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Article

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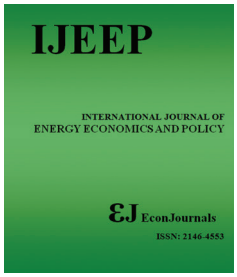

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The Renewable Energy Policy Convergence in the European Union: A Comparison on Germany and Turkey's Incentives for the Wind and Solar Energy Resources

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ABSTRACT

Empirically, this article deals with support mechanisms for renewable electricity in Germany and Turkey. By making a focus on the wind and solar energy resources, it analyses the evolution of renewable energy policies in Germany as a European member state and Turkey as a candidate country to understand increasing cross-national policy similarities in Europe. By identifying the incentive mechanisms behind international policy convergence, it is expected to shed a new light on renewable policy coordination options in the European Union.

Keywords: Renewable Energy, Incentives, Energy Resources
JEL Classifications: P18, Q21, Q48

1. INTRODUCTION

Undoubtedly, energy is an important element in the struggle of any country to alleviate poverty, promote economic growth, and foster social development. However, the most of the main energy sources of the world are in specific locations under great political turmoil and instability, and in limited quantities. Thus, providing a stable and secure supply of energy for sustainable development is a great challenge for the states. As another challenge, the world consumes more and more energy in parallel with increasing number of people on the Earth. According to United Nations projections, human population on the earth is likely to have approximately doubled before the end of the 21st century which means more energy demand and consumption. The nuclear power stations have been seen as crucial part of the energy production; however, the nuclear meltdown in Fukushima, Japan, in March 2011 has become a turning point about the future of clean and safe energy policies. In addition to these points, a critical question has arisen by increasing concern over the pollution, resource depletion and possible climate change implications of our continuing use of conventional fossil and nuclear fuels: How adequate supplies of energy can be cleanly and safely provided for the future generations? It can be argued that renewable energy sources (RESs) will be a very important part of the answer.

In consideration of these points, the European Union (EU) has long been worldwide leader in the promotion and development of renewable energy. It has made remarkable achievement and progress in hydropower, biomass conversion, geothermal, solar thermal technology, wind energy conversion and the increasing usage of photovoltaics (PVs). Europe steered the effort to combat climate change, encouraged the shift to a low-carbon economy and stimulated high-potential economic growth. Between 2004 and 2013, the largest 19 European countries more than doubled their renewable outputs. The lessons learnt from the EU's historic policy of promoting renewable energy through incentives has proved effective in delivering capacity and output (Haar, 2016) particularly in Germany.

In this context, this study argues that a clear understanding of associated expansion of RES in Germany as an EU member state and Turkey as a candidate country is highly beneficial to clarify policy options for the future of renewable energy policies across the EU and the world. Thus, this article makes an observation on

existing policies and support mechanisms for renewable energy in Germany and Turkey by a comparative perspective.

2. THE LITERATURE REVIEW ON THE IMPLICATIONS OF RES DEPLOYMENT IN THE EU

In the literature, several studies confirm the importance of RESs for the future of Europe. Some scholars reveal the costs and benefits of RES deployment in the EU by identifying different dimensions such as economic, environmental, technological and social effects (Resch et al., 2016). In 2014, Joint Research Center of the European Commission used a system-based approach to assessing potential effects of wind power on society (JRC, 2014). The employment impacts of renewable energy use in energy generation are also analyzed by the researches (Breitschopf et al., 2013; Lehr et al., 2012). With an overview of existing literature of RES policies, the effects occur at three different levels: System-related; distributional, and macro-economic (Resch et al., 2016. p. 13).

System-related impacts include all benefits, direct and indirect costs of RES deployment and capital expenditures of investments. The costs are related to integrating RES into the existing generation system. In addition, the input factors based on market prices of labor, capital and natural resources are also included into the costs. The benefits from RE-use arise can be observed as sectoral or overall effects.

By focusing on the selected economic agents on groups, distributional effects are revealed in measuring which agent pays for RES deployment and which one receives the resulting revenues from this deployment. Lastly, macro-economic effects encompass gross and net impacts in a certain economy's all industries and all sectors. In this category, all negative and positive direct, indirect and induced effects of RES policies are taken into account.

Moreover, International Renewable Energy Agency (IRENA) and Clean Energy Ministerial widened these three categories by a consideration of additional effects which are mainly caused by construction, manufacturing and installation of RES (IRENA and CEM, 2017). In the pursuit of sustainable development, energy access, energy security and low-carbon economic growth and prosperity, IRENA (2017) as an intergovernmental organization that supports developing countries in their transition to a sustainable energy future promotes the widespread adoption and sustainable use of all forms of renewable energy, including bioenergy, geothermal, hydropower, ocean, solar and wind energy. While IRENA has worked on highlighting key lessons learned from countries that have implemented auctions, the EU has long been worldwide leader in the promotion and development of renewable energy. Thus, the following section is devoted to indicating the EU's renewable energy policy as a first step for comparing the experiences of Germany and Turkey.

2.1. The EU Renewable Energy Policy

Since the beginning of the new millennium, the EU has maintained an effective deployment of renewable energy systems across the member states. The EU Renewable Energy Directives in 2001 and 2003 played a crucial role to harmonize national policies and to function structural changes in Europe's energy supply in the energy and transport sectors (Rahlwes, 2013. p. 30). These directives increased the overall RES shares in gross final energy consumption at the EU level. The rate was more than two thirds from 7.5% in 2000 to 12.5% in 2010.

The European Council, the European Commission, and the European Parliament accepted a new RES Directive in 2009 to establish binding RES targets for each member states in consideration of their gross domestic product/capita. National Renewable Energy Action Plans (Rahlwes, 2013. p. 36) and the biennial monitoring have been effective in promoting transparency for investors and other economic operators which caused the rapid deployment increase in the share of renewables from 12.5% in 2010 to 17% in 2015.

In 2010, as the strategy of competitive, sustainable and secure energy, the Europe 2020 strategy, put forward the "Resource efficient Europe" as one of the seven flagship initiatives which aim to build a framework for policies to support the shift towards a resource-efficient and low-carbon economy. It was suggested that this initiative would boost economic performance while reducing use of resources. Moreover, it would help to identify and create new opportunities for economic growth and greater innovation and boost the Union's competitiveness. It is also expected that resource efficient Europe would ensure security of supply of essential resources. Last but not least, this policy would help to fight against climate change and limit the environmental impacts of the use resources.

