



Solar and Wind Energy: An Alternative Solution for the Problem of Jobless Economic Growth in Turkey

Güneş ve Rüzgar Enerjisi: Türkiye'deki İstihdamsız Büyüme Sorunu İçin Alternatif Bir Çözüm Yolu

Hüsnü BİLİR¹

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Abstract

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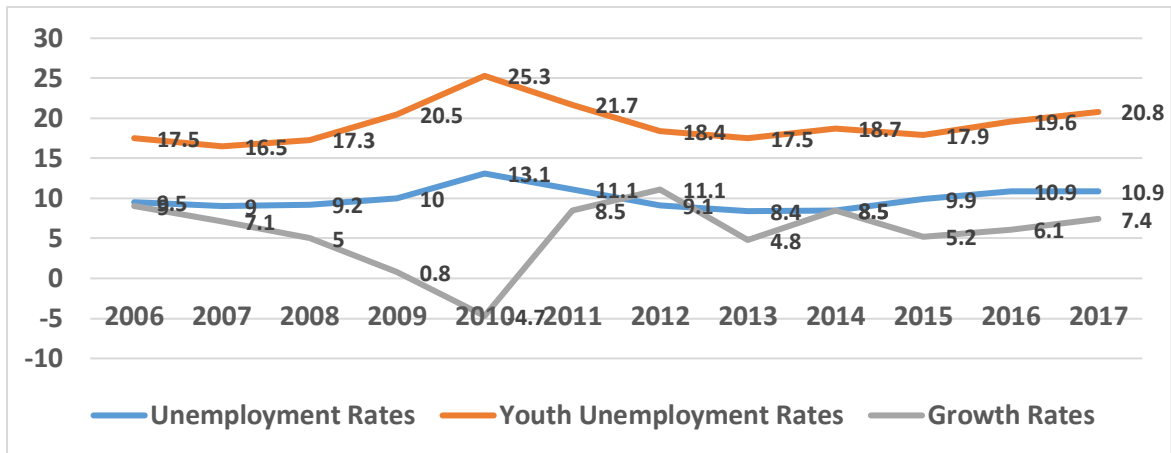
Turkish economy has seen unemployment rates almost above 10% (and 20% for youth) between 2006-2017, although it has grown 5,7% on average in this period. The main reason of this "jobless economic growth" is Turkey's energy import dependency (which was 77,5% in 2015). So Turkey has to reduce this energy dependency, and renewable energy sources could be an alternative solution at this point. Because Turkey has a huge potential for renewables, especially in solar and wind energy. The aim of this paper is to emphasize the importance of solar and wind energy in terms of employment opportunities for Turkey, given that the number of unemployed persons aged 15 years old and over is about 4 million 468 thousand persons in the period of January 2019 and that the total installed capacities are 3,4 GW and 6,5 GW in these sectors.

1. Introduction

Turkish economy has achieved a good performance with its steady growth since 2006. It's growth rate was 5,7% on average in the period of 2006-2017 and this growth rate has reached 7,4% in 2017. Within this particular field Turkish economy has come to the forefront among OECD countries. Although this spectacular growth performance, Turkish economy has failed to reduce the unemployment rates. For example, the unemployment rate is 9,9% on average for this period. Especially the youth unemployment rate is more apparent. It's been nearly for two times higher than overall unemployment rates (19,3% on average), or in other words, young people are nearly three times more likely to be unemployed in Turkey. Figure 1 shows this "jobless economic growth" for the period of 2006-2017.

¹ Dr. Öğr. Üyesi, Aksaray Üniversitesi

Figure 1: The Unemployment, Youth Unemployment and Growth Rates in Turkey, 2006-2017 (%)



Source: Turkish Statistical Institute (TSD) database.

As seen from Figure 1, Turkish economy has grown steadily but the unemployment rates didn't fall below 10% generally (and 20% for youth) and the number of unemployed persons aged 15 years old and over is about 4 million 468 thousand persons in the period of January 2019. Moreover unemployment rates in Turkey has been on an upward trajectory since 2012 and OECD projections suggest that Turkey's unemployment rate is likely to remain above 10% through to the end of 2018 (OECD, 2017).

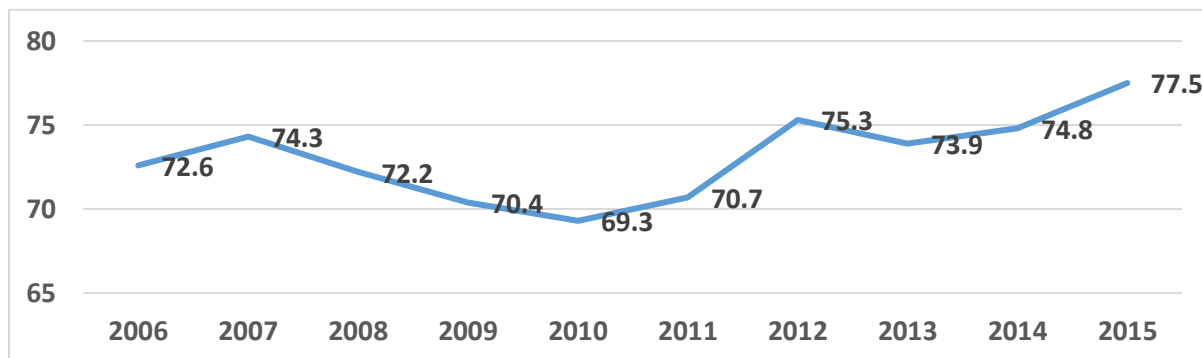
On the other hand this high growth rates have been major drivers of energy demand in the Turkish energy market. According to *Turkey Review 2016* by *International Energy Agency (IEA)* energy supply in Turkey has been on an upward trend for the last four decades to meet the rapidly increasing energy needs of the fast growing economy (IEA, 2016). For example, while Turkey's total primary energy supply (TPES) was 129,7 million tonnes of oil-equivalent (Mtoe) in 2015, representing an increase of 54% from 84,2 Mtoe in 2005, electricity demand almost doubled to reach 207 terawatt-hours (TWh) in 2015, while gas demand grew even faster, rising from 22 billion cubic metres (bcm) to 49 bcm for the 2005-2015 period² (IEA, 2016, pp. 9-22).

And this growing energy demand has been met by rising energy import as only 22.5% of energy supply is met by domestic production. Figure 2 reflects the dependency rate on energy imports

² For an ecological perspective for energy and environmental problems in Turkey see. Yayla, 2014.

in Turkey from 2006 to 2015. The dependency rate on energy imports in Turkey reached 77.5% by 2015.

Figure 2: Dependency on Energy Imports in Turkey, 2006-2015



Source: <https://www.statista.com/statistics/691224/dependency-on-energy-imports-in-turkey/>.

Natural gas was the main fuel in Turkey, accounting for 30,2% of total primary energy supply (TPES) and 38,6% of electricity generation in 2015. Natural gas supply was almost entirely provided by imports of 48,2 billion cubic metres (bcm), as domestic gas production is negligible (0,4 bcm). Since 2005, Turkey's natural gas net imports have grown by almost 80% and total imports in 2015 were 48,2 bcm, originating mostly from the Russia (55,1% of the total), Iran (16,2%), Azerbaijan (12,3%), Algeria (8,1%), Nigeria (2,9%) and others (IEA, 2016, pp. 103-104).

