T.C.
ISTANBUL AYDIN UNIVERSITY
INSTITUTE OF SOCIAL SCIENCES

RENEWABLE ENERGY POLICIES FOR SUSTAINABLE BUSINESS: COMPERATIVE STUDY BETWEEN EU AND TURKEY

MSc. THESIS

HTET MYAT AUNG
(Y1412.130044)

Department of Business Administration

Business Administration Program

Thesis Advisor: Assist. Prof. Dr. ÖZGÜL UYAN

JULY, 2019

T.C.
ISTANBUL AYDIN UNIVERSITY
INSTITUTE OF SOCIAL SCIENCES

RENEWABLE ENERGY POLICIES FOR SUSTAINABLE BUSINESS: COMPERATIVE STUDY BETWEEN EU AND TURKEY

MSc. THESIS

HTET MYAT AUNG

Department of Business Administration

Business Administration Program

Thesis Advisor: Assist. Prof. Dr. ÖZGÜL UYAN

JULY, 2019

T.C.
İSTANBUL AYDIN ÜNİVERSİTESİ
SOSYAL BİLİMLER ENSTİTÜSÜ MÜDÜRLÜĞÜ

YÜKSEK LİSANS TEZ ONAY FORMU

Enstitümüz İşletme İngilizce Anabilim Dalı İşletme Yönetimi İngilizce Tezli Yüksek Lisans Programı Y1412.130044 numaralı öğrencisi HTET MYAT AUNG'un **"Renewable Energy Policies For Sustainable Business: Comperative Study Between EU and TURKEY"** adlı tez çalışması Enstitümüz Yönetim Kurulunun 27.06.2019 tarih ve 2019/15 sayılı kararıyla oluşturulan jüri tarafından oybirliği/oyçokluğu ile Tezli Yüksek Lisans tezi 09.07.2019 tarihinde kabul edilmiştir.

	Unvan	Adı Soyadı	Üniversite	İmza
		ASIL ÜYELER		
Danışman	Dr. Öğr. Üyesi	Özgül UYAN	İstanbul Aydın Üniversitesi	
1. Üye	Doç. Dr.	Meral FIRAT	İstanbul Aydın Üniversitesi	
2. Üye	Dr. Öğr. Üyesi	Mehmet Çağrı GÜNDOĞDU	İstanbul Gelişim Üniversitesi	
		YEDEK ÜYELER		
1. Üye	Doç. Dr.	Erginbay UĞURLU	İstanbul Aydın Üniversitesi	
2. Üye	Dr. Öğr. Üyesi	Aziz MUSLU	Ordu Üniversitesi	

ONAY

Prof. Dr. Ragıp Kutay KARACA
Enstitü Müdürü

FOREWORD

Renewable energy is the key factor of economies. But there are many gaps that need to be filled in this issue. Therefore, i set out to study this topic. On the other hand i preferred to investigate this topic from Turkey's perspective for that Turkey is a developed country and has many advantages of technologies compared to my country Myanmar.

I wish to thank all my Turkish and Myanmar community who gave me all the information about energy for my research. And I'd also like to express my acknowledgement to Istanbul Aydin University's Library for providing me many books throughout my research. There have also been other people who, in some ways, have been a part of this process. My sincerest thanks to my sisters, and closest friends for their encouragement as well.

Lastly, i am utmost grateful to my thesis advisor ASSIST PROF. DR. ÖZGÜL UYAN, whose guidance and supports throughout my entire research were very valuable. Her candor and openness to my various questions were so reassuring for me. Her patience, readiness and availability whenever i need her counsulting made the difficult process more endurable.

I repeat my sincere thanks to all.

July, 2019 **HTET MYAT AUNG**

TABLE OF CONTENTS

Page

ABBREVIATIONS

CCGT	**:**	Combined-cycle Gas Turbine
CIS	**:**	The Common Wealth of Independent States
CO2	**:**	Carbon Dioxide
dwt	**:**	Dead weight tons
EC	**:**	The European Commission
ECSC	**:**	The European Coal and Steel Community
EEC	**:**	The European Economic Community
e.g.	**:**	Exempli Gratia (For Example)
EU	**:**	The European Union
EURATOM	**:**	European Atomic Energy Community
GDP	**:**	Gross Domestic Product
GW	**:**	Giga Watt
H2O	**:**	Hydrogen
IEA	**:**	International Energy Agency
kWh	**:**	Kilowatt Hour
LNG	**:**	Liquefied Natural Gas
O2	**:**	Oxygen
OECD	**:**	Organization for Economic Co-operation and Development
OPEC	**:**	Organization of the Petroleum Exporting Countries
PPM	**:**	Parts Per Million
R&D	**:**	Research and Development
Tw-h	**:**	Terawatt Hours
UN	**:**	The United Nations
USA	**:**	The United States of America
USD	**:**	United States Dollar
WTC	**:**	World Trade Center
WTI	**:**	West Texas Intermediate

LIST OF TABLES

Page

LIST OF FIGURES

Page

RENEWABLE ENERGY POLICIES FOR SUSTAINABLE BUSINESS: COMPERATIVE STUDY BETWEEN EU AND TURKEY

ABSTRACT

Using energy effectively is important to achieve the goal of sustainable development. In the world today, energy consumption is increasing rapidly due to rapid increasing of world population. Therefore, energy demand is also increasing for urbanization, industrialization, widespread use of technology and electronic products, etc. Thus, the energy supply security become important. Countries has explored new renewable energy resources in order to reduce their dependence on fossil fuels imported from oil producing countries. On the other hand, energy sources can be obtained directly or indirectly from nature. However, with the increase of the world's population, natural resources are being destroyed and the climate is undergoing a major change. Therefore, it is important for both individuals and institutions to learn the value of energy and to have the knowledge how to use energy more effectively.

The aim of this study is to investigate the importance of the businesses operating in the renewable energy field to ensure sustainable economic development, and the adequacy of government support provided to these businesses in terms of Turkey by comparing with EU energy policies.

In the first part of the study, the importance of renewable energy and the purpose of the study is stated. In the second part, the energy resources conditions and the types of traditional and renewable energy sources are explained. In the third part, sustainable development, energy market, energy demand, energy prices, and the effects of renewable energy on economic growth are discussed. In the last part, Turkey and EU energy policy are revealed. Then the government incentives provided to enterprises operating in the field of renewable energy in Turkey are examined in comparison with the EU countries by using the datas of Turkish Statistical Institute (TUIK), Turkey Ministry of Commerce, International Energy Agency, European Commission, OECD and World Bank. Finally, the findings of the study are evaluated and certain recommendations are made.