For climate change and energy sustainability, these headline targets have been set by the Commission which serve creating the conditions for smart, sustainable and inclusive growth:

i. A 20% reduction in Union greenhouse gas emissions when compared to 1990 levels;
ii. Raising the share of Union energy consumption produced from renewable resources to 20%;
iii. A 20% improvement in the EU's energy-efficiency compared to 1990 levels.

By collecting the national progress reports of EU countries every 2 years, the European Commission monitors the overview of renewable energy policy developments in the EU countries. (Annex to the Report from the Commission to the European Parliament, 2015). The report shows to what extent the EU's 2020 renewable energy goals have been achieved. In 2015, 25 of the 28 EU countries exceeded their national indicative trajectories for 2020. This means that Europe is well on the way to achieving its goal. In 2013, over 72% of all new installed new power capacity in the EU was renewable as the result of the major increases in wind power by 44%, in solar PV by 43%, biomass by 6%, and hydropower by 5%. The EU energy mix reached to as following: Natural gas had the major share with 22% of the total, followed by coal with 19%, hydropower with 16%, nuclear energy with 14%, wind power with 13%, and solar PV with 9% (Pedraza, 2015. p. vii).

The latest EU-wide report published in 2017 noted that in its final energy consumption the EU achieved a 16% share of renewable energy in 2014 and an estimated 16.4% share in 2015. Remarkably, the turnover of the renewables industry in 2014 was €144 billion, signaling the benefits of renewables also extend to economic growth and added value. As another important contribution to economy, there were more than one million jobs in renewables in 2014. As a part of its strategy, the EU has been committed to prioritizing research and innovation to further drive the energy transition. This policy pushed up innovation and the EU reached 30% of global patents in renewables.

When it comes to wind power generation, it tripled over the period 2005-2014 and it became the second largest contributor to renewable electricity. Preliminary 2014 data indicated that power production from wind reached 247 TWh compared to 234 TWh in 2013. Moreover, solar electricity generation accounted for 10% of all renewable electricity and became the third most important contributor to the electricity production from renewable sources in 2013. In addition, the electricity generated from PV energy surpassed solid biomass.

It is noteworthy that using more renewables resulted in a €16 billion saving in fossil fuel imports in 2015. The latest report also emphasized that renewables can help developing countries gain access to affordable and clean energy. Using renewables contributed to reducing greenhouse gas emissions by the equivalent of Italy's total emissions. Right enough, through fuel switching to renewables in all sectors improved air quality.

In 2011, the European Commission declared the EU Energy Roadmap 2050 as the Renewable energy development path ways beyond the year 2020. Later on, the Council of the EU defined a clear framework and vision for the future of renewable energy systems in 2014, specifically achieving at least 27% renewable energy systems have in gross final energy demand by 2030.

Furthermore, the European Commission proposed the energy and climate objectives to be met by 2030 on 22 January 2014. (Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, 2014). The pillars of the 2030 Framework are:

i. A reduction in greenhouse gas emissions by 40% relative to the 1990 level;
ii. An EU-wide binding target for renewable energy of at least 27%;
iii. Renewed ambitions for energy efficiency policies;
iv. A new governance system and a set of new indicators to ensure a competitive and secure energy system.

In related with the first pillar, the prediction of global warming led the European Commission defined mandatory levels for the percentage of wind, solar and other types of renewable power sources in the energy mix (European Consulting Network, 2017) to set the goal of cutting greenhouse gas emissions 40% from by 2030.

The EU adopted guidance (Communication from the Commission, 2014) for EU countries when designing and reforming renewable energy support schemes. This guidance suggests that financial support for renewables should aim to make renewables competitive in the market. The support schemes should be flexible and respond to falling production costs to respond to market developments. The support schemes should be well designed and stable to maintain investor confidence and guarantee future investment. The support schemes should help consumers to take advantage of the renewable energy potential in other countries via cooperation mechanisms countries which would boost investor confidence.

Beside these support mechanisms, on several occasions, both the European Council and the European Parliament have encouraged the Commission to review and develop legislation related to renewables to underpin the agreed 2030 target. After crucial reviews on the policies, EU energy system projections indicated that if no new policies or updated regulatory framework are put in place, it would prevent the Union to achieve targeted levels of renewable energy consumption in 2030. The continuation of existing policies would also seriously risk undermining the realization of collectively delivering on the commitments made in the 2015 Paris Agreement.

In consideration of these findings, the European Council published the Renewable Energy Directive in 2016 (European Commission, 2017) to highlight reaching the EU level target of at least 27% calls for a change in policies in the form of a Union level framework leading to EU, national and regional level measures. In the Proposal, a framework of measures on the Energy Union Governance is outlined, which includes, (i) planning, whereby member states formulate national plans on energy and climate; (ii) reporting and monitoring, where by member states report progress on implementing their national plans; and (iii) gap filling/corrective measure, whereby the commission in 2025 will undertake a more thorough review of the renewable energy progress.

The RES directive set the RESs targets triggered national support strategies. To support the market, the EU member states began to improve the corresponding administrative conditions related to grid connections and geographic distribution. In order to fulfill the national targets as set in the RES directives, EU member countries currently use feed-in tariffs (FITs), quota-based tradable green certificates (TGCs), investment subsidies and tax cuts as the effective support instruments. These instruments have been implemented on specific national levels. The most common incentive schemes within the European countries are (European Consulting Network, 2017):

- FITs are generation-based, price-driven incentives. The federal or regional government regulates the tariff rate by a fixed amount per produced MWh which is guaranteed from the date the RES plant is connected to the grid. In this case, the grid operator is obliged to buy the electricity produced by the renewable source either at a price determined by the RES national or regional system
- Quota obligations based on TGCs are production-based, quantity-driven incentives. The state defines the percentage (quota) of the total electricity production to be provided

by RES-E sources and obliges the conventional electricity producers to buy a predetermined number of green certificates per MWh produced. The green certificates given by the state are traded in a market regulated by the government or the energy authority and their price is set following demand and supply. The revenues from the sale of the produced electricity in the power market and the sale of the TGCs support the RES-E producers financially.

