

# Renewable Energy Policies of States

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**Abstract**—This document contains governments perspectives on renewable energy and their policies on this issue. In this document, the United States, has been viewed renewable energy and investment policies of the European Union and the Republic of Turkey.

**Index Terms**—Renewable Energy, PV Panel, Wind Turbine, Electricity, Policy

## I. INTRODUCTION

Industrial Revolution in Europe in the 18th century to meet the needs of people more efficiently with the increasing world population happened, and the whole world started to industrialize quickly. On top of that, energy as important as raw material in production need increased. At first, steam powered machines were replaced by industrial machines powered by electrical energy after a few centuries. After these developments, human beings started to produce electrical power by using materials such as coal, oil and water and to establish new power plants. However, when the last quarter of the 20th century was reached, the things were not going well. As the previous century, raw material conflicts started again among countries as the reserves of fossil fuels such as oil and coal decreased. By the end of the 20th century, there was a new problem while all these conflicts were happening and this time it was everyone's problem "Nature Pollution". So human beings "Renewable Energy" focused on the idea of producing energy without harming nature with its own materials of nature.

## II. GOVERNMENT'S POLICIES AND OBJECTIVES OF RENEWABLE ENERGY SOURCES

### A. EUROPEAN UNION'S POLICIES AND OBJECTIVES OF RENEWABLE ENERGY SOURCES

The EU renewed its renewable energy use targets set by the Kyoto agreement to 22 percent in the 2001 / 77 / EC directive and countries have set their own targets accordingly. Among EU countries, Sweden and Austria targeted the highest rates (60-78 percent) for 2010 in the use of renewable energy sources. Targets in countries with high energy consumption such as Germany, England, France and Italy, It ranges from 10-25 percent. Comparing the energy production statistics of 1997 and the targets of 2010, the increase target of England and Belgium is 5 times, and the lowest increase targets are in the range of 1-1.5 percent in Portugal, Austria, Finland, France, Spain and Sweden seen. [1]

TABLE I  
RENEWABLE ENERGY USE TARGETS OF EU COUNTRIES

Country	1997(per)	2010(per)	Increase Rate
Germany	4,5	12,5	2,78
Austria	70	78,1	1,12
Belgium	1,1	6	5,45
Denmark	8,7	29	3,33
Finland	24,7	31,5	1,28
France	15	21	1,4
Netherlands	3,5	9	2,57
UK	1,7	10	5,88
Ireland	3,6	13,2	3,67
Spain	19,9	29,4	1,48
Sweden	49,1	60	1,22
Italy	16	25	1,56
Luxemburg	2,1	5,7	2,71
Portugal	38,5	39	1,01
Greece	8,6	20,1	2,34
Average	13,9	22	1,58

EU countries use some incentive mechanisms to accelerate the investments on renewable energy resources to be established in their countries in order to reach the determined targets. These Incentives It is evaluated within 3 categories. [2]

- Financial incentives
- Tax exemptions
- Production incentives

**Investment Incentives:** In this type of incentive, the government contributes to a certain extent to the total investment amount. This rate varies between 20 percent and 40 percent.

**Government Supported Loans:** Government or international organizations are offering more attractive loans to these types of projects than normal business loans to finance investments. Deutsche Ausgleichsbank and Commerzbank loans in Germany are examples of this situation. It is possible to collect tax incentives under two subheadings; **Tax Exemptions:** Some states do not charge corporate and / or income tax from the income generated from the power plant between 1-5 years. It is practiced in the Netherlands. [3]

**Customs Exemptions:** States impose customs tax exemption with a low or total rate of imports and exports of equipment such as wind turbines, solar panels. It is practiced in Denmark. Production incentives are collected under three sub-headings;

**Renewable Portfolio / Energy Standard:** In this type of incentive, electricity distribution companies can renew a certain

percentage of the electricity they distribute within a certain period of time must meet from energy sources.

**Incentive to Generated Electricity:** Another type of incentive given to renewable resources is the type of incentive given to the unit price of electricity produced.