Key Words: *EU Energy Policy, Government Incentives, Renewable Energy, Sustainable Business, Turkey Energy Policy.*

SÜRDÜRÜLEBİLİR İŞ İÇİN YENİLENEBİLİR ENERJİ POLİTİKALARI: AB VE TÜRKİYE ARASINDA KARŞILAŞTIRMALI BİR ÇALIŞMA

ÖZET

Enerjiyi etkin kullanmak, sürdürülebilir kalkınma hedefine ulaşmak için önemlidir. Günümüz dünyasında nüfusun hızla artması nedeniyle enerji tüketimi hızla artmaktadır. Bu nedenle kentleşme, sanayileşme, teknoloji ve elektronik ürünlerin yaygın kullanımı vb. için enerji talebi de artmaktadır. Böylece enerji arzının güvenliği önemli hale gelmiştir. Ülkeler, petrol üreten ülkelerden ithal edilen fosil yakıtlara bağımlılıklarını azaltmak için yeni yenilenebilir enerji kaynaklarını araştırmaktadırlar. Öte yandan, enerji kaynakları doğrudan veya dolaylı olarak doğadan temin edilebilmektedir. Ne var ki, Dünya nüfusunun artmasıyla birlikte doğal kaynaklar tahrip edilmekte ve iklim büyük değişikliğe uğramaktadır. Bu nedenle hem bireylerin hem de kurumların enerjinin değerini öğrenmeleri ve enerjiyi daha etkili bir şekilde nasıl kullanabileceklerini bilmeleri önem arz etmektedir.

Bu çalışmanın amacı, sürdürülebilir ekonomik kalkınmayı sağlamak için yenilenebilir enerji alanında faaliyet gösteren işletmelerin önemini ve bu işletmelere sağlanan devlet desteğinin yeterliliğini, AB enerji politikaları ile karşılaştırmak suretiyle, Türkiye açısından araştırmaktır.

Çalışmanın birinci bölümünde, yenilenebilir enerjinin önemi ve çalışmanın amacı ifade edilmiştir. İkinci bölümde, enerji kaynaklarının durumu ile geleneksel ve yenilenebilir enerji kaynaklarının türleri açıklanmıştır. Üçüncü bölümde sürdürülebilir kalkınma, enerji piyasası, enerji talebi, enerji fiyatları ile yenilenebilir enerjinin ekonomik büyüme üzerindeki etkilerine yer verilmiştir. Son bölümde, Türkiye ve AB enerji politikaları ortaya konmuştur. Türkiye İstatistik Kurumu (TÜİK), Türkiye Ticaret Bakanlığı, Uluslararası Enerji Ajansı, Avrupa Komisyonu, OECD ve Dünya Bankası verileri kullanılarak, Türkiye'de yenilenebilir enerji alanında faaliyet gösteren işletmelere sağlanan devlet teşvikleri AB ülkeleri ile karşılaştırılarak incelenmiştir. Son olarak, çalışmanın bulguları değerlendirilmiş ve bazı önerilerde bulunulmuştur.

Anahtar Kelimeler: *AB Enerji Politikaları, Devlet Teşvikleri, Sürdürülebilir İş, Türkiye Enerji Politikaları, Yenilenebilir Enerji.*

1. INTRODUCTION

Using energy effectively is important to achieve the goal of sustainable development. In the world today, energy consumption is increasing rapidly due to the rapid increasing world population. So energy demand is also increasing for urbanization, industrialization, widespread use of technology and electronic products, etc. Thus the energy supply security has become important. Countries have explored new renewable energy resources in order to reduce their dependence on fossil fuels imported from oil producing countries.

Most of the energy used today is mainly obtained from woods and petroleum products. But these methods leads to emit millions of tons of carbon dioxide into atmosphere and to deforestation. Another energy source is nuclear energy. But it is dangerous for the radioactive things are difficult to be stored. So this method has gradually been losing its popularity. However there is another alternative energy source called renewable energy. Renewable energy sources are available on the nature plentifully.

Many researchs show the relationship of the GDP per capita and renewable energy. Increasing production of renewables will make positive affects on economic growth for a short term and for a long term. Even there were several of wars for the energy sources throughout the history, especially in the Middle East. So it is important to discuss energy in business. Especially EU energy policies are important in terms of renewable energy enterprises. Because, EU countries have mostly lack of energy resources and they have to depend on outside. So they have created technologies for renewable energy.

People generally comprehend the value of energy when they face with the power cut or the increase on oil prices. In fact there are various reasons of the requirement to develope renewable energies. Using energy is also the main reason of pollution. On the other hand, energy sources are directly or indirectly available on the nature. However, with the increase of world's population, the natural resources are destroyed and the world is undergoing climates changes. So it is important both individuals and

institutions to learn the value of energy and to know how to use it effectively. In this respect the relationship between economical development and the consumption of renewables, and the role and importance of renewable energy companies were examined in this study.

The main aim of this study is to investigate the importance of the businesses operating in renewable energy field to ensure sustainable economic development, and the adequacy of government support provided to these businesses in terms of Turkey by comparing with EU energy policies. In the first part of the study, the importance of renewable energy and the purpose of the study is stated. In the second part, the energy resources conditions and the types of traditional and renewable energy sources are explained. In the third part, sustainable development, energy market, energy demand, energy prices, and the renewables' effects on economic growth are discussed. In the last part, Turkey and EU energy policy are revealed. Then the government incentives provided to enterprises operating in the renewable energy field in Turkey are examined in comparison with the countries in EU by using the datas of Turkish Statistical Institute (TUIK), Turkey Ministry of Commerce, International Energy Agency, European Commission, OECD and World Bank. Finally, the findings of the study are evaluated and certain recommendations are made.

2. THE IMPORTANCE, TYPES AND CHARACTERISTICS OF RENEWABLE ENERGY

2.1 What is Energy?

The dictionary meaning of energy includes many definitions. Accordingly, energy is "the strength and vitality required for sustained physical or mental activity", or "power derived from the utilization of physical or chemical resources, especially to provide light and heat or to work machines", or "the property of matter and radiation which is manifest as a capacity to perform work (such as causing motion or the interaction of molecules)" (Oxford Dictionaries, 2019).

The term energy is derived from Greek "energon", which means "force in action". Energy is the capacity to perform work, impart movement or raise temperature such as heating a building, cooking food. Energy is produced via using natural sources like wind or solar energy, from the combustion of fuels; or combustible materials like oil, gasoline, diesel fuel, fuel oil, natural gas, coal, wood; or from electricity (Favennec, 2011).

The word energy refers to the movement of an object against the resistance shown to it. Energy is defined as the main input of many means of production. Energy can be in different types such as mechanical, kinetic, electrical, thermal, magnetic, chemical and these forms can be converted from one to the other (Albayrak, 2019).