In order to reach the EU level target, strengthening investors' certainty is defined as one of the crucial objectives of the Proposal. In this spirit, the European Fund for Strategic Investments (EFSI) has been a major contributor to investments in the renewable energy sector. Almost half of the projects in energy sector have been related to renewable energy investments in the 2014-2020 periods due to EFSI have focused on low-carbon investments, including renewable energy.

2.2. The Development of Renewable Energy Policies in Germany

In the area of the transition to renewable energy, Germany has been a world leader and a global role model. In Germany, the wind and solar electricity plant installations date back to 1983 (Kalamova et al., 2011. p. 37-38). The 100 MW Wind Program began in 1989 to provide enormous capital grands for facilities larger than 1 MW. The program extended and led to remarkable growth of installations in Germany. The FIT law came into force in 1990 which covered 75% of investments costs by providing low-interest loans to companies for a period of 10 years (Deutsche Welle, 2016). Moreover, the KfW bank gave loans to freelancers and small companies. It was effective for all renewable energy technologies, in particular, for the wind energy. Further, the RESs Act and Renewable Energy Law in 2000 constituted a new FIT subsidy system for Germany. Under this framework, electricity transmission utilities bought power at flat rate per kilowatt-hour guaranteed over a 20-year contract from any wind or solar electricity generator. Renewable Energy Law launched a turning-point for German electricity sector by paving the way for the boom of renewable including wind, solar, hydropower, landfill gas, mine gas, sewage gas, biomass and geothermal (Poser et al., 2014. p. 13).

Renewable Energy Law has been reformed to response changing market conditions since 2004. For small investors, 'the 2005 KfW-Programme Producing Solar Power' provided low interest loans and a redemption-free initial phase of 2-3 years (Leimbach and Müller, 2008. p. 22). The more effective FIT policies have been adopted to improve national renewable power generation capacities. The objective of the modifications was to raise the share of renewables in total electricity supply to a 12.5% by 2010 and 20% by 2020 (PricewaterhouseCoopers, 2012. p. 9). In 2012, it reached to 17%, thus the target increased to 35% for 2020. Guaranteed FITs and decreased costs of setting up installation have urged a rapid growth of wind turbines since 2009. In addition to wind energy, Germany built solar applications PV around 7 GW a year. Thus, it became the market leader of solar PV in the world in 2011 and received 57% of the investments in 2012. (PricewaterhouseCoopers, 2012. p. 16). The solar operating capacity of Germany in 2012 became 32% (Figure 1).

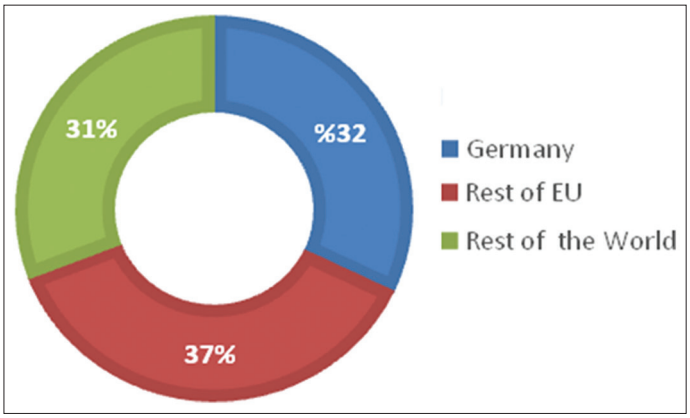
In addition to the solar capacity, the wind capacity of Germany was 40% in 2012 (Figure 2). Germany was the leader within the EU countries with 27.2 GW of installed wind power capacity in 2013 (PricewaterhouseCoopers, 2012. p. 22-23). It generated more than one-quarter of Europe's wind power in 2015 (IRENA, 2015. p. 92).

RESs Act in 2012 offered the market premium model as an additional option to companies (German Energy Agency, 2016. p. 41).

The new reform of the act encouraged direct marketing of the regenerative electricity. Wisely, Germany did not ignore the important measures for infrastructure development and made great investment in transmission grid after adopting an energy package in 2011. The National Grid Expansion Acceleration Act reformed responsibilities of authorities for line crossing country border. In order to simply and accelerate the procedures and process of national and cross-border lines, a Federal Requirement Plan for Transmission Network of 2011 ruled to construct thirty-six necessary and urgent power line projects.

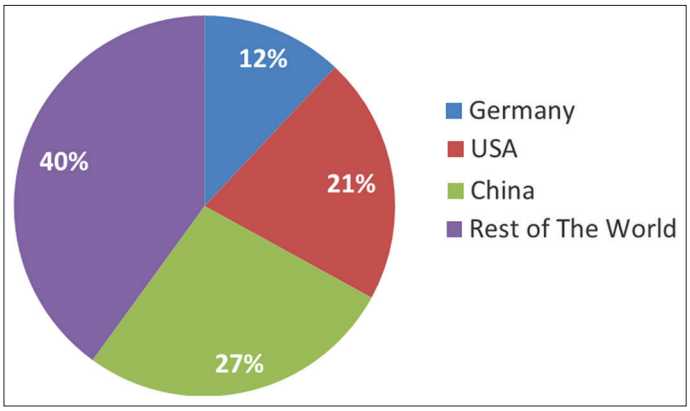
More significantly, the share of renewables in total electricity supply of 2016 has been already 29.5% as a direct result of the acts. The net power generation from solar and wind power plants have become more than hard coal and nuclear (Figure 3).