In 2015, oil was the second-largest energy source (30,1%) in Turkey, just behind natural gas (30,2%) and followed by coal (27,3%). Over the last decade, net crude oil imports have increased by 7,2%, while net imports of oil products have grown by 260%. Turkey has become a major export market for oil products from the Middle East, while crude oil supplies from the Russia, Iran and Libya collapsed [2]. However, most of the hard coal consumed in Turkey has to be imported, as domestic coal is low quality and lignite fields are only partially developed [2]. So it could be said that Turkey depend on import with regard to primary energy supply. Table 1 shows that Turkey's oil, gas and coal dependency on imports.

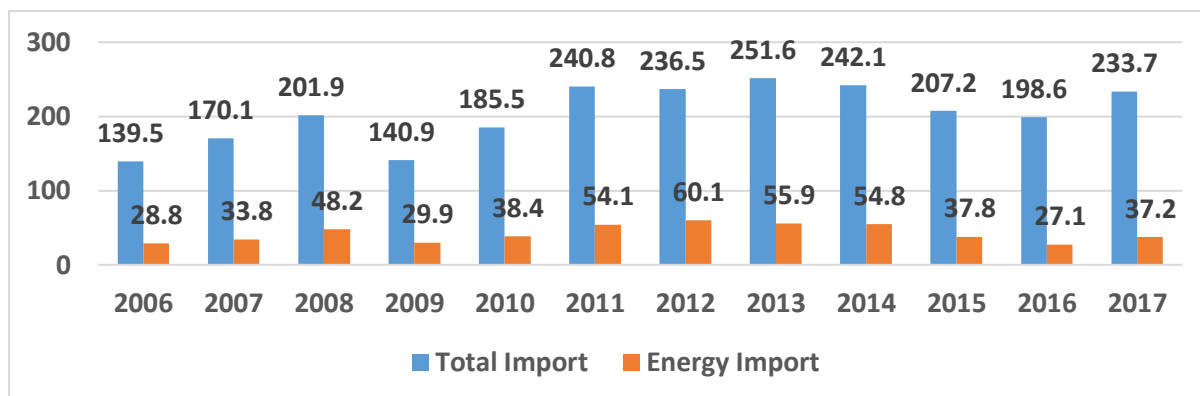
Table 1: Turkey's Oil, Gas and Coal Dependency on Imports, 2016

FUEL	Quantity	Import/Export Country
Crude Oil		
Imports	25.1 Mt	Iraq (36.9%)
Exports	0.6 Mt	Singapore (31.3%)
Oil Products		
Imports	24.9 Mt	Russia (23.5%)
Exports	5.8 Mt	Egypt (19.6%)
Natural Gas		
Imports	46.3 bcm	Russia (53%)
Exports	0.7 bcm	Greece (100%)
Coal		
Imports	36.2 Mt	Colombia (42.7%)
Exports	0.1 Mt	Not specified (100%)
ELECTRICITY		
Imports	7.1 TWh	Bulgaria (67.9%)
Exports	3.2 TWh	Greece (88.2%)

Source: IEA, 2016.

In this direction, energy import is the main chapter in Turkey's import. For example, Turkey's energy import is \$37,2 billion, while total import is \$233,7 billion, so the percentage of energy import in Turkey's total import is 15%. Figure 3 indicates that this ratio has always been above 13%.

Figure 3: Turkey's Total Import and Energy Import, 2006-2017



Source: TSI database.

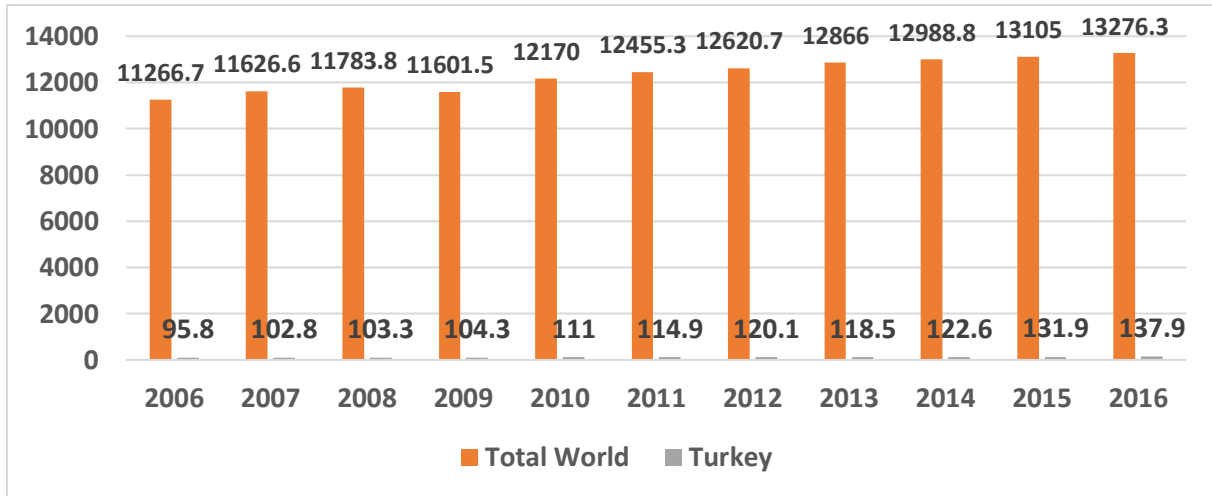
So one of the most crucial problems for Turkey is energy dependency and Turkey has to get rid of this energy dependency to create employment. Because the production structure depends on import and Turkey has difficulties to create new employment opportunities. Renewable energy sources may be a solution at this point. The term of renewable energy, in a broad sense, refers to biomass energy, hydro energy, solar energy, wind energy, geothermal energy, and ocean energy (Turkenburg, 2012, p. 773). Renewable energy is being used increasingly in power generation, heating and cooling nowadays, and transport. However renewable energy sources will be discussed only in the context of power generation and creating employment. Besides that renewable energy sources will be examined within the scope of solar PV and wind power as both Turkey has huge potential in terms of these sources, and they're rising investment and employment areas in Europe and in the emerging markets such as China, India and Brazil.

In this direction, firstly the general outlook of renewable energy in the world will be examined, and then recent developments in renewable energy sources in Turkey will be discussed. And lastly the employment opportunities of renewables for Turkey will be evaluated.