The phenomenon of energy is explained as the capacity for doing work in the terminology of physical science. This can be done in various ways, such as lifting, accelerating or heating any material. However, it is seen that the economic meaning of the word energy differs from its meaning in physics. In the economic sense, energy refers to all resources or commodities that embody a significant amount of physical energy and thus ensure the ability performing work (Sweeney, 2002). Therefore, energy is an important production factor. In addition, energy is an important element that enables all living things in the world to survive.

From an economic and social point of view, energy is the most important factor in the development of world standards of living and development of country. Along

with the great industrial developments, the increase of the world population brings out the need for energy. While fossil resources (coal, petroleum, etc.) had been used in the past to meet the energy which is required in all fields of life, today renewable and convertible (wind, solar, hydraulic, etc.) energy sources are produced as well (Koç et al, 2018).

According to the U.S. Energy Information Administration (EIA), "energy is the ability to do work". Energy can be in various forms such as heat/thermal, light/radiant, motion/kinetic, chemical, nuclear, electrical and gravitational. Humanbeing use it for many purposes from walking on the way to sending rockets to space. There are 2 sorts of energy. These are: stored/potential energy and working/kinetic energy. For instance, the food that is ate by a person includes chemical energy. However the body of the person stores this energy till it is used by him or her as kinetic energy for working or playing. Energy sources are categorized in two different groups as renewables and nonrenewables. While renewables are the sources which can be easily replenished, nonrenewables are the sources which cannot be easily replenished (U.S. Energy Information Administration, 2019).

Energy takes place in business and social society as an indispensable element. Energy conversion activities now become affecting the balance of life. People need three elements to continue their life. These are (Çubuk, 2019):

- Material
- Energy (required for production of the material.)
- Information (required for using energy)

Information is also necessary for efficient use of energy. These three elements are integrated and cannot be separated. In most companies, energy has become significant in two main forms. These are (Çubuk, 2019):

- Direct production of a product (e.g., energizing in a steam boiler; powering to electric motors),
- At events that support the manufacturing process (e.g., heating offices and warehouses; hot water services; lighting).

2.2 Global Warming

The influence of greenhouse effect is significant on global warming. The greenhouse effect is a natural process that warms the Earth's surface. When the Sun's energy reaches the Earth's atmosphere, some of it is reflected back to space and the rest is absorbed and re-radiated by greenhouse gases. Greenhouse gases include water vapour, carbon dioxide, methane, nitrous oxide, ozone and some artificial chemicals like chlorofluorocarbons. The absorbed energy warms the atmosphere and Earth's surface. This process maintains the Earth's temperature at around 33 degrees Celsius warmer than it would otherwise be, allowing life on Earth to exist. The problem we now face is that human activities. Particularly burning fossil fuels (oil, coal, and natural gas), agriculture and land clearing - are increasing the concentrations of greenhouse gases. This is the enhanced greenhouse effect, that has been contributing to warming of the Earth. The six basic steps of Greenhouse effect is given below (Australian Government Department of the Environment and Energy, 2019).

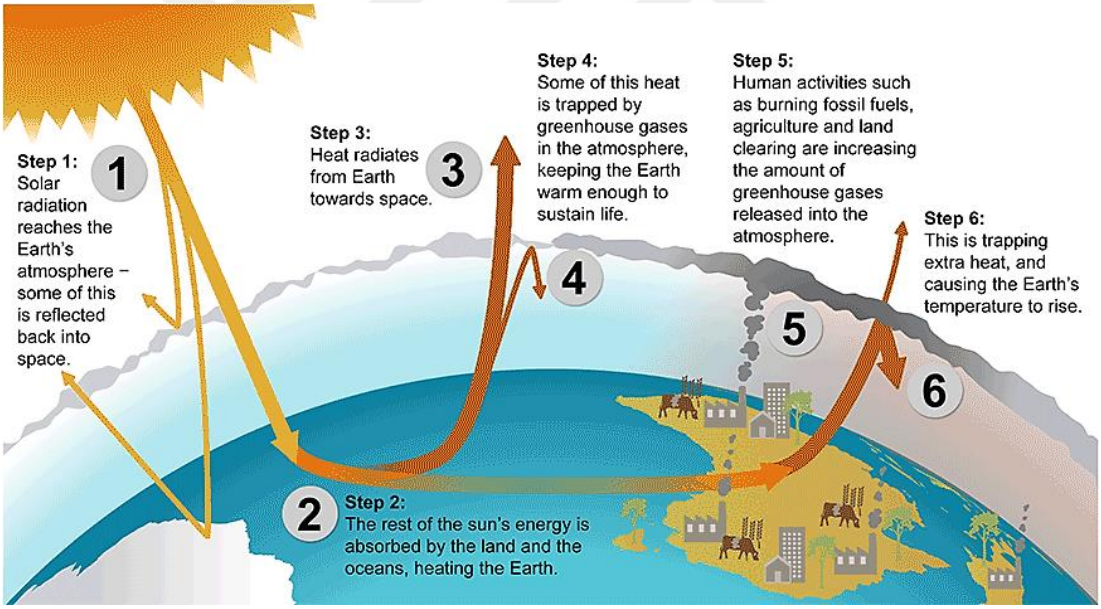

Figure 2.1: Greenhouse Effect

Source: Australian Government Department of the Environment and Energy, 2019

In thermal power plants, in industries and in buildings, using coal as fuel causes pollution. Fuels contain heavy metals. This fact has a huge affect on pollution. Thus, WHO specified ten types of chemicals raising concerns on public health. 4 of them are heavy metals (cadmium, lead, mercury, arsenic) (European Environment Agency, 2018).

To use continuously fossil fuels leads certain global changes such big events like drought, heat waves, heavy precipitation; rise in sea level and enhanced flooding in fields close or below average sea-level; extreme-level weather events like storms; and increased ultraviolet radiation. So the degradation of the ecological balance of nature is unavoidable (World Health Organization, 2000). Therefore, production and consumption of energy can be much more harmful for the environment than the other people activities. This makes the way to generate energy crucial.

The World Health Organization years ago stressed the importance of the necessity developing indicators that determine the climate change's initial impacts. For this purpose, WHO has drawn attention to a broad monitoring scheme, developed by Haines and McMichael (1997), in order to monitoring to detect the early affects of climate change for human health in Europe (World Health Organization, 2000).