Figure 1: Solar operating capacity, Germany and Rest of World, 2012



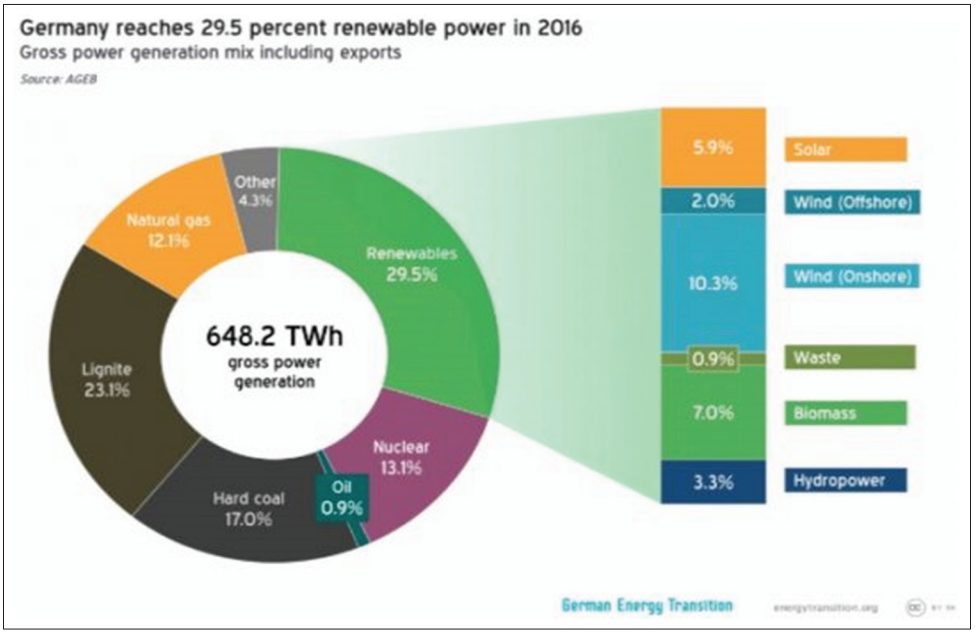
Source: Morris and Pehnt, 2015. p. 19

Figure 2: Wind operating capacity, Germany and Rest of World, 2012



Source: Morris and Pehnt, 2015. p. 19

Figure 3: Germany's gross power generation mix in 2016



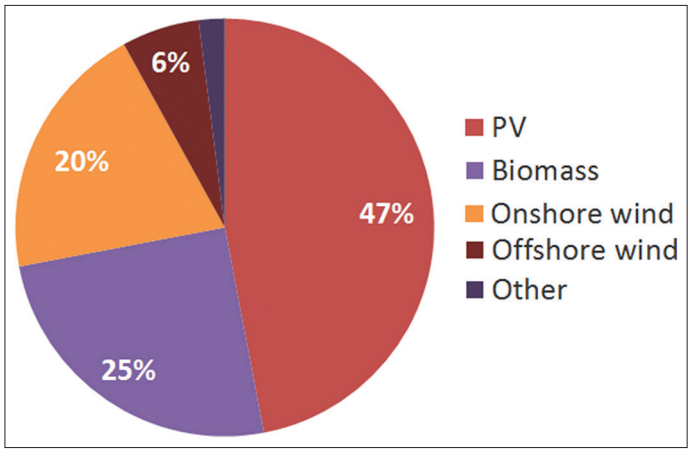
To sum up, the support mechanisms for solar power and wind power energy sources in the Germany are based on (Poser et al., 2014. p. 13):

- Investment protection through guaranteed FITs: Owners of new plants receive a fixed rate for 20 years, the FIT, for every kWh of renewable energy they generate, depending the plant's size and technology.
- Guaranteed interconnection to the grid for renewable energy resources: Every new renewable energy plant gets a preferential treatment over conventional sources by the network operator for feeding "green" electricity into the grid.
- Decreasing FITs/digressive rates: Every year, the FIT rate decreases for new plants by a fixed percentage (digression rate) which intend to give renewable owners an incentive to lower the costs.
- Socialized and financed by customers, not the government: The FIT is not paid with governmental funding, but instead is completely financed by markets and consumers. Renewable generation is sold into wholesale markets and receives the market price. The difference between the market price and the government set, predetermined FIT, is paid for by consumers as part of their electricity bills. This portion is called the EEG levy or renewable energy levy (or surcharge). The levy is not applied equally to all consumer types. Industrial consumers pay only a fraction or, in the case of energy intensive industries, are completely exempted.

In Germany, these developments replaced fossil-generated power to clean electricity in unexpected way (Figure 4).

In addition to clean energy and environment-friendly benefits, renewable energy industry created a new sector jobs which employ more than 45.000 full-time workers. The researches show that renewable energy technology is improving, parallel to that, the investments are increasing to push up this capacity. It is expected that Germany's 70% of the power system capacity will turn to be

Figure 4: The share of renewable technologies in Germany, 2014



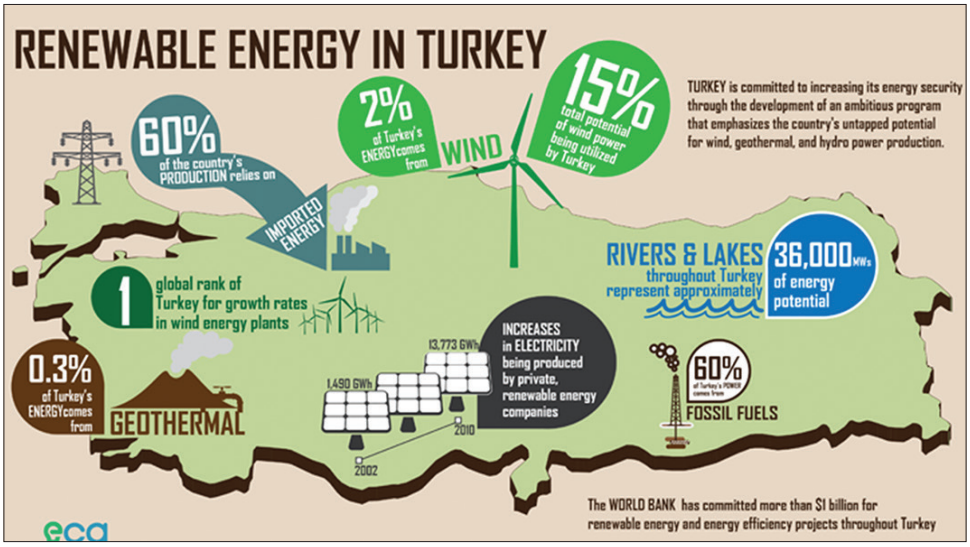
Source: Poser et al., 2014. p. 30

renewable with 62 GW wind power in 2030. Recently, Germany moves toward a more competitive free-market pricing system instead of a system of government-mandated prices which could be a paradigm shift in German energy policy.