2. Renewable Energy Sources: Turkey's Outlook from a Global Perspective

Primary energy demand and consumption has grown for a long time in the world. According to *BP's Statistical Review of World Energy*, world primary energy consumption reached 13.276 million tons of oil equivalent (toe) in 2016 and it's average annual growth rate is 1,8%, while this rate was 1% in 2016. Similarly primary energy consumption has reached from 95,8 Mtoe to 137,9 Mtoe in this period (BP, 2017, p. 8)

Figure 4: World Primary Energy Consumption (Mtoe)

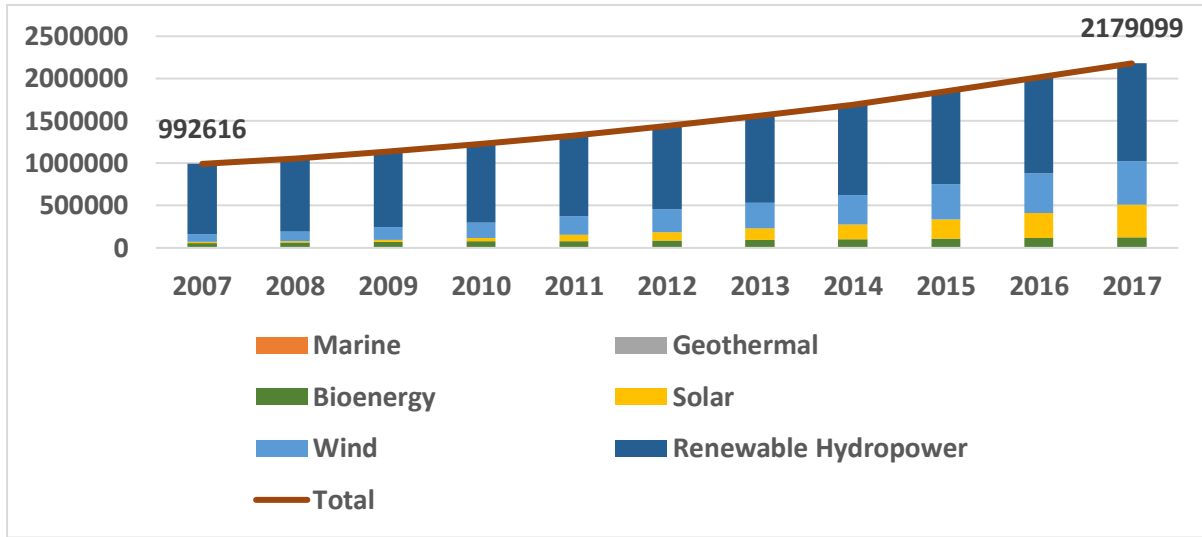


Source: BP, 2017, p. 8.

And this growing energy demand has rised the importance of renewable energy sources in the whole world. Because traditional baseload generators such as coal and nuclear power plants are beginning to lose their economic advantage and may no longer be the first to dispatch energy³ (REN21, 2017, p. 27). In this direction renewable energy installed capacity has grown since 2007 both in the world and in Turkey. According to the *International Renewable Energy Agency (IRENA)* database, total installed capacity was 2.179 GW in 2017, while 992 GW in 2007 in the world.

³ In this context, some studies suggest that 75-95% or even 100% contributions from renewables can be achieved by 2050 regionally (in the European Union (EU), for instance) as well as (Greenpeace and EREC, 2007, 2010; Krewitt vd., 2009; ECF, 2010; WWF, 2011).

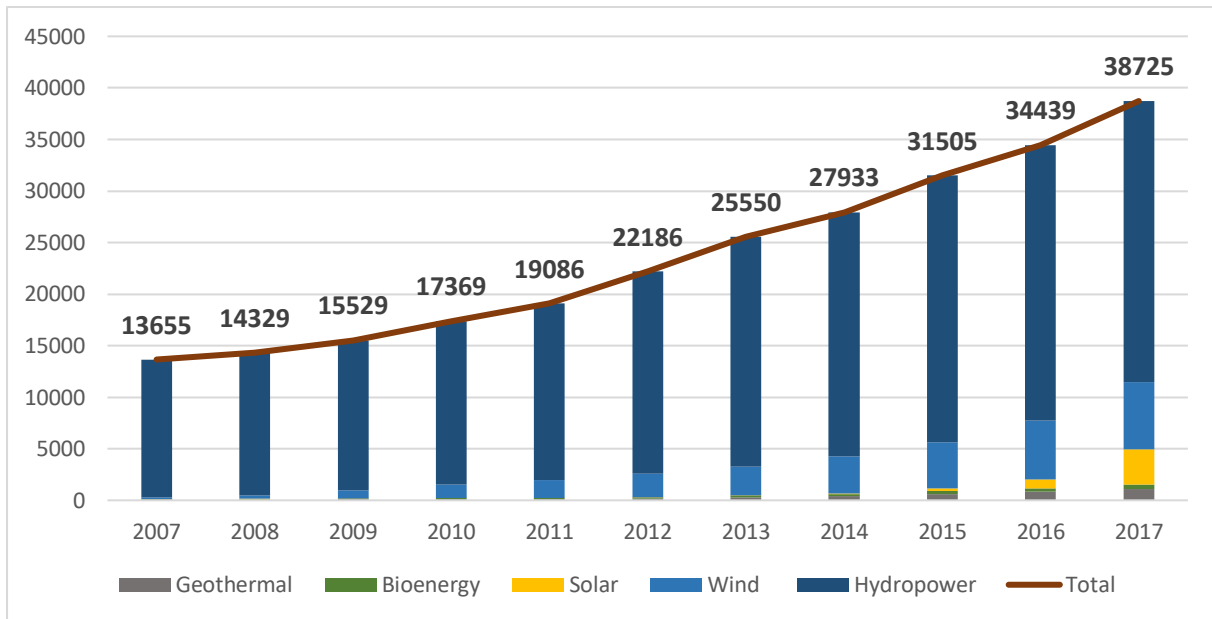
Figure 5: Trends in Renewable Energy in the World, 2007-2017 (Installed Capacity, MW)



Source: IRENA database.

Similarly total installed capacity in renewable energy reached to 38,7 GW (11,4 GW, excluding hydropower), while 13,6 GW (260 MW, excluding hydropower) in 2007 in Turkey. According to *IEA* renewable sources constituted 48,9% of all domestic energy production, with biomass providing 10,1%, hydro 17,9%, geothermal 14,8%, solar 3% and wind 3,1%. And energy from renewable sources represented 12,1% of TPES, and came from biofuels and waste (2,5%), hydro (4,4%), geothermal (3,7%), solar (0,7%) and wind (0,8%) (*IEA*, 2016, p. 23).