2.3 Energy Change Process in the World

The production processes in today's developed countries, which completed the industrialization process first, were transferred to other countries with the understanding of the harm to the environment caused by the increased production, consumption, population and the use of fossil energy in these countries. This shift, particularly to undeveloped or developing countries, involves mainly production processes that cause the most waste or require high fossil energy use. In time, with all these developments, the environmental problem has become a global issue by reaching higher dimensions regardless of the development level of countries. For the purpose of raising awareness and finding solutions against the issues - like changes on climate, natural sources' depletion, extinction of living species, detection of global disasters like energy, water, food, drought - environmentally sensitive green and sustainable thinking style has started to be formed (Çevikalp, 2019). Thus production methods have also evolved in accordance with the environment.

The production change process in the World is given below in chronological order (Çubuk, 2019) :

- Year 1960: Everything is for production.
- Year 1970: Everything is for production + cost.
- Year 1980: Everything is for production + cost + quality.
- Year 1990: Everything is for production + cost + quality + term.

- Year 2000: Everything is for production + cost + quality + term + management and Environmental awareness.

At the U.N.'s Human Environment Conference the which is held in Stockholm on 5-16 June 1972, certain issues were declared on the basis of the necessity of common views and principles to guide people to protecting and strengthening of environment. At this conference, it was emphasized that the protection of the environment as a whole with the natural resources and living things on it is a duty at the level of individuals and state. It is stated that population growth is expected to have negative effects on the environment and resources in the future. In addition, it is mentioned that the development plans of the countries and the aim of preventing the damage to the environment should be carried out in coordination. International cooperation, supportive international institutions, encouragement and development of scientific studies, and environmental education of individuals are considered as solutions for the development's realization while protecting the environment (Türkiye Barolar Birliği, 2014).

2.4 Energy Saving

There is a change process in the world today. The demarcation of borders between different countries and increasing globalization requires more international understanding and cooperation. The world is also faced with serious environmental problems like global warming and acid rains. For health, environmental and economic reasons, strategies are being developed to reduce air pollution. In parallel with this change process, the the concept of "sustainable development" in industrial strategy planning and project is emerging increasingly (Çubuk, 2019).

Energy saving is not a crucial issue only from a financial aspect, however also from the efficient use of energy due to the limited resources and increased levels of environmental pollution. Thus, energy management systems that will provide efficient use of energy come to the agenda. Energy policy of developing countries always aims to provide together economic growth, energy security and environmental protection (3E) (Çubuk, 2019):

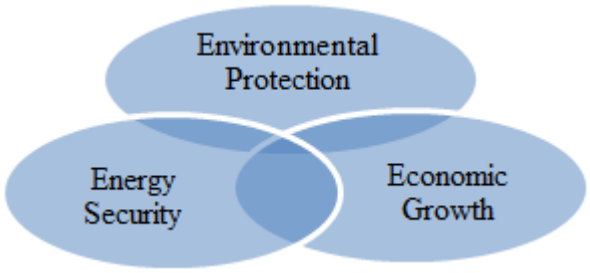

Figure 2.2: 3 E of Energy: Economic Growth, Energy Security and Environmental Protection

In 2005, the European Union published a "Green Book" on energy efficiency, in which certain measures were proposed to reduce waste. It was stressed that success cannot be based solely on technological advances, it must also come from enhanced awareness that encourages consumers to change their behavior. On the world scale, initiatives that aim improving energy efficiency and reducing fossil energy consumption remain limited. In addition, the measures prepared by them could only be adopted when a serious supply crisis emerged (Favennec, 2011).

Energy savings should not be considered as reducing or restricting energy supply. Energy saving is the reduction of energy consumed per product, not the amount of energy used. The producer, which reduces energy consumption, will increase its competitiveness in national and international arena by generating the same numbers of goods and services via less energy or by generating more goods or services via the same numbers of energy. Saving energy means using energy efficiently without any reduction in production, comfort and labor, ie, not wasting. So, it refers to doing the same job by using less energy. Unconscious consumption has brought up the issue of preventing the environmental pollution, caused by the disposal of solid, liquid and gaseous wastes into the nature without treatment, as well as the efficient use of energy resources (Çubuk, 2019).

Turkey's energy consumption is increasing rapidly as well. This leads to the unconscious and rapid depletion of natural resources. Approximately one third of the energy produced is consumed in industry. However, it is possible to recover a significant amount of this energy through energy saving measures using advanced technology (Çubuk, 2019). By saving energy, Turkey can get rid of the energy

shortage, and the industrialists in Turkey can increase their competitiveness by achieving the same product at a lower cost.

2.5 Why Energy Management ?

Although energy is a basic necessity to sustain human life, energy consumption is accepted as an indicator of welfare level. Energy, which has an undeniable importance on the axis of life, production and service cycle, forms the basis of economic activities and in this context, the concepts of "energy economy" and "energy management" are becoming increasingly important (Albayrak, 2019).

The demand of the Global energy is expexted to increase substantially in next few decades. This is basicly because of the estimated growth of world's population and the economy, industrial growth of developing countries (e.g. China and India). In addition, reducing the amount of greenhouse emissions, particularly carbon dioxide from fossils fuel- is required to tackle climate change and achieve global sustainability. The way to solve these issues is managing energy use more effectively. Energy management is a significant strategy for energy users seeking to avoid energy price volatility and reduce the use of resource. It can also ensure further benefits for overall effectiveness and social responsibility of an organization. (Energy Institute, 2019).

The terms "energy management" and "energy efficiency" are generally used synonymously. In fact, there are some differences between them. Enegry Efficiency is "the use of minimum amount of energy while maintaining a desired level of economic activity or service. In other words, energy efficiency is the amount of useful output achieved per unit of energy input. Imroving energy efficiency means either achieving more form the same input or achieving the same otput with less energy". Energy Management is "a systematic and continuous effort to improve energy efficiency within an organization. It can take many forms and involve all types of interactions with energy, from procurement and purchasing strategies to technological improvements and behavioural changes" (Energy Institute, 2019).