3. THE IMPORTANCE OF RENEWABLE ENERGY POLICIES IN TURKEY

Since Turkey has been experiencing a remarkable economic growth, its energy demand and energy consumption have increased in the last decade. However, this demand has been covered by non-environment-friendly resources. Despite its rich renewable energy potential, Ankara is encountering problems related with heavily dependence on expensive imported energy sources which can also be considered as a security matter (Figure 5). Moreover, fossil fuels which cause economic, social and environmental problems have dominated Turkey's energy system:

Figure 5: Renewable energy in Turkey, 2013



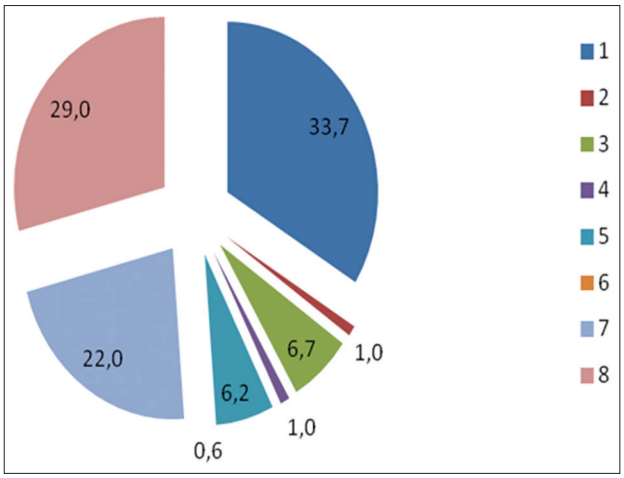
Source: The World Bank, 2013

The examination of the map indicating world solar power potential published by the United National Environment Programme shows that Turkey has higher potential of solar power in terms of capacity when compared to a number of countries (UNEP, 2012. p. 29). In another study, it is expressed that Turkey has a high solar power potential, i.e., 110 days in average annually, and if necessary investments are made Turkey may produce solar power of 1527 kWh per square meter unit annually (Kılıç, 2015. p. 32). The numbers show that Turkey has 48.000 MW wind power potential, but it just produces 7557 GWh electric energy from wind power. As to the economical meaning of this potential, wind power of 48,000 MW is equal to 61,935 barrels of oil (Özen et al., 2015. p. 90). In early April 2017, 1 barrel of oil was about USD55 (55,24 $ as of 07.04.2017), and the economic value of the wind power potential is equal to 3.4 billion US Dollar approximately. So, it may be said that effective use of wind power will save a resource of 3.4 billion US Dollar annually in Turkey. It is estimated that development of wind investments in the years 2017-2035 will provide total contribution of USD 12.9 billion net in the reduction of current deficit. With the continued investments in the wind power, creation of totally 276.6 million tons carbon emission will be eliminated in the period of 2017-2035. And, consequently, it is anticipated that annual carbon emission of Turkey will reduce by 3-4% approximately (Turkish Wind Power Association et al., 2016. p. 25). In a nutshell, Turkey can reduce foreign dependency in the power sector and thus make significant savings on foreign exchange by following proper power production and consumption policies in the matter of solar and wind power.

With a raising awareness of significance of RESs, Turkey has tried to shape its energy policy to cover increasing demand, use domestic sources and reduce import dependency. Securing energy supply and increasing energy effienciency have become the main targets. As an alternative to fossil fuels, government has invested on diversification of energy sources with RESs which minimalizes environmental degradation (Figure 6).

The target set to achieve 20,000 MW installed power of wind energy by 2023 in Turkey and to maximize use of solar power

Figure 6: Installed power distribution of Turkey, 2016



Source: TEİAŞ, Ministry of Energy and Natural Resources, 2016. p. 3

Hydropower	33.7	26.443 MW
Solar	1.0	745.7 MW
Wind	6.7	5.286 MW
Geothermal	1.0	775.1 MW
Other thermal	6.2	4836.9 MW
Biomass	0.6	464.8 MW
Coal	22.0	17332.3 MW
Natural Gas + LNG	29.0	22560.1 MW

potential for electric generation (Ministry of Energy and Natural Resources, 2017. p. 131). With annual production of solar collectors exceeding 1.6 million m2, producer more than 90, dealers above 800 and installer more than 3000 provide service to thermal power generation from the sun (Bayraktar, 2017. p. 52). In case Turkey fulfils the targets for renewable power investment set for 2023 in the Certificate of Energy Efficiency Strategy 2012-2023, direct and fulltime employment number is estimated to increase about 360,000. With addition of direct and stimulated employment to this number, the employment increase is anticipated to reach 735,000 (Karaca and Eşgünoğlu, 2016. p. 2669).

Moreover, Turkey has transferred power distribution to the private sector completely. Privatization of the power production assets is scheduled to complete by 2020. Privatization of power sector has brought a competition structure and rapid growth in the energy sector of the country. These RES policies of Turkey are supported by the EU. Turkey has shown its political commitment to achieve effective renewable energy policy by reforming its legal framework in the line with acquis communautaire as a candidate country for EU membership. In this context, following sections reveal how Turkey has been improving its renewable energy policy and the EU has played a role in these developments.

3.1. The Development of Renewable Energy Policies in Turkey

When the current stats analyzed, several landmarks have occurred in Turkey's renewable energy policy with more than 35 modifications in the legislation over the past 11 years in the renewable energy sector since 2005. The first legal amendment was Law on Use of the Renewable Energy Resources for Generation of Electric Energy which provided warranty of FIT for the renewable energy generation plants. In 2007, Energy Efficiency Law was put into force in order to provide financial support for the efficiency-enhancing projects. The next year, Law on modification of Electric Market Law aimed to increase the incentives given to the renewable energy resources by the tools such as grant of stamp duty exempt, fee exempt, special consumption tax exempt. In the recent years, Turkey has moved forward to enhance competitive power of the country in the international arena, therefore, the new regulations urge development of innovation-oriented energy equipment and methods. The basic legislation concerning renewable energy resource in Turkey is summarized in Tables 1-4.