Figure 6: Total Renewable Energy Installed Capacity in Turkey, 2007-2017 (MW)

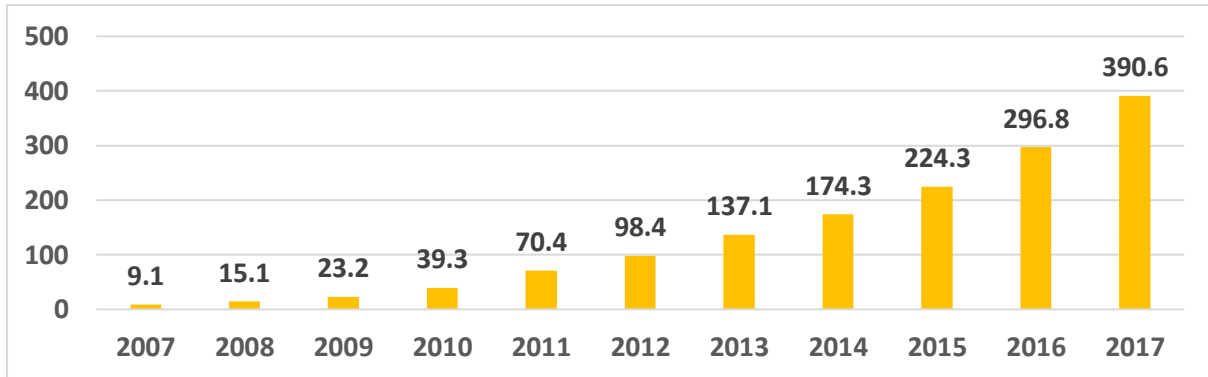


Source: IRENA database.

On the other hand, solar and wind energy have upward trend and total installed capacity for solar and wind power has grown %800 over the last decade, reaching to 904,5 GW as seen from Figure 5. Correspondingly solar PV was the world's leading source of additional power generating capacity in 2017, raising nearly %30 to 390,6 GW. In solar PV the top five markets are China (130,6 GW), Japan (48,6 GW), United States (42,8 GW) and Germany (42,3 GW) and these countries accounted for about 77% of total installed capacity. The other top countries are Italy (19,6 GW), India (19,2 GW), United Kingdom (12,7 GW), France (8,1 GW), Spain (7,2 GW) and Australia (6,4 GW)⁴. On the other hand, according to *IEA* at least 17 countries had enough solar PV capacity in 2017 to meet 2% or more of their electricity demand, and several countries met far higher shares during 2016, including Honduras (9,8%), Italy (7,3%), Greece (7,2%) and Germany (6,4%) (*IEA*, 2017, p. 23).

⁴ Also considering solar thermal technology which is used extensively in all regions of the world to provide hot water, to heat and cool space, to dry products and to provide heat, steam or refrigeration for industrial processes or commercial cooking, the top five countries for cumulative capacity were China, the United States, Turkey, Germany and Brazil in 2015 (*REN21*, 2017, p. 75).

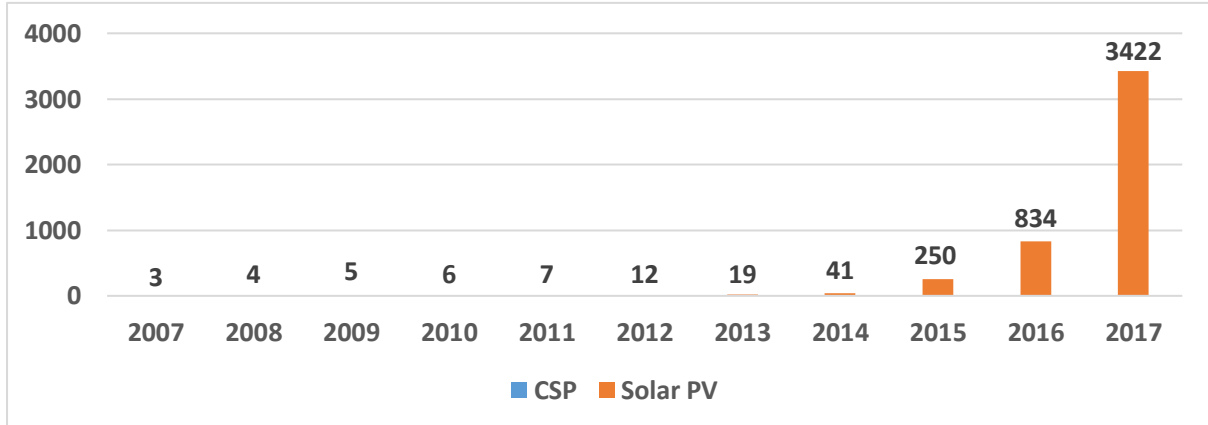
Figure 7: Solar Energy Global Cumulative Capacity, 2007-2017 (GW)



Source: IRENA database.

Turkey's total solar power installed capacity has grown since 2013. According to *IRENA* database, total installed capacity for solar power was 3,4 GW in 2017, while it was 3 MW in 2007. In this regard, Turkey's ranked as the thirteenth for cumulative capacity in the world.

Figure 8: Total Solar Power Installed Capacity in Turkey, 2007-2017 (MW)



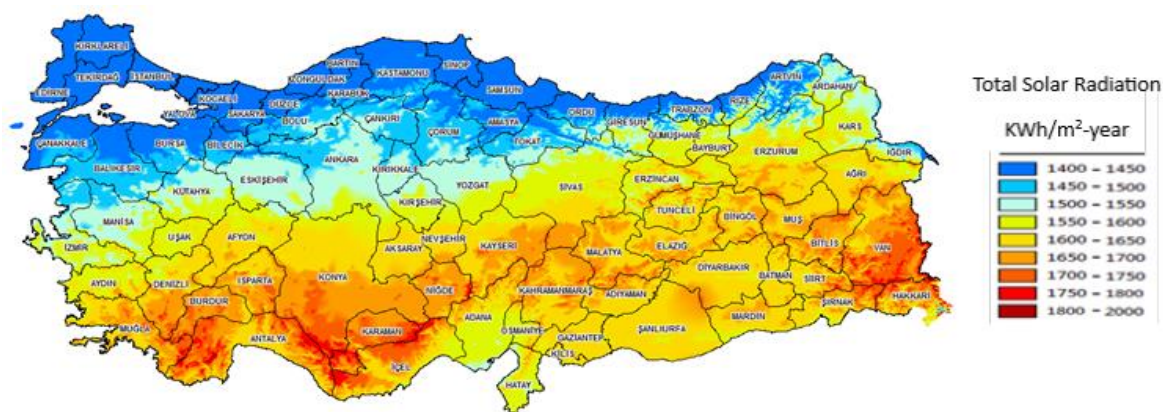
Source: IRENA database.

So Turkey has seen a significant increase in solar energy cumulative capacity over the last decade, but this increase isn't sufficient. Because Turkey has a great potential for renewable energy resources, notably in solar and wind power⁵. For example, Turkey is in the forefront with regard to solar energy potential among the OECD and EU countries. The average sunshine

⁵ For studies estimating Turkey's renewable energy potentials see Çapık, Yılmaz and Çavuşoğlu, 2012; Toklu 2013, 2017; Melikoglu, 2016, 2017.

duration and the solar radiation in Turkey are 7.2 h/day and 309.6 cal/m² day, respectively. The South-East Anatolia and Mediterranean regions are particularly rich in solar energy sources. In this context, the president of the *International Solar Energy Society Turkey Section (ISES)* Kemal Gani Bayraktar stated that Turkey's solar potential for electricity production is estimated as at least 500 GW (Bayraktar, 2016, p. 50).