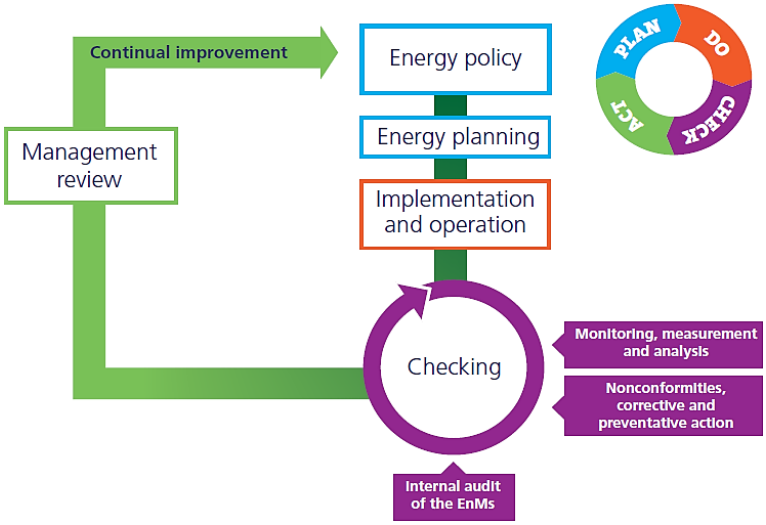

Figure 2.3: Significant Steps for Implementing ISO 50001 Energy Management System Model

Source: Energy Institute. *Energy Essentials: A Guide to Energy Management, 2019*

It can be stated that energy management is connected to the other managerial types in organisation (e.g. risk, asset or resource management). Managing energy can be adjusted according to the size and requirements of the organisation. To be effective, it requires the implementation of a flexible, value-oriented system in line with the organization's strategic objectives (Energy Institute, 2019). Several energy management standarts have been provided for the use of energy organisations since 2000. ISO 50001: 2011-Energy Management Systems standart is given above (Energy Institute, 2019).

With the developments in the world, the handling of energy management within the economies has changed. Thus the features of management and efficiency of energy in 20th and 21st century are different (Fawkes, 2018).

2.6 Energy in Different Forms

Today, there is no general classification of the energy which is used for the purpose of heating, cooling, transportation, electricity generation etc. However, various classifications are made considering the structural differences. Energy sources are categorized in two groups as “renewable (alternative) energy sources”, and “nonrenewable (fossil) energy sources” (Albayrak, 2019), depending on their reusability. In addition, energy sources are categorised in two groups as “primary energy sources” and “secondary energy sources” depending on the changing of their qualifications (Şentürk, 2012). The main sources of each category are listed in the table below.

Classification of energy sources are :

Primary Energy Sources - Coal, Oil, Natural Gas, Boron, Nuclear, Wave, Sun

Secondary Energy Sources - Electricity, Hydrogen

Renewable Energy Sources - Hydraulic, Geothermal, Solar, Wind , Sun

Nonrenewable Energy Sources - Oil, Natural Gas, Coal, Nuclear Energy

(Rahmani, 2019).

2.6.1 Primary and secondary energy

Primary energy is the energy resulting from the exploitation of resource available in nature such as coal, wood, oil, wind, natural gas, solar radiation, hydraulic or geothermal energy. These energies cannot always be used directly. They must be converted first. For example, oil is refined for obtaining gasoline. Secondary energy results from the transformation of a primary energy by using a conversion system. For example, electricity (secondary energy) is produced via using coal or gas (primary energy) in a thermal power plant; or via using uranium (primary energy) in a nuclear power plant. Changing from primary energy into secondary energy involves transformation or conversion losses (Favennec, 2011). Primary energy sources are oil, natural gas, coal, wood, nuclear and water etc. The most important type of secondary energy obtained by the change of primary resources through various processes is electrical energy (Şentürk, 2012).

2.6.2 Renewable and nonrenewable energy

Energy sources can be divided as renewables or nonrenewables. Renewables and nonrenewables are defined and classified by EIA as follows (U.S. Energy Information Administration, 2019) :

- Renewable: An energy source that can be easily replenished.
- Nonrenewable: An energy source that cannot be easily replenished.

It is possible to use renewables and nonrenewables use as primary energy for producing useful energy like heat, or for producing secondary energy like electricity.

There are 5 basic renewable energy sources:

- Solar energy from the sun
- Geothermal energy from heat inside the earth
- Wind energy
- Biomass from plants
- Hydropower from flowing water

There are 5 basic nonrenewable energy sources:

- Oil and petroleum products
- Hydrocarbon gas liquids
- Natural gas
- Coal
- Nuclear energy

Coal, crude oil and natural gas are known as “fossil fuels” since they have been formed from the remains of dead plants and living things over millions of years. Nuclear energy is produced from uranium, atoms of whose are split to create heat and, eventually, electricity.

Non-renewable energy sources can be used once and cannot function as energy sources again. They also often leave a hazardous waste to the environment. However renewable energy sources are not only cleaner, bu also less harmful for environment than nonrenewable energy sources. These sources do not become unusable again after being used (Şentürk, 2012).

Statistics show that, nonrenewables made up nearly 90% of U.S.'s energy consumption in 2018, Biomass is the largest renewable energy source with apoximately 45% of all the consumption of the renewables.

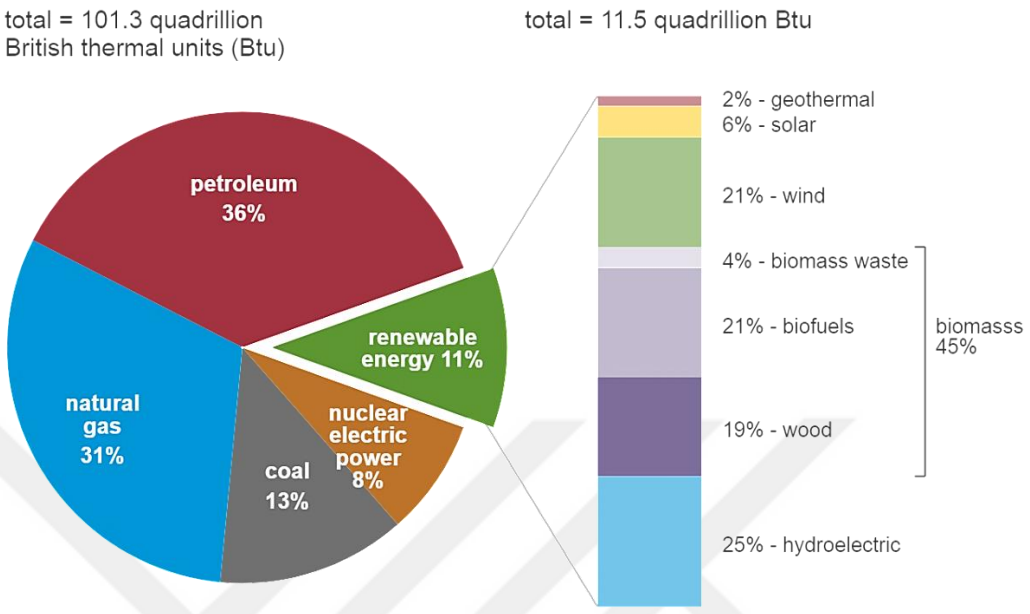

Figure 2.4: U.S. Energy Consumption by Energy Source, 2018

Source: U.S. Energy Information Administration (EIA), 2019.