3.2. Turkey - EU Financial Cooperation Concerning Renewable Energy Resources

EU provides financial aids to the candidate countries to become a member of EU. Such aids are used in line with the projects and programmes prepared according to the requirements of the countries. Thus, financial resource is created for political, economic, legal and administrative reforms required to enhance adaptation of the candidate countries to EU standards. In the scope of Instrument for Pre-Accession Assistance - IPA, a financial aid of 4.79 billion Euro for the period 2007-2013 (Table 5) and 4.45 million Euro for the period of 2014-2020 (Table 6) has been reserved for Turkey. As to evaluation of use of the financial aids in Turkey in this respect, operations are performed for environment protection, fight against climate change, increased adaptation to EU programme for alignment with the acquis, development of

Table 1: Incentive legislations on generation of power from renewable energy in Turkey (2005-2009)

Years	Legislation	Primary objective of the legislation	Result created by the legislation
2005	Law on Use of the Renewable Energy Resources for Generation of Electric Energy (Law No. 5346, Official Journal: Date: 18.05.2007, No: 25819)	Giving support to the renewable energy generation plants for land use Providing warranty of FIT for the renewable energy generation plants	Discount made on the lease, easement and usage license of the forest or treasury lands. Discount rate: (50% for 2005-2011); (85% for 2007-2011); (85% for 2008-2012) Period of support is maximum 7 years for the investments made in 2005 and maximum 10 years for those made in 2007 and 2008
2007	Energy Efficiency Law (Law No. 5627, Official Journal: Date: 02.05.2007, No: 26510)	Raising and improving awareness of energy efficiency; alleviating burden of the energy costs on the economy and achieving potential of energy savings with a value of 4 Billion Turkish Lira to the benefit of national economy	Ministry of energy and natural resources has provided financial support for the efficiency-enhancing projects and for the voluntary agreements committed to reduction of energy density Sale of the product which use energy inefficiently has been restricted Research and development projects for enhancing energy efficiency and taking advantage of renewable energy resources have been primarily supported by TÜBİTAK
2008	Law on modification of Electric Market Law (Law No. 5784, Official Journal: Date: 26.07.2008, No: 26948)	Increase of the incentives given to the renewable energy resources	Grant of stamp duty exempt, fee exempt, special consumption tax exempt No application of interest on repayment of the loans required to be paid back to the electric energy fund by providing supplementary resource to the companies Considerable increase has occurred in the generation of wind energy
2009	Certificate of Strategy for Electric Energy Market and Security of Supply (Higher Planning Council, No. 2009/11 of 18.09.2009)	Increasing share of the renewable energy in the electric generation up to 30% by 2023	New technologies have been encouraged. Use of local and renewable resources was maximized - Improvement has been achievement in minimizing loss in the generation, transmission, distribution and use of the electric energy

FIT: Feed-in tariff

Table 2: Incentive legislations on generation of power from renewable energy in Turkey (2010-2011)

Year	Legislation	Primary objective of the legislation	Result created by the legislation
2010	Regulation of Support Program for Research-Development in the Energy Sector (ENAR) (Official Journal, Date: 08.06.2010, No: 27605)	Support by the ministry of energy and natural resources of the projects on research, development and improvement based on technologic development and innovation for conversion of scientific and technologic information to product, process, method, implementation or system to serve the energy policies, security of supply, local energy technologies and industry	Projects contributing to development of innovation-oriented energy equipment and methods and enhancing competitive power of the country in the international arena by improving the sector, employment and information level in this area are supported by the cabinet decree
2010	Renewable Energy Resources Law No. 5346 was revised on 29/12/2010. Law No. 6094, Official Journal: No: 27809 of 08.01.2011 (Law on Modification in the Law Relating to Use of Renewable Energy Resources for Production of Electric Energy)	Further increase of the incentives laid down in the Renewable Energy Resources Law Achievement of minimum 3000 MW installed power for licenced PV stations as per the targets set up to 2023	Permission was given for establishment of renewable energy resources in the national parks, natural parks, natural monuments and nature reserve areas, protection forests, wildlife improvement areas Use of PV systems was made widespread
2011	Regulation on Certification and Support of Renewable Energy Resources (Official Journal, Date: 21.07.2011, No: 28001)	Grant of certificate of renewable energy resource to the legal persons holding production license for generation plants basing on renewable energy resources	As a result of considerable investments made on renewable energy resources, severe financial burden has occurred on the electric market due to the incentive guarantee granted to these resources. Furthermore, as the electric investments has exceeded the electric demand quickly and resulted in excess supply, the electric price PTF (Market Exchange Price) generated in the free market decreased in value, put the base load power plants fuelled by natural gas into trouble in repaying loans. And it in turn caused change of the Renewable Energy Resources Support Mechanism (YEKDEM)

PV: Photovoltaic

Table 3: Incentive legislations on generation of power from renewable energy in Turkey (2013-2015)

Year	Legislation	Primary objective of the legislation	Result created by the legislation
2013	New Electric Market Law (Law No. 6446) (Official Journal: Date: 30.03.2013, No: 28603)	a. Provide incentive for the power plants in operation or to start operation by December 31, 2020 so as to include the investment and operating periods b. Bring some new incentives special to the investors that have a production license and started to operate prior to the date specified in the Law (31.12.2015) To exempt the documents and transitions related to the power plants and completed in the investment period from stamp duty and fees	Grant of a discount of 85% on lease, easement and usage rights of energy transmission lines for 10 years have entered into effect Accordingly, application of 50% on the price for use of transmission system for 5 years from the starting date of operation to the benefit of these investors has entered into effect
2013	Regulation on Technical Evaluation of the License Applications Basing on Solar Energy (Official Journal: Date: 01.06.2013, No: 28664)	Determine principles and procedures to build technical opinion to be given with respect to the license applications made on basis of solar energy in order to ensure effective and efficient use of solar energy in the generation of electric energy	Solar energy plants have increased in number
2013	Regulation on Manufacture of the Components Used in the Plants Which Generates Electric Energy from Renewable Energy Resources (Official Journal: Date: 04.09.2013, No: 28755)	Provided that some requirements are met, provision of extra price support if the plants generating electric from renewable energy resources use equipment manufactured in the country	If the plant started operation prior to December 31, 2015, an extra price support in range of USD 0.4 and 3.5 has been granted for a period of 5 years

(Contd...)