Figure 9: Solar Energy Potential Atlas of Turkey

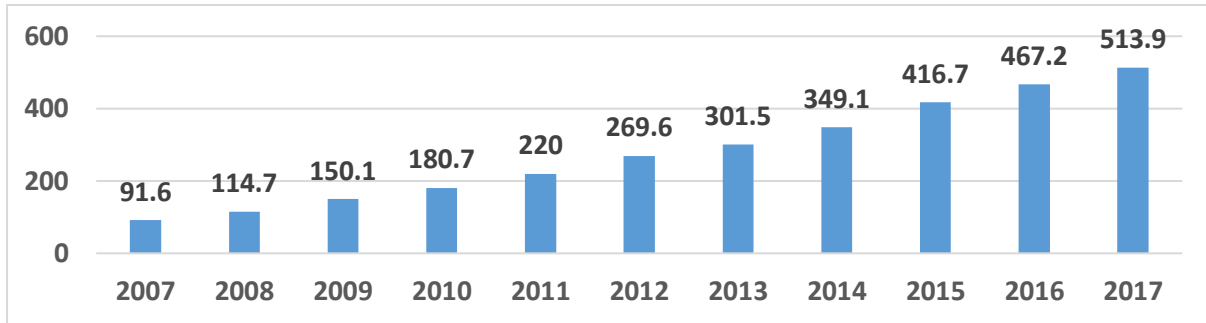


Source: The General Directorate of Renewable Energy (GDRE), <http://www.yegm.gov.tr/MyCalculator/Default.aspx>.

Accessed: 03.04.2018.

As to wind power, almost 47 GW of wind power capacity was added in 2017 which increased the global cumulative capacity nearly %10 to 514 GW. Hence, according to IEA, over 90 countries had seen commercial wind power activity, and 29 countries had more than 1 GW in operation in 2016, so wind has become the least-cost option for new power generating capacity in an increasing number of markets. The leading five countries in wind power are China (164 GW), the United States (87,5 GW), Germany (55,8 GW), India (32,8 GW) and Spain (22,9 GW). The top other countries were United Kingdom (20,4 GW), France (13,1 GW), Canada (12,3 GW), Brazil (12,2 GW) and Italy (9,6 GW) as wind energy cumulative capacity. And onshore wind was the most cost-effective option for new grid-based power during 2016 in many markets, including Brazil, Canada, Chile, Mexico, Morocco, South Africa, Turkey, and parts of Australia, China, Europe and the United States (REN21, 2017, pp. 82-85).

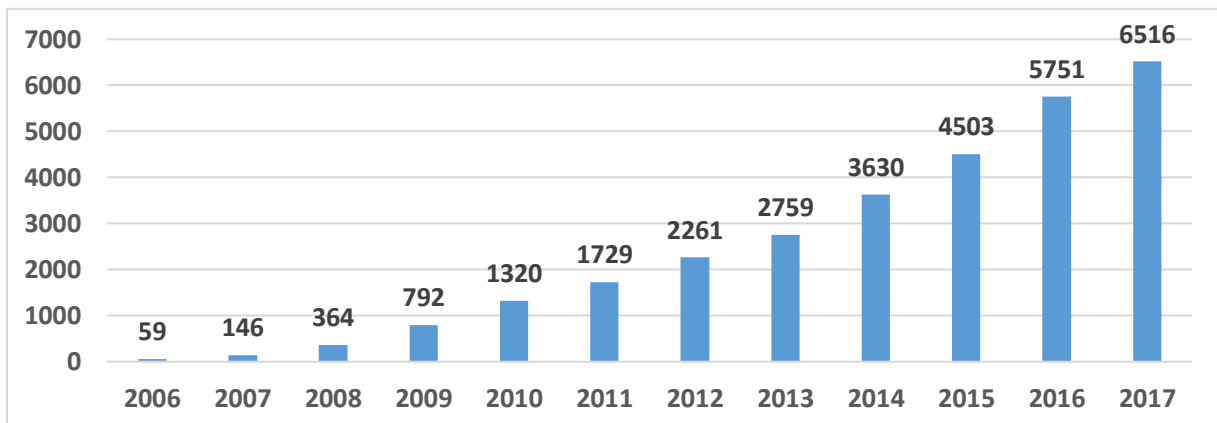
Figure 10: Wind Energy Global Cumulative Capacity, 2007-2017 (GW)



Source: IRENA database.

Turkey has started to utilize its wind potential recently just as solar power, despite its great potential. According to IRENA database, Turkey's wind power total installed capacity has grown from 59 MW to 6,5 GW between the period from 2006-2017. In this context, Turkey's ranked as the twelfth for cumulative capacity in the world.

Figure 11: Total Wind Power Installed Capacity in Turkey, 2006-2017 (MW)



Source: IRENA database.

Furthermore Turkey has huge potential for wind power. Turkey has the first place among the EU countries regarding wind energy potential and also has a great technical wind energy potential of 88 GW (Ugurlu and Gokcol, 2017, p. 150). According to *Ministry of Energy and Natural Resources (MENR)* wind plants with a capacity of 5 MW can be established in Turkey at heights of 50 meters above ground level, and in areas with a wind speed exceeding 7.5 m/s. In the *Potential Wind Energy Map (PWEM)* which has been prepared in the light of this acceptance, Turkey's wind energy potential is estimated as 48 GW⁶. And the large part of this

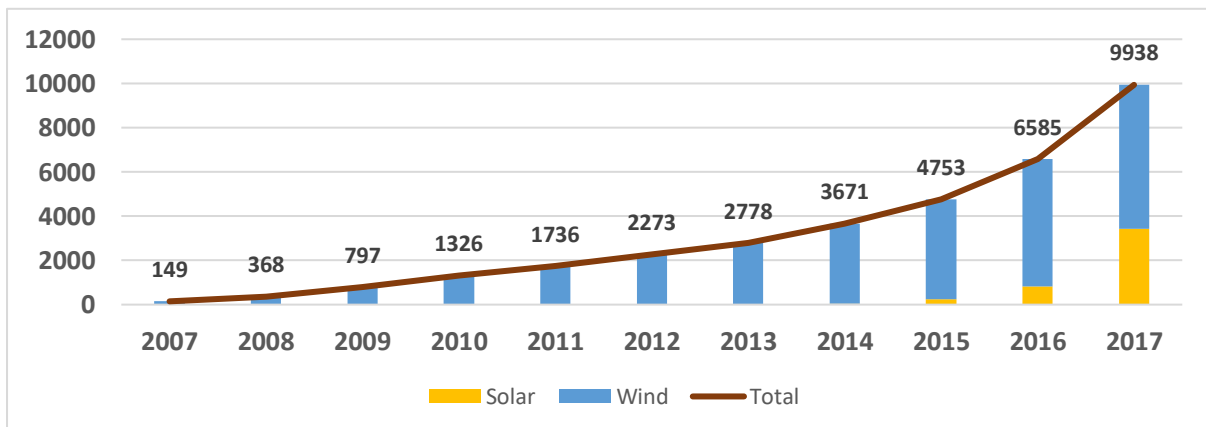
⁶ Further, the offshore wind potential is estimated as nearly 17,4 GW for Turkey according to GDRE.

potential is concentrated in Aegean, Mediterranean and Marmara regions, and Central Anatolia and Central Black Sea regions partly.