2.6.2.1 Advantages and disadvantages of renewable energy sources

Today, renewables like wind, solar, hydro and geothermal get more popular worldwide. Countries, organisations, and individuals have been adopting renewable energy for numbers of benefits. But these sources have some limitations as well. The benefits and limitations of renewables are explained in the following (Thoubboron, 2018).

The use of renewables over fossil fuels has several advantages. The main advantages of going green are given below:

- Renewable energy will not run out: The technologies of renewables including sunshine, biomas, wind, tides etc. straight from the environment for generating.
- Lower requirements for maintenance: The technologies of renewables are mostly required less maintenance cost than generators that use standart fuel. This is since generating technology like solar panels and wind turbines are

not dependent on flammable and combustible fuel for operating. Thus less maintenance requirements save time and money.

- Saving money: The use of renewables can ensure saving money for both maintenance and operating costs. Because, while using the technology generating power via wind, sun, steam, or natural sources, it isn't required paying for refuel. While the amount of money to be saved using renewables depend on the technology itself and many other factors, mostly, the transition to renewables provides substantial savings.
- Numbers of benefits for health and environment: Renewables emit less or no greenhouse gas into air. On the contrary, using fossil fuels emit greenhouse gases and other harmful pollutants leading health problems. issues.
- Based on foreign energy sources lower: Energy can be produced locally via technologies of renewables. Using more renewables for power requirements refers to less need to import energy.

It can be said that renewables have more advantages than disadvantages. The transition to renewable energies at the personal, institutional or state level won't just help saving, but will also providing a clean and healthy environment for future. Some limitations to use renewable sources instead of traditional sources are given below:

- Higher upfront cost: Although it is possible saving money by using renewables, its technology is mostly more expensive than standart energy generators., financial incentives, like tax credits are used to support alleviate the initial costs of renewable technology. To overcome this, financial incentives, such as tax credits and discounts that will support reducing renewable technology costs, can be used.
- Intermittency: Renewables sources may not be available 24/7. There may be unforeseen weather events (such as drought) which disrupt using renewable technologies.
- Storage capabilities: Since some renewables are intermittent, there is a great requirement for energy storage. This can be particularly expensive for larger renewable power plants.
- Geographic limitations: Due to differences such as different climates, topography, vegetation, some geographies do not suit to the technologies of renewables. For instance, a large-scale farm can be a suitable place for a wind

or solar system, however a town house cannot benefit from these technologies.

2.6.2.2 Advantages and disadvantages of nonrenewable energy sources

Non-renewables make up nearly 95% of the world's electricity needs and it is estimated to increase. Non-renewable energy sources have numbers of advantages as well as certain disadvantages. These are given below (Johnson, 2017).

The main benefits of non-renewable energy sources are as follows:

- Relatively cheaper: Fossil fuels as energy soruces are still cheaper sources for their being abundance in the world. Eventhough such sources can exhausted one day, the current infrastructure is based on them. Therefore, it may be cheaper for companies to realize their production with fossil fuels than to invest in alternative technologies.
- Power-Plants can generate more power: Fossil fuel plants can generate large amount of power. This is an significant benefit because placing a plant in a regional location can power both buildings and homes for thousands of miles.

The main downsides of non-renewable energy sources are as follows:

- Finite amount: Non-renewables are finite on earth. Fossil fuels will ultimately be exhausted on the earth if it is used constantly. This refer to that new alternative energy sources will eventually be required.
- Negative effect on the environment: Fossil fuels release carbon dioxide when burned. Releasing tons of pollution that is harmful to the planet creates a negative affect upon the environment. This is one of the biggest downside of fossil fuels. On the contrary, alternative energy sources cause nearly no carbon dioxide.
- Pollution: Sulphur dioxides and nitrous gases cause vast amounts of pollution, particularly in large cities. This can cause the events like acid rains.

2.7 Renewable Energy Sources

2.7.1 Water-hydroelectricity

Hydroelectric energy is obtained by converting the potential energy of water into kinetic energy via hydroelectric power plants (Albayrak, 2019). For a long time, people use water force that flow in rivers and streams for producing mechanical energy. One of the first energy sources which is used to generate electricity was hydropower (U.S. Energy Information Administration, 2019). Water is the essential source for all living requirements. Water can neither be created nor destroyed, however it is constantly moved around. This is called "water cycle" (runoff, evaporation, precipation, etc.). Water runoff provides energy that can be transformed into electricity and the process has a high efficiency. Many dams were built in the 1950s, and today most of the best sites are already being exploited in zones such as Europe. The construction of dam can cause some harmful results such as the flooding of extended areas and displacement of the population. Tidal energy generates electricity by using the same principle as hydroelectricity, but its production is intermittent. Ocean wave energy is a combination of wind and hydraulic energy. The wind applies a force which is concentrated on the ocean surface and this energy can be recovered by floats equipped with pumps. Lastly, differences between temperatures of sea water at different depths can be used for producing energy (Favennec, 2011).

2.7.2 Wind energy

Wind energy is obtained from moving air. Wind is caused by uneven heating of the earth's surface by the sun. The sun's heat is absorbed at different rates, as the earth's surface consists of various types of water and land. For instance, the daily wind cycle. Nowadays, wind energy is mostly used for producing electricity. Water pumping windmills operate on ranches and farms, mainly for providing water for livestock (U.S. Energy Information Administration, 2019).

2.7.3 Solar energy

The sun is the basic and oldest source to produce all energy types and fuels that is used today. In time, new technologies are developed to collecte solar energy for

heating and convertig it into electricity. Solar energy has two main benefits: it does not produce pollutants on air or carbon dioxide, and solar energy which is used on buildings has minimum affects on environment. There are some downsides of solar energy. Sunlight amount arriving at the earth's surface is not continuous. This amount changes according to the location, season, time, and weather conditions, sunlight amount tthat reachs a square foot of the surface of the earth is relatively small. Thus a large surface area is needed for absorbing or collecting a useful amount of energy (U.S. Energy Information Administration, 2019). The electricity produced from this way has the same quality with the electricity produced from others. The prices are decreasing and the quality of production is effective.

2.7.4 Geothermal energy

Geothermal energy which is heat within the earth is a renewable energy source. Because heat can be constantly obtained inside the earth. Geothermal heat is used for bathing, heating buildings, and producing electricity. This energy is from deep inside the earth. Geothermal energy is produced by the slow decay of radioactive particles in the earth's core, a process which happens in all rocks (U.S. Energy Information Administration, 2019).