Table 3: ***(Continued)***

Year	Legislation	Primary objective of the legislation	Result created by the legislation
2013	Regulation on Certification and Support of Renewable Energy Resources (Official Journal: Date: 01.10.2013, No: 28782)	Encourage electric energy production basing on renewable energy resources Regulate establishment and operation of RER Support Mechanism to be operated under the Law No. 5346 on Use of Renewable Energy Resources for Production of Electric Energy	Certificate of Renewable Energy Resource has been given to the legal persons holding production license for their production plants basing on renewable energy resources
2013	Regulation on Unlicensed Electric Generation in the Electric Market was issued (Official Journal: Date: 02/10/2013, No: 28783)	Meeting power requirements of the consumers from a production plant nearest to the consumption point; inclusion of small-scaled production plants in the national economy for security of supply, ensuring effective use of them and reducing amount of loss that occur at the grid	It has been possible for the real or legal persons to generate electric energy without having to get license and establish company. This Regulation has also allowed the consumers to set up cost-efficient power plants panes and systems meet their power requirements, and to sell excess energy by connecting to the system according to the specified technical criteria
2013	Electric Market License Regulation brought Pre-license Application for Prevention of License Trade. (Official Journal: Date: 02/11/2013, No: 28809)	Determine procedures and principles concerning pre-license and licensing implementation in the electric market as well as rights and liabilities of the holders of pre-license and license	With this regulation, the previously existing implementation of wholesale and retail license was abolished. It was replaced by the supply license implementation
2013	Competition Regulation Pre-license Applications Made to Established Production Plant Basin on Wind and Solar Power (Official Journal: Date: 06.12.2013, No: 28843)	Determine procedures and principles concerning liabilities of the legal persons to participate in the competition to be made by TEIAS to determine the legal person (s) to connect to the system if, in the framework of the Electric Market Law No. 6446 of 14.03.2013, there are more than one applications among the pre-license applications made to set up production plant basing on wind or solar energy in the same site and/or for connection to the same connection point and/or to same connection area, and concerning payment of Contribution of Power Plants Basing on Wind and Solar Power as determined according to the result of the competition	This regulation revokes the Competition Regulation No. 27707 of 22.09.2010 on License Applications Made to Set Up Production Plant Basing on Wind Power and the Competition Regulation No. 28307 of 29.05.2012 on License Applications Made to Set Up Production Plant basing on Solar Power. Competition Regulations for License Applications Made has been revoked
2014	Communique Relating to Wind and Solar Measurements to be Made for Prelicence Applications Based on Wind and Solar Power. (Official Journal: Date: 17.06.2014, No: 29033)	Determine procedures and principles of performance and evaluation of the wind and solar measurements to be performed under the Electric Market License Regulation published in the Official Journal No. 28809 of 02.11.2013	General directorate of meteorology will be able to supervise the stations onsite and remotely Location coordinates of the measuring station will be controlled by GPS instrument. Error margin of GPS measuring instrument will not exceed five meters Once the wind measuring station is established, coordinate and elevation information about the station will be notified by the firm to the General Directorate of State Airports Organization Insolation data will be prepared daily Loss of data in the annual wind measurement will not exceed 20%

(Contd...)

Table 3: ***(Continued)***

Year	Legislation	Primary objective of the legislation	Result created by the legislation
2015	Regulation on Technical Evaluation of Electric Production Based on Wind Resource. (Official Journal: Date: 20.10.2015, No: 29508)	Ensure effective and efficient use of wind power in the generation of electric energy; perform technical evaluation of the pre-license or unlicensed electric generation basing on wind resource	Letters of conformity have been issued with respect to requests of coordination change, capacity increases and changes related to the technical characteristics of turbine under the pre-licensed, licensed or unlicensed projects whose technical evaluations completed positively

Table 4: Incentive legislations on generation of power from renewable energy in Turkey (2016)

Year	Legislation	Primary objective of the legislation	Result Created by the Legislation
2016	Law on Modification of Electric Market Law No. 6719 and Some Other Laws. (Official Journal: Date: 17.06.2016, No: 29745)	Meet new needs appeared related to the renewable energy investments and implement new policies adopted by the modified energy management and bureaucracy	Prerequisite of local production or use of local product is sought after for the parts to be used in the production plants to be established in the fields of renewable energy specified as location of renewable energy resource, then rapid expropriation can be performed on such real properties Pre-license will be revoked if the shareholding structure of the legal person holding pre-license change directly or indirectly, or if its shares are transferred or works and actions are carried out to result in transfer of its shares or if it fails to fulfil its liabilities until the license is obtained, except for the exemptions specified by the Energy Market Supervisory Board Modification in the applicable regulation to enable the power distribution and supply companies to collect from the consumers the loss, illegal use, meter reading, retail sale, service, transmission system usage and distribution fee entered into effect
2016	Regulation on Support of Local Parts Used in the Plants Generating Electric Energy from the Renewable Energy Resources. (Official Journal: Date: 24.06.2016, No: 29752)	Encourage use of the local accessories and complementary parts with high added value which will help growth of the renewable energy sector as well as the production sector	Applications made by the companies for it have been evaluated and the suppliers and energy production plants were supervised onsite in 2016. In this respect, 99 plants out of 119 plants in total got entitled to take advantage of incentive and the information about the entitled organizations were notified to the Energy Market Regulatory Authority. (General Directorate of Renewable Energy, Operating Report for, 2016, January 2017. p. 6)
2016	Regulation on Areas of Renewable Energy Resources. (Official Journal; Date: 09.10.2016, No: 29852)	Create large-scale areas of renewable energy resources (YEKA) on the public and treasury owned properties and on the private properties to ensure effective and efficient use of our renewable energy resources Formulate activities of research development/product development Ensure purchase of the electric energy to be produced at the areas of renewable energy resource (YEAK) at more affordable prices than the market prices Provide considerable employment thanks to the plants to be established	Once the environment-friendly production plant starts to operate, electric energy of about 1.7 billion kW/h will be generated each year and power need of approximately 600,000 houses will be met each year. The electric power production plant to be operated during 30 years will use photovoltaic (FV) solar modules to be manufactured in integration with Turkey as well as secondary parts/components with certificate of local product to be obtained from the manufacturers operating in the country

sustainable transportation roads compatible with EU standards with low-carbon emission, increased integration of Turkey with the European electric and natural gas market; support of energy efficiency and an renewable energy adapted to resource efficiency and renewable energy of EU and adaptation of nuclear regulations with EU standards.