Having all these in mind, it could be said that Turkey has experienced strong growth in its total installed solar and wind power capacity, adding almost 9,8 GW between 2007-2017. Clearly, as Ugurlu and Gokcol (2017, p. 157) stated, the renewable energy law in 2005 that includes some legal regulations, developments and important incentives to take private sector's attention to this sector has an important role in this increase in the renewable energy utilization in Turkey over the last decade. In this respect, Turkey has seen increasing investment in renewable energy industry and especially 2015 was a fascinating year in terms of new investments. For example, Turkey's new investments in renewables was almost \$1.9 billion and Turkey was one of the four countries along with England, France and Netherlands passing \$1 billion threshold (Karagol and Kavaz, 2017, p. 19).

Also in 2016, Turkey included a premium of up to 50% higher tariffs under the country's wind power FIT if all turbine components are made in the country, and adopted a 50% tariff on solar panel imports. For the first time, a local content requirement also was applied to tender specifications for the Karapinar solar PV project, for which it is anticipated that 75% of module components will be manufactured locally in Turkey (REN21, 2017, pp. 124-125). And consequently as seen from Figure 12, there has been an upward trend in Turkey's solar and wind power cumulative capacity over the last decade.

Figure 12: Total Solar and Wind Power Cumulative Capacity, 2007-2017 (MW)



Source: IRENA database.

Although these remarkable developments, Turkey is far away from its renewable energy potential. For example, the share of total installed capacity in the total potential is 4% and 7,6% for solar and wind, respectively. Therefore new investments and incentives are important for reaching this potential. In this direction, Turkey implemented new energy targets to utilize its renewable energy potential efficiently under the Vision 2023, the year that marks the 100th anniversary of the Republic of Turkey. The energy goals to 2023 include the promotion of indigenous energy resources, such as coal (lignite) and a 30% share of renewable energy in the electricity mix.

Table 2: Targets for Renewable Power Installed Capacity by 2023

Energy Sources	Targets
Bio-Power from Solid Biomass	1 GW
Geothermal Power	1 GW
Hydropower	34 GW
Solar PV	5 GW
Wind Power	20 GW

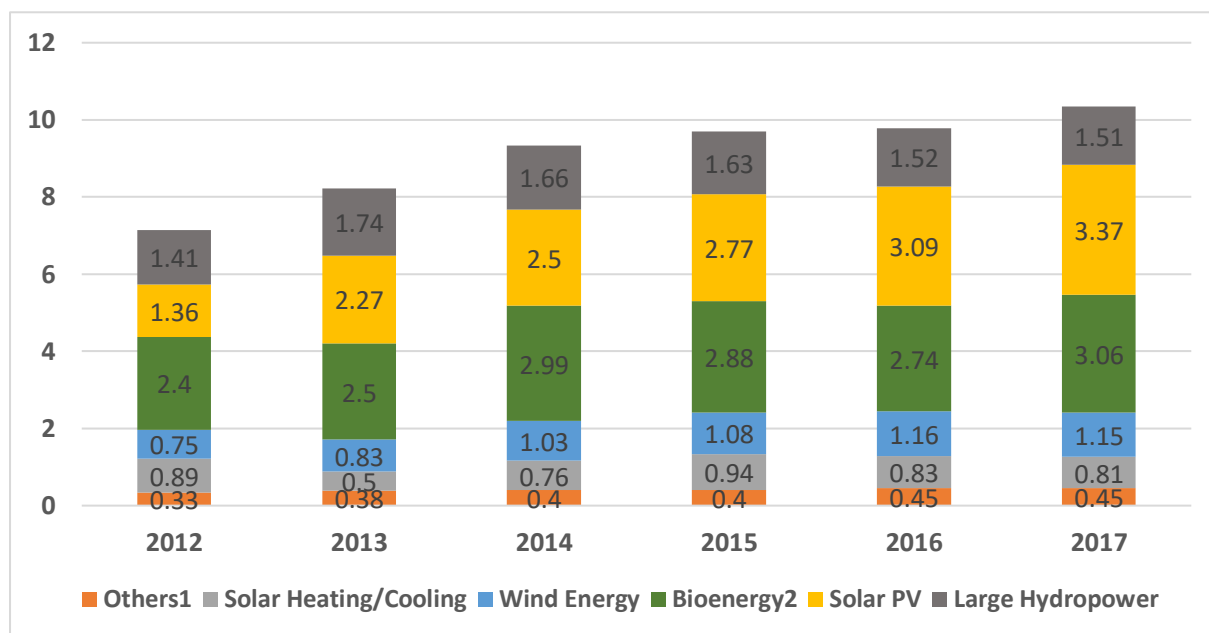
According to this strategic plan, main targets for renewable energy sources are to reach a total capacity of 61 GW by 2023 and increase installed power generation capacity to 5 GW of solar and 20 GW of wind. And given the targets presented above, the gross electricity generation in 2023 would be 91.800 GWh for hydropower; 50.000 GWh for onshore wind energy; 5.100 GWh for geothermal energy; 8.000 GWh for solar energy; and 4.533 GWh for biomass. All in all, the total gross electricity generation would be 159.433 GWh. This quantity represents 37% of the total forecast consumption in 2023; the commitment of the Government is 30%, 127.324 GWh⁷ (YEGM, 2014, p. 67).

⁷ On the other hand, the cost of achieving all the targets in 2023 is estimated to require investment in the renewable energy generation around 80 billion TL (6 billion TL/year), which is about 21 billion USD (1,5 billion USD/year) (Ugurlu and Gokcol, 2017, p. 151).

3. Employment Opportunities in Renewable Energy and Implications for Turkey

In parallel with growth in renewable energy markets, renewable energy employment expanded during 2017. According to IRENA, global renewable energy employment reached 10,3 million jobs –directly and indirectly- in 2017, adding 500.000 new jobs last year (IRENA, 2018, p. 3).

Figure 13: Global Renewable Energy Employment by Technology, 2012-2017 (Million Jobs)



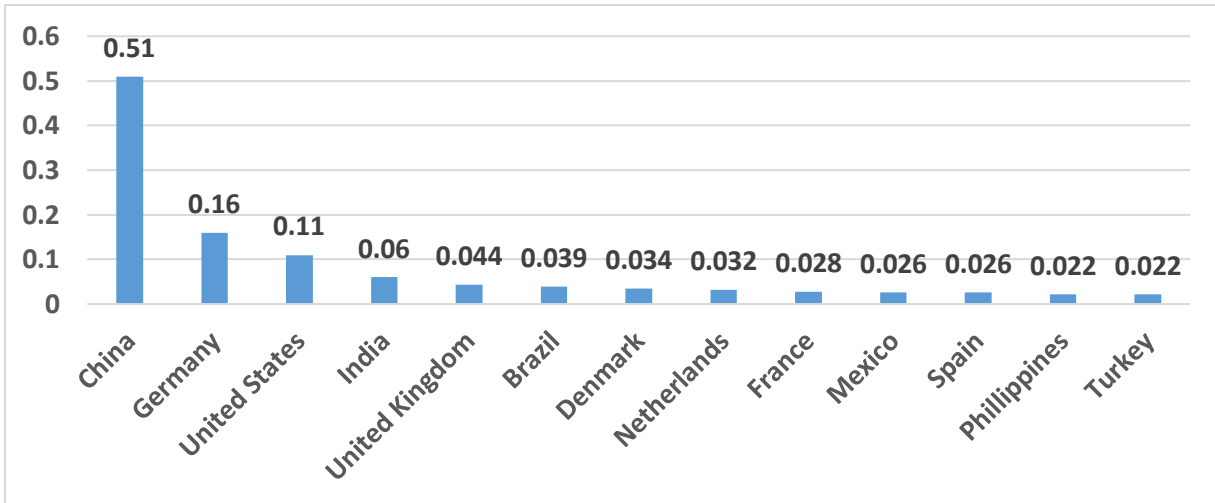
Source: IRENA, 2018, p. 5.