**Fixed Tariff Application:** For the electricity produced, a certain price tariff is applied in a certain time interval. For example, fixed price tariff is applied in 2 different periods, the first 10 years and the second 10 years. Since the power plant repays loan debts and interest rates, the first 10 years higher tariff is applied. It is a widely used type of incentive. [3]

## B. REPUBLIC OF TURKEY'S POLICIES AND OBJECTIVES OF RENEWABLE ENERGY SOURCES

Turkey's energy demand is continuously increasing. Despite the increase in energy demand, the fact that production does not increase at the same rate increases dependency on imports. Turkey's energy demand in 1995 to 63.1 Mtoe to 107.6 Mtoe, which reached levels in 2007. While production was 26.3 MTEP in 1995, it did not change much in 2007 and reached 27.4 MTEP. Turkey produced 25 percent of the energy it consumes itself in 2007, it had to import 75 percent from abroad. [4] While the rate of lignite, which is the primary energy source produced in our country, is 43 percent in production, It has a share of 11 percent. Oil in total consumption Is the 33 percent ratio, and the ratio between the power generation source in Turkey is 9 percent. In recent years, the demand for natural gas has increased gradually, 30 percent of the energy need is provided from this source. Turkey needs to meet 63 percent of energy from oil and gas resources and provide the substantial international energy market. This situation causes our country to be dependent on foreign markets in the field of energy. Especially in recent years, it has been observed that natural gas supply countries use natural gas supplies as weapons in political and economic problems. Economic, political and security problems in the regions where oil providers are located cause the price of this resource to fluctuate constantly, and this situation shakes the economic balances of countries dependent on oil imports. to meet Turkey's energy demand to decrease dependence on imports is required in order to use renewable energy sources, which have a great potential in its own production resources and the country. Increasing energy production from renewable sources in our country; It will be possible with decision makers to use the correct support mechanisms and determine their support rates according to their strategic importance levels. In Turkey the most commonly used renewable energy sources conventional biomass energy, hydraulic energy, and geothermal energy. Turkey's highest renewable energy source with the potential of solar energy and 1.4 million MW is technical, there are 116 000 MW economic potential. Turkey is widely used in solar energy to produce hot water in homes. Turkey's hot water production is 11 million m2 of collector area used for the purpose are manufactured annually and 0.4

Mtoe of energy from the collector. 0.15 m2 of collector area per capita in Turkey.

This value is 0.23m2 in Austria, 0.28m2 in Greece, 0.82m2 in Cyprus. [5] Investment costs of electricity production from solar energy are quite high. For this reason, a higher contribution should be made in supporting electricity production from solar energy than other sources. terrestrial wind energy technical and economic potential in Turkey is 55 000 and 20 000 MW, respectively. While the total installed power in the wind power plants in our country was 20 MW until 2003, with the introduction of the YEK law in 2005, approximately 50 MW in 2006, 140 MW in 2007, 433.35 MW in 2008 installed power level has been reached. [6] The installed power of the projects signed by the turbine supply contract in wind energy is 667 MW. The reason for the widespread use of wind energy in our country is the reduction of the electricity production costs of these resources with the studies and new technologies developed in recent years. The fixed purchase price applied by the YEK law in Turkey, the investment costs of the producers is caused to focus on energy sources that are cheaper. This situation leads to a decrease in diversity in the development of renewable resources and concentration of investments in certain regions in our country.

TABLE II  
TURKEY'S RENEWABLE ENERGY SOURCES POTENTIAL

Energy Source	Gross(MW)	Technical(MW)	Economic(MW)
Hydraulic Energy	107.5k	53.75k	34 862
Geothermal Energy	36k	8k	3 193
Solar Energy	111 500k	1 400k	116k
Wind Energy	222k	115k	20k
Seauquake Energy	75k	9k	null
Biomass Energy	120Mtep/year	50Mtep/year	32Mtep/year

YEK law entered into force on 05.10.2005 electricity generated from renewable sources in Turkey were taken into state purchase guarantees. [7] In this law, the purchase price of electricity to be produced from renewable sources is determined as 5.5 Euro cent / kWh. At this price, the Council of Ministers has been authorized to increase 20 percent. However, electricity purchase prices can increase to 6.6 Euro Cent / kWh. The YEK law published in our country has made a start in determining the legal position of electricity generation from renewable sources, but it is insufficient in terms of both price and support mechanism. In the use of renewable energy sources, fixed price application for electricity produced from all sources prevents the spreading of resources with high production costs.