With the financial aid taken from the EU, European Bank of Reconstruction and Development (EBRD) conducted TURKSEFF (Turkish Sustainable Energy Finance Programme), MIDSEFF (The Turkish Mid-Size Sustainable Energy Financing Facility), TUREEFF (Turkish Residential Energy Efficiency Financing Facility) and MUNISEFF projects.

Table 5: IPA-I Period funds allocated to Turkey by components (2007-2013) (Million Euro)

Component	2007	2008	2009	2010	2011	2012	2013	Total
Transition assistance and ınstitution building	256.7	256.1	239.6	217.8	231.3	227.5	238.5	1.667.5
Cross-border cooperation	2.1	2.9	3.0	3.1	5.1	2.2	2.2	20.6
Regional development	167.5	173.8	182.7	238.1	293.4	356.1	366.9	1778.4
Human resources development	50.2	52.9	55.6	63.4	77.6	83.2	91.2	474.1
Rural development	20.7	53.0	85.5	131.3	172.5	187.4	204.2	854.6
Total	497.2	538.7	566.4	653.7	779.9	856.3	903.0	4795.2

Source: Ministry for EU Affairs, TR-EU Financial Co-operation, EU: European Union

Table 6: IPA - II Period, funds allocated to Turkey by components (2014-2020) (Million Euro

Turkey	2014	2015	2016	2017	Total 2018-2020	Total 2014-2020	Of which climate change relevant (%)
Reforms in preparation for Union membership	355.1	196.6	240.3	137.2	652.2	1,581.4	
Democracy and governance	540.2				416.3	956.5	
Rule of law and fundamental rights	388.9				236.0	624.9	
Socio-economic and Regional development	155.8	265.8	247.0	261.4	595.3	1,525.3	
Environment and climate action	297.1				347.5	644.6	70
Transport	386.0				56.8	442.8	60
Energy	59.0				34.4	93.5	70
Competitiveness and innovation	187.8				156.6	344.4	10
Employment, social policies, education, promotion of gender equality, and human resources development	37.4	62.9	65.9	68.9	199.9	435.0	
Education, employment and social policies	235.1				199.9	435.0	
Agriculture and rural development	72.0	100.9	77.0	158.1	504.2	912.2	
Agriculture and rural development	408.0				504.2	912.2	10
Total	620.4	626.4	630.8	636.4	1,940.0	4,453.9	

Source: Ministry for EU Affairs, TR-EU Financial Co-operation, EU: European Union

TURSEFF (Turkish Sustainable Energy Finance Programme) has provided SMEs finance of USD 265.000.000 EBRD Loan + 29.000.000 Euro Grant in the fields of renewable energy and energy efficiency since it has been established in 2010.

MİDSEFF (Turkish Medium-Scale Sustainable Energy Finance Programme) provided EBRD Loan of 1.500.000.000. - Euro and finance above 5 million Euro in the areas of renewable energy and energy efficiency.

TUREEFF (Turkish Energy Efficiency Finance Programme for Houses) provided USD 282.500.000 EBRD Loan + USD 62.500.000 CTF Loan for the Houses in the areas of renewable energy and energy efficiency.

MUNISEFF (Ministry of Energy and Natural Resources) pilots implementation operations under TURSEFF 3 Programme for providing the municipalities with finance in the areas of renewable and energy efficiency.

German International Cooperation Agency (GIZ) operates in Turkey since 1996. GIZ concentrates upon the matters of climate change and economic incentives in Turkey and implements projects commissioned by the Federal Ministry of Economic Cooperation and Development, Federal Ministry of Environment, Nature Protection and Nuclear Security and Federal Ministry of Foreign Affairs. With GIZ, a project will be carried out for Incentive of Grid Connected Renewable Energies with an estimated budget of 2 million Euro. Under the project where TEİAŞ (General Directorate of Turkish Electric Transmission Inc.), TEDAŞ (General Directorate of Turkish Electric Distribution Inc.,) and YEGM (General Directorate of Renewable Energy) and private sector will be the beneficiaries, the operations for improvement of the legislative background and development and establishment of technical infrastructure and provision of various supports to "Renewable Energy Training Centre" (Ministry of Energy and Natural Resources, 2017. p. 82).

4. FINDINGS AND CONCLUSION

In this study, an overview of the achievements of Germany in renewable energy production gives crucial hints for the developing countries, including Turkey. The fact that Turkey has to import 60% of its primary energy demand signals importance of renewable energy policies for the future of the country. A comprehensive renewable energy policy which combines political commitment with stable and long-term measures would have a large influence on efforts to reach clean and sustainable energy in Turkey.

The comparison of two states demonstrated that Germany had launched its clean energy policy in the beginning of the 1980s and made first regulation in 1990. In Turkey, the RES Law enacted 15 years later than Germany in 2005. There were serious flaws in Turkey's renewable energy policy such as administrative obstacles, long and complex licensing procedures, insufficient support and lack of innovation, deployment and diffusion programs.

In Europe, Turkey has the richest solar energy potential after Spain. The study indicated that Ankara could not use this potential

sufficiently owing to being very late in establishing its support mechanism. The required steps have taken recently for stimulating investments to produce solar power. Germany has already been the leader of solar PV in the world market by receiving almost 60% of the investments. What is more the point, its solar capacity reached to 50%. In addition to solar capacity, there is a huge gap between wind capacities of Germany and Turkey. Despite the fact that Turkey has voluminous wind potential, it produces just 3% of its electricity from wind power. When one looks at Germany, its wind operating capacity is 40%.

The evaluation of Turkey's incentive legislations on generation of power from renewable energy from 2005 to 2016 demonstrates that Ankara has learnt from EU experiences and has intensified its focus on the effective management of its renewable energy resources. It can be said that Turkey's bid for EU membership made significant contribution to country's renewable energy policy. With the aim to align its legal framework in the line with access communautaire, Turkey made reforms in energy legislation, notably including liberalization, energy efficiency and renewable energy. The European Commission emphasized the importance of a stronger regulatory environment for inciting renewable energy investments in Turkey's Progress Reports. Moreover, the EU fostered to form a renewable support mechanism and improve Turkey's technology and innovation profile. EU institutions have provided public funds for projects to help Turkey in utilizing its renewable energy potential. All in all, beyond the debates of Turkey's membership in the EU, Turkey's cooperation and harmonization with the EU in renewable energy policies contribute to realization of its targets in energy production and energy security for 2023.

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