1 Other technologies include geothermal energy, hydropower (small), concentrated solar power (CSP), heat pumps (ground-based), municipal and industrial waste, and ocean energy.

2 Includes liquid biofuels, solid biomass and biogas

The leading countries in renewable energy employment are China, Brazil, the United States, India, Germany and Japan. China which is at the forefront of renewable energy in the world by far, alone accounts for 43% of all renewable energy jobs. Its share is particularly high in solar heating and cooling (83%) and in the solar photovoltaic (PV) sector (66%), and less so in wind power (44%) (IRENA, 2018, p. 3).

Figure 14: Renewable Energy Employment by Technology, 2017 (Thousands)

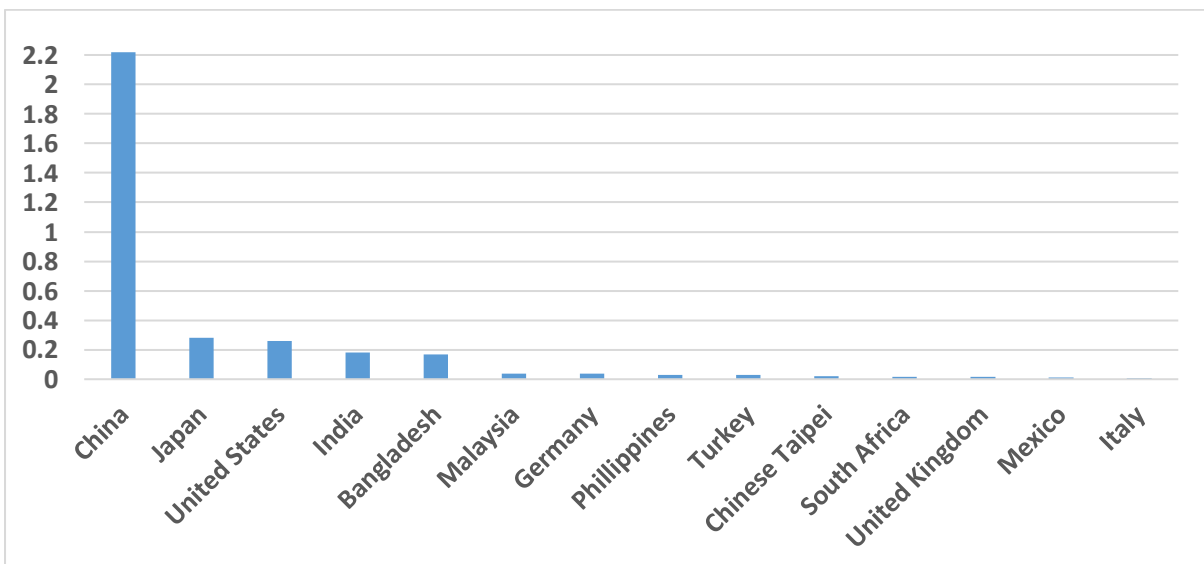


Source: IRENA, 2018, p. 6.

Note: Others includes jobs which are not technology specific.

The new installations in solar PV industry was 94 GW during 2017 and in this direction, the solar PV was the largest employer (almost 3,4 million jobs, up 9% from 2016). China, India, the United States and Japan were the most important markets, followed by Turkey, Germany, Australia and the Republic of Korea (IRENA, 2018, p. 7).

Figure 15: Leaders in Solar PV Employment, 2017

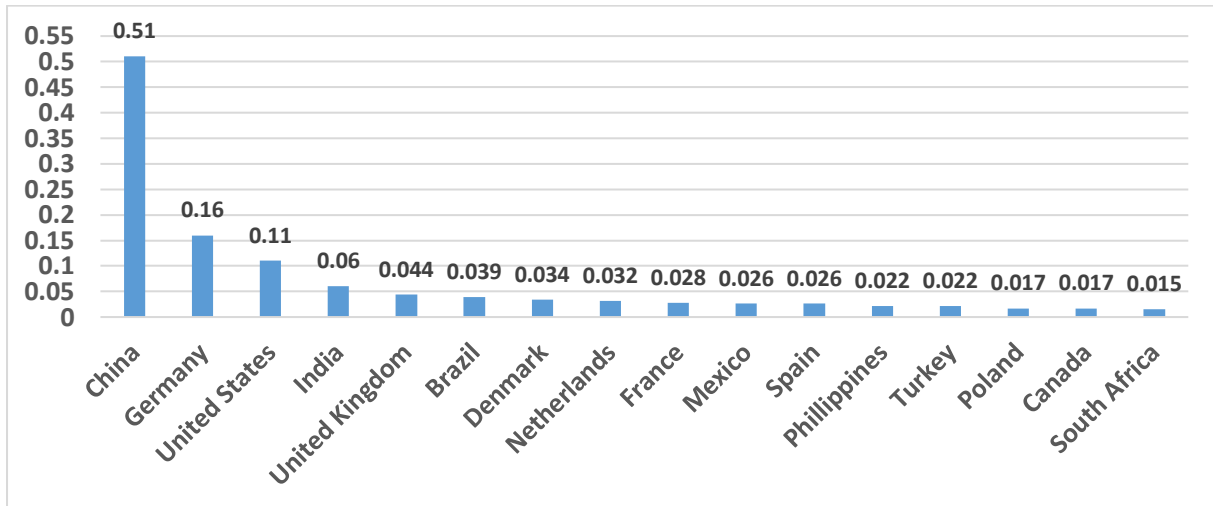


Source: IRENA, 2018, p. 7.

Note: The threshold for inclusion in the figure is 10 000 jobs.

Including its onshore and offshore segments, the wind industry employs 1,15 million people worldwide, a 0,6% decrease from 2016 and China alone accounts for 44% of global wind employment. The top five countries represent 76% of the total (IRENA, 2018, p. 10).