2.7.5 Biomass energy

Biomass is an organic material. It comes from plants and animals. It contains stored energy from the sun. Plants absorb the energy of the sun via photosynthesis process. The chemical energy in biomass is released as heat when biomass is burned. Biomass can directly be burned or it can be converted into liquid biofuels or biogas that can be burned as fuels. Woods and wood processing wastes; agricultural crops and waste materials; food, yard, and wood waste in garbage; and animal manure and human sewage, are main examples of biomass to generate energy (U.S. Energy Information Administration, 2019).

2.8 Nonrenewable Energy Sources

2.8.1 Oil and petroleum products

Crude oil is a mixture of hydrocarbons formed from animals and plants that lived millions of years ago. Crude oil is a fossil fuel in liquid form existing in underground pools. Petroleum products are fuels that are made from crude oil and other hydrocarbons in natural gas. They can be made from coal, natural gas and biomass as well (U.S. Energy Information Administration, 2019).

Oil is a strategic raw material. Much of the civilization is based on the transportation of individuals or goods. Passenger cars operate mainly with gasoline or diesel fuel, planes with jet fuel, and trucks with diesel fuel. Other fuels are gas, fuels produced from biomass, or even hydrogen. But currently, none of them are economically competitive compared to petroleum products. Petroleum products supply nearly 97 percent of fuel requirements. Oil is therefore essential in transport sector. Economic activities are not possible without petroleum products (Favennec, 2011).

Oil is shown as a leading reason of the wars. Almost ¼ or 1/2 of interstate wars since 1973 are connected to oil related mechanisms. No other goods or services have had such an affect on world security. Oil fuels international conflict through eight distinct mechanisms. These mechanisms can cause to conflict in combination or individually. These are (Colgan, 2013) :

- Resource wars, in which states try acquiring oil reserves by force,
- Petro aggression, whereby oil insulates aggressive leaders from domestic opposition, therefore makes them more ambitious to engage in risky foreign policy adventurism,
- Civil wars' externalization in oil-producing states ("petrostates"),
- Financing for insurgencies,
- Conflicts that are triggered by the expectation of oil market domination,
- Clashes over control of the transit routes of oil, like pipelines and shipping lanes,
- Oil related grievances, whereby the existence of foreign workers in petrostates, helps extremist groups to recruit locals,

- Oil related barriers to multilateral cooperation, like when the attempt of an importer to curry favor with a petrostate avoids multilateral cooperation on security issues.

The world experiences military conflict's perpetuating patterns followed by oil supply crises, and accompanying global financial recessions. The oil related difficulties on security, humanitarian, and economic have become increasingly dangerous (Jaffe and Elass, 2015). It can be stated that addition to the business and human needs, oil is also used in war and oil also creates war.

2.8.2 Natural Gas

Natural gas occurs at depths beneath the earth. Natural gas contains various of elements. The largest element of natural gas is methane (CH4). Natural gas contains smaller amounts of natural gas liquids, and nonhydrocarbon gases as well. It is used as a fuel, and for making chemicals and materials (U.S. Energy Information Administration, 2019). Natural gas is a light, colorless and odorless gas. It is the cleanest fossil fuel used (Albayrak, 2019). Gas production's geography differs from the oil production's.In addition, while oil transportation's cost represents only a small part of its price, gas trasportation's cost and distribution is very high. Natural gas can be transported by gas pipeline or by tankers (Favennec, 2011).

2.8.3 Coal

Coal is a rock with a high amount of carbon and hydrocarbons that is combustible black or brownish black sedimentary. It is a nonrenewable energy source since its forming takes millions of years. Layers of dirt and rock covered the plants over millions of years. Thus the heat and pressure turned the plants into the substance called coal (U.S. Energy Information Administration, 2019). Coal is used extensively for heat and electricity production in domestic and industrial areas, especially in thermal power plants (Albayrak, 2019).

2.8.4 Nuclear energy

Nuclear energy is the energy in an atom's core (U.S. Energy Information Administration, 2019). It is the conversion of the heat energy resulting from the decomposition of atoms into electrical energy. The fuel used in the power plants

constituting this energy is uranium. Uranium is not renewable and its processing results in waste (Albayrak, 2019). Nuclear energy's advantage is that it doesn't produce greenhouse gases. But it gives rise to radioactive wastes that is the risk for people and the environment (Favennec, 2011).

3. SUSTAINABLE DEVELOPMENT, ENERGY MARKET AND THE EFFECTS OF RENEWABLE ENERGY ON ECONOMIC GROWTH

3.1 Sustainable Development

The significant term for each economy "Sustainable development" is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own need" (World Commission on Environment and Development, 1987). International Atomic Energy Agency pointed out the importance of the following issues about energy to ensure sustainable development (International Atomic Energy Agency, 2005).

Sufficient and cost efficient energy resources are crucial for economic development and the transition from agricultural economies to modern industrial and service oriented societies. Energy is indispensable for both economic and social prosperity. Sustainable development is the major factor for reducing poverty, improving human well-being, and raising standarts of living. Although energy is essential for development, it is in fact only a means to achieve a goal. No energy (coal, sun, nuclear, wind etc.) in itself is not good or bad.

Most of the current energy use and supply based on finite fossil fuel sources are not environmentally sustainable. There is no risk-free and waste-free energy generation or conversion technology. From the extraction of resources to the provision of energy services, all energy chains often lead to serious health and environmental problems. The combustion of fossil fuels is mainly responsible for risk of climate changes, air pollution in urban and regional acidification. Using nuclear energy has created numbers of concerns (e.g. the disposal or storage of high level radioactive waste, and the spread of nuclear weapons).

There are no reliable and safe sources of energy in many areas of the world. In fact, 1.7 billion people in the world do not have access to electricity. Being unable to access to modern energy services heavily restricts socio-economic development, which is sustainable development's integral part. However, a developing country that uses advanced energy systems today can provide a transition to an agricultural

industrial economy at lower cost and less damage for environment than developed countries.

The wise use of resources, technologies, appropriate economic incentives, and strategic policies will be required to achieve sustainable economic development on global-scale. While choosing energy fuels and related technologies- for the generation, delivery and use of energy services- economic, social and environmental consequences need to be considered. Policy makers need certain methods to measure and assess the current and future impacts of energy use on air, water, soil, society and human health. So, it is important to follow the indicators related to economic, environmental and social issues that constitute the basic dimensions of sustainable development.

The Energy Indicators for Sustainable Development given in the following table. There are 30 indicators that are divided into 3 dimensions as social, economic and environmental.

