th>
<th>Installed Power Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas</td>
<td>30.9</td>
</tr>
<tr>
<td>Hydraulic</td>
<td>34</td>
</tr>
<tr>
<td>Coal</td>
<td>21</td>
</tr>
<tr>
<td>Wind</td>
<td>5.2</td>
</tr>
<tr>
<td>Geothermal</td>
<td>0.6</td>
</tr>
<tr>
<td>Solar</td>
<td>0.1</td>
</tr>
<tr>
<td>Other</td>
<td>8.2</td>
</tr>
</tbody>
</table>

CONCLUSIONS

Turkey is considered as one of the fastest growing markets in the world for almost two decades. Nevertheless, this growth speed is heavily dependent on imported energy, which is quite expensive for the country’s budget and the environment. Therefore, it is very important to generate energy by using renewable energy sources to cover Turkey’s energy needs. Turkey has a significant potential for renewable energy resources. While decreasing the share of natural gas below 30%, The Turkish Government mainly targets to increase the share of renewable energy sources in electricity generation to at least 30%. For this purpose, the Turkish government has planned to make the required arrangements in the related law to fully utilize economically feasible renewable potentials in electricity generation 3000 MW for solar power capacity is planning to be reached by 2023 (Basaran et al. 2015).

Solar energy is considered a key source for the future, not only for Turkey, also for all of the world. The development and usage of solar energy technologies are increasingly becoming vital for sustainable economic development. Although Turkey is rich in solar energy resources, the country has not deployed
enough solar power yet and significant investments are needed in generation, transmission and distribution facilities to balance the supply of the power systems and energy demand (Benli, 2013). The utilization of solar irradiation for energy generation is depending on the climate conditions and the existing technological levels and other inhibitory factors like social, geographical, economical, technical, regulatory, etc. Some important researches are needed for the realization of the new technologies for the country’s economic future. The regulatory framework is one of the most important factors, but the regulatory framework does not involve enough incentives for the support of the small units, covering own consumption, as well as for the heat generation from solar radiation (Basaran, 2015).

The major priorities in the solar and other types of energy policies of Turkey are:
- Ensuring the diversity of resources by giving priority to local resources. This will also help promoting local markets.
- Supporting local production: for equipment such as solar energy panels.
- Giving support to use of solar energy. It has been projected that 37% share for solar power by 2100.
- Increasing energy production and usage in renewable energy.
- Ensuring resource diversity in oil and natural gas to minimize risks regarding to imports.
- Considering the environmental concerns, realizing energy activities
- Increasing energy efficiency in every step of energy industry and usage areas.
- Introducing Turkey as an energy bridge to many neighboring countries.
- Making energy available to consumers in a low cost and efficiently.
- Supporting the environment and free market.

Turkey’s efforts in promoting renewable energy are commendable in terms of legal improvements. Nonetheless, achieving the targets requires a firmly commitment and practice of suitable policies.

**DISCLAIMER**

Although some date taken from governmental document, this paper is not necessarily representative of the views of the government.

**REFERENCES**