Figure 16: Leaders in Wind Employment, 2017

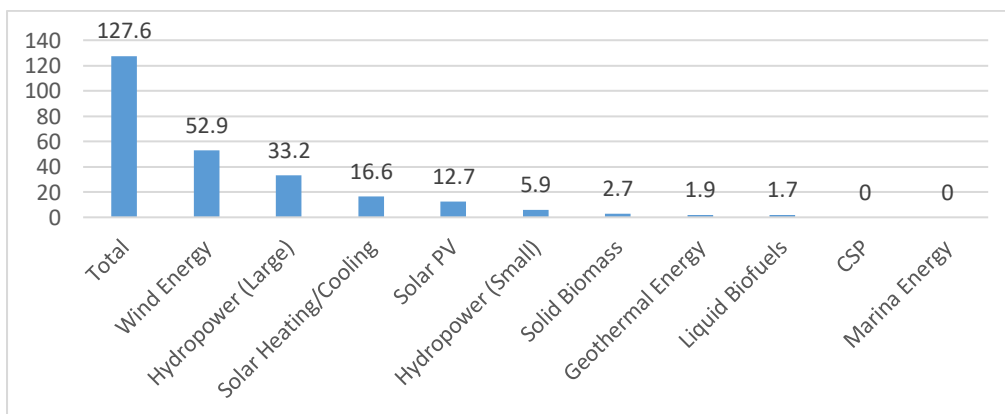


Source: IRENA, 2018, p. 10.

Note: The threshold for inclusion in the figure is 10 000 jobs.

As to employment created by renewable energy sources in Turkey, total renewable energy employment was 127.588 in 2016. According to IRENA database, wind power industry was the largest employer in 2016, creating 52.886 jobs. Some 30.000 people were employed in the solar PV and solar heating/cooling industry. Especially Turkey has an estimated 16.600 people working in this sector, behind China and Brazil (IRENA, 2018, p. 11). Figure 17 shows total renewable energy employment in Turkey.

Figure 17: Total Renewable Energy Employment in Turkey, 2016



Source: IRENA database.

So Turkey started to utilize its renewable energy employment recently and it has a great potential with regard to solution of unemployment issue. The employment potential of renewable energy sources is estimated generally as $\frac{Direct\ Employment}{Installed\ Capacity}$. In this regard, Meyer and Sommer (2014) indicated that PV employment factors in the literature ranged from 28 jobs/MW to 55 jobs/MW depending on the geographical area and wind employment factor ranged from 8 jobs/MW to 13 jobs/MW, while Greenpeace, GWEC and EREC estimated the employment factor (PV, solar heat and solar thermal) as nearly 40 jobs/MW for the solar industry and 27 jobs/MW for the wind industry (just onshore). On the other hand, Cetin and Egritas (2011) accepted the employment factor in the solar industry as 37-46 jobs/MW for Turkey. Greenpeace (2015) estimated employment factors for Turkey as nearly 33 jobs/MW for the wind industry (onshore plus offshore) and nearly 20 jobs/MW for the solar industry, 42 jobs/MW including solar thermal and solar heat sectors for which Turkey has great potential.

In the light of numbers above, the employment factors for Turkey is calculated as nearly 10 (53.000/5.751) and 35 (30.000/834) for the wind and solar industries, respectively. Accordingly, given energy targets for 20.000 MW for wind and 5.000 MW for solar energy under the Vision 2023, potential employment opportunities would be 184.000 and 180.000 in the wind and solar industry, respectively⁸.

Table 3: Projections about Renewable Employment Opportunities

Energy Sources	2016		2023	
	Total Installed Capacity	Jobs Created	Total Installed Capacity	Estimated Addition Jobs
Solar Energy	834 MW	29.300	5.000 MW	180.000
Wind Energy	5751 MW	52.900	20.000 MW	184.000

⁸ By the way, Mehmet Özer the CEO of Tunmatik declared that the solar industry has such a potential as to create employment for 300.000 by 2030 in Turkey (<https://enerjienstitusu.org/2018/03/05/gunes-enerjisi-sektoru-2030da-300-bin-kisiye-istihdam-olusturacak/>).



This potential becomes more meaningful given that the number of unemployed persons aged 15 years old and over is about 4 million 468 thousand persons in the period of January 2019 and that the unemployment rate target is 5% in Vision 2023. Further, as the leading regions are South-East Anatolia and Mediterranean regions for solar power and the Aegean, Mediterranean and Marmara regions, and Central Anatolia and Central Black Sea regions partly for wind power, renewable energy investments could reduce unemployment in different regions, creating new jobs and local employment, especially in rural areas.

4. Concluding Remarks

Turkish economy has achieved a good performance with its steady growth over the last decade, but the unemployment rates has remained stable around 10% for several years. And the main reason of this "jobless economic growth" is the import energy dependency which was 77.5% in 2015. In this regard renewable energy sources are so important for Turkey. Because Turkey has a strong potential with regard to renewable energy, specifically solar and wind. For example, solar potential for electricity production is estimated as at least 500 GW, while wind energy potential is estimated as 48 GW in Turkey. However only about 9 GW is used to generate electricity by 2017, equal to about 1,6% of this potential.

And by utilizing this great potential efficiently, Turkey could solve one of the urgent problems: unemployment. For example, total renewable energy employment was 127.588 and specifically almost 30.000 jobs in the solar industry and 52.886 jobs in the wind power industry in 2016. And given energy goals to 2023, Turkey could create 364.000 more jobs by 2023.

So Turkey has to develop strategies and policies to increase the renewable share in electricity generation. Firstly Turkey should pay attention to design the renewable energy industry in consideration of international laws and regulations. Emergent markets such as China, India and Brazil and the leading countries in Europe such Germany, France and Denmark may guide Turkey in this regard. Also the education of qualified workers should be improved, promoted the relationship between universities and renewable energy industry and induced private investments. *IEA* recommends, accordingly, that Turkey should remove regulatory barriers to renewables deployment so as to enable investors and other private parties to install renewable energy facilities without undue delay (*IEA*, 2016, p. 180).

The declining costs and prices especially in solar PV modules can facilitate this process. Because according to *REN21*, renewables have benefited from a cycle of falling costs spurred



on by accelerated deployment, and the competitiveness of renewable power generation technologies continues to improve around the world [5]. In this direction the solar and wind industry can be competitive with fossil-fired power generation in Turkey.

And IEA confirms that Turkey can increase the share of renewable energy sources. Turkey's renewable energy medium-term outlook is positive. It is the only country in OECD Europe where annual additions of renewables are stable, but growth is behind strong forecasts for many emerging economies (IEA, 2016, p. 177). Similarly the SHURA Energy Transition Centre's comprehensive report reveals that Turkey can double its estimated increase from 20 GW to 40 GW of wind and solar energy by 2026, without any additional cost to the Transmission System Operator's (TSO) investment projections. In other words, doubling Turkey's solar and wind capacity would have no major impact on system planning and operation (SHURA, 2018).

Therefore Turkey has to invest renewable energy sources especially solar and wind to reduce the levels of its import dependence and to provide employment for citizens. Also for the leading regions are South-East Anatolia and Mediterranean regions for solar power and the Aegean, Mediterranean and Marmara regions, and Central Anatolia and Central Black Sea regions partly for wind power, solar and wind energy could be an alternative solution for the issue of jobless economic growth in Turkey creating new jobs and local employment, especially in rural areas.

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