TABLE III  
TURKEY'S ENERGY PRODUCTION RESOURCES DISTRIBUTION

Material	Rate(per)
Lignite	43
Wood&waste	19
Hydraulic	14
Petrol	9
Coal	5
Natural Gas	3
Others	7

### C. UNITED STATE'S POLICIES AND OBJECTIVES OF RENEWABLE ENERGY SOURCES

The strategic plan published by the United States Energy Unit (DOE) under the title "DOE Goals" in 2006 is based on three main objectives. -Increasing energy diversity to reduce dependence on oil. To prevent environmental pollution by reducing the negative effects of toxic gas emissions released due to energy production and consumption on air, water and soil. To establish a flexible and reliable energy infrastructure system at high capacity. [7] In line with these goals, ACI (The American Competitiveness Initiative) and AEI (The Advanced Energy Initiative) was established by George W. Bush in 2006. [8] Likewise, the strategic goals of DOE for reliable and clean energy are supported by Solar American Initiative (SAI). If we talk about SAI briefly, SAI has undertaken the task of designing reliable, cheap, high performance and efficiency photovoltaic (PV) systems and increasing RD activities. In 2007, the President of the United States allocated 148.4 million dollars for SAI's work, and more than 66 million dollars of that budget was spent on solar energy research and development SAI has three types of targets for PV systems. [7]

- It is suitable for the use of residential houses connected to the network
- For commercial purposes
- For useful applications

The United States has a very large electricity generation system with an instantaneous 1000 GW power generation capacity, whereas in 2005 the installed power of the United States PV systems was 0.44 GW, making up only 0.1 percent of the total installed power. [9] In the first place, solar energy was only used in energy production in Texas and California, but now it is used in almost all states, and in large states such as New York and Minnesota, a large amount of energy is provided from the sun. According to data from the National Renewable Energy Laboratory (NREL), if a 3kW PV system was installed on the roof of every house in the United States, more than 420 billion kilowatt-hours of electrical energy would have been generated, and this amount of energy was more than 35 percent of the United States' total electrical energy demand. [10] PV systems, which have become widespread as a result of the work of SAI, may be a new alternative in energy production. 0.6 MW of new capacity emerges for each MW of installed PV. When the data are analyzed, it can be seen that the use of PV may reveal additional new capacity up to 10-25 percent in 2015 and 40 percent in 2030. [11] In addition, electrical energy produced from solar energy will reduce the harmful gas emission of the United States. Although there is no air pollution and toxic gas emission in the production of electricity from the sun, there is almost no need for water. In addition, it is envisaged to employ 10000-30000 workers in 2015 and 67000-89000 workers by 2030 to be employed in the field of renewable energy. For the first time in the USA, wind and solar energy exceeded 10 percent in electricity production. [12]

According to a recent report by the U.S. Energy Information

Administration (EIA), more than 10 percent of electricity production for the first time in U.S. history came from wind and solar energy in March 2017.

### III. RESULTS AND DISCUSSION

In the field of renewable energy sources, together with the emergence of the YEK law in Turkey it has increased in investment. It is an important step to guarantee the purchase of electricity produced from renewable energy sources with the YEK law. However, it is insufficient for the road that our country should take in line with Kyoto and EU targets. In our country, tax exemptions and financial incentive mechanisms should be used in addition to production incentives, as in EU countries and in the USA, to develop renewable energy sources. In addition, electricity purchase prices should be increased depending on the characteristics of the source to be used and the technology strategy desired in our country. The agricultural sector has an important potential in the production and use of renewable energy sources. Small-scale hydraulic power plants, wind power plants, solar energy systems, and biomass and biogas systems have wide applications in the agricultural sector. However, the cost of electricity produced in small-scale systems is higher than large-scale systems. In the case of Germany, it is seen that electricity purchase prices vary according to the system scale in addition to the resources used. In our country, the purchase price of electricity produced in small-scale systems should be higher than large-scale systems in order to ensure the development of renewable energy sources, especially in the agricultural sector. In this way, both the development of the agricultural sector in our country and the use of new technologies are provided, and an area with a high potential in terms of renewable energy resources is utilized, making it easier for our country to reach the determined targets.

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