Social				
Theme	**Sub-theme**	**Energy Indicator**		**Components**
Equity	Accessibility	SOC1	Share of households (or population) without electricity or commercial energy, or heavily dependent on non-commercial energy	– Households (or population) without electricity or commercial energy, or heavily dependent on non-commercial energy – Total number of households or population
	Affordability	SOC2	Share of household income spent on fuel and electricity	– Household income spent on fuel and electricity – Household income (total and poorest 20% of population)
	Disparities	SOC3	Household energy use for each income group and corre-sponding fuel mix	– Energy use per household for each income group (quintiles) – Household income for each income group (quintiles) – Corresponding fuel mix for each income group (quintiles)
Health	Safety	SOC4	Accident fatalities per energy produced by fuel chain	– Annual fatalities by fuel chain – Annual energy produced

Figure 3.1: List of Energy Indicators for Sustainable Development

Source: International Atomic Energy Agency (IAEA) ,2005

Economic				
Theme	**Sub-theme**	**Energy Indicator**		**Components**
Use and Production Patterns	Overall Use	ECO1	Energy use per capita	– Energy use (total primary energy supply, total final consumption and electricity use) – Total population
	Overall Productivity	ECO2	Energy use per unit of GDP	– Energy use (total primary energy supply, total final consumption and electricity use) – GDP
	Supply Efficiency	ECO3	Efficiency of energy conversion and distribution	– Losses in transformation systems including losses in electricity generation, transmission and distribution
	Production	ECO4	Reserves-to-production ratio	– Proven recoverable reserves – Total energy production
		ECO5	Resources-to-production ratio	– Total estimated resources – Total energy production
	End Use	ECO6	Industrial energy intensities	– Energy use in industrial sector and by manufacturing branch – Corresponding value added
		ECO7	Agricultural energy intensities	– Energy use in agricultural sector – Corresponding value added
		ECO8	Service/ commercial energy intensities	– Energy use in service/ commercial sector – Corresponding value added
		ECO9	Household energy intensities	– Energy use in households and by key end use – Number of households, floor area, persons per household, appliance ownership
		ECO10	Transport energy intensities	– Energy use in passenger travel and freight sectors and by mode – Passenger-km travel and tonne-km freight and by mode

Figure 3.1 (**cont'd):** List of Energy Indicators for Sustainable Development

Economic				
Theme	**Sub-theme**	**Energy Indicator**		**Components**
	Diversification (Fuel Mix)	ECO11	Fuel shares in energy and electricity	– Primary energy supply and final consumption, electricity generation and generating capacity by fuel type – Total primary energy supply, total final consumption, total electricity generation and total generating capacity
		ECO12	Non-carbon energy share in energy and electricity	– Primary supply, electricity generation and generating capacity by non-carbon energy – Total primary energy supply, total electricity generation and total generating capacity
		ECO13	Renewable energy share in energy and electricity	– Primary energy supply, final consumption and electricity generation and generating capacity by renewable energy – Total primary energy supply, total final consumption, total electricity generation and total generating capacity
	Prices	ECO14	End-use energy prices by fuel and by sector	– Energy prices (with and without tax/subsidy)
Security	Imports	ECO15	Net energy import dependency	– Energy imports – Total primary energy supply
	Strategic Fuel Stocks	ECO16	Stocks of critical fuels per corresponding fuel consumption	– Stocks of critical fuel (e.g. oil, gas, etc.) – Critical fuel consumption

Figure 3.1 (**cont'd):** List of Energy Indicators for Sustainable Development

Environmental				
Theme	**Sub-theme**	**Energy Indicator**		**Components**
Atmosphere	Climate Change	ENV1	GHG emissions from energy production and use per capita and per unit of GDP	– GHG emissions from energy production and use – Population and GDP
	Air Quality	ENV2	Ambient concentrations of air pollutants in urban areas	– Concentrations of pollutants in air
		ENV3	Air pollutant emissions from energy systems	– Air pollutant emissions
Water	Water Quality	ENV4	Contaminant discharges in liquid effluents from energy systems including oil discharges	– Contaminant discharges in liquid effluents
Land	Soil Quality	ENV5	Soil area where acidification exceeds critical load	– Affected soil area – Critical load
	Forest	ENV6	Rate of deforestation attributed to energy use	– Forest area at two different times – Biomass utilization
	Solid Waste Generation and Management	ENV7	Ratio of solid waste generation to units of energy produced	– Amount of solid waste – Energy produced
		ENV8	Ratio of solid waste properly disposed of to total generated solid waste	– Amount of solid waste properly disposed of – Total amount of solid waste
		ENV9	Ratio of solid radioactive waste to units of energy produced	– Amount of radioactive waste (cumulative for a selected period of time) – Energy produced
		ENV10	Ratio of solid radioactive waste awaiting disposal to total generated solid radioactive waste	– Amount of radioactive waste awaiting disposal – Total volume of radioactive waste

Figure 3.1 (cont'd): List of Energy Indicators for Sustainable Development

3.2 Energy and Society

Worldwide, the need for energy is constantly increasing, while resources are gradually decreasing. Increasing demand for energy is pushing the world to look for a new source every day. Population estimates for the world are expected to double the population of cities in 2050 and economic growth is expected to occur in developing countries. However, it is predicted that as many people reach the middle class standard of living, the amount of energy per capita will increase. This means more source consumption (Kafalı, 2015).

Today, very little of the increasing demand for energy consumption is due to natural needs such as population growth. It is required to diversify the energy sources sufficiently to cover the increasing demand. In addition to fossil fuels, it is significant to expand the use of renewables such as wind, solar, geothermal and wave energy. Moreover, the world will be kept cleaner. (Kafalı, 2015). However, waste and inefficiency play the key role in the increase of energy demand.

Considering that many people doesn't have access to electricity, the importance of energy efficiency is understood. The efficient use of energy, in particular, which supplies a vast amount of energy is extremely important in terms of Turkey. Inefficient use of energy leads to a further reduction in already scarce resources and an increase in external dependency and current account deficit. Indeed, energy, permanently constitute the agenda of the debates related to the current account deficit and whether nuclear power plants should be used or not in Turkey (Kafalı, 2015).

Mankind has to face the question of how much of the energy produced is actually spent for needs (Kafalı, 2015). As a matter of fact, developed societies question the sustainability of energy resources and they consciously demand the energy options of the future which can be an alternative to fossil fuels. By increasing awareness of individuals and societies on energy, efficient use of renewable energy sources will be ensured. For this purpose, the relationship between energy and society was examined by a special issue titled "Energy and Power" published by Scientific American in 1971 and it was found that diversified and rising energy consumption caused economic, social and environmental problems (Kiraz, 2005).

The massive use of fossil fuels is the problem of pollution. Petroleum products will continue using for many years in transportation sectors. Also Industrial sectors needs

fossil fuels for their massive requirement of energy. It is important to develop the renewable energy and technologies related in producing renewable energy. The more technology developed will reduce the operating costs.

There are some alternatives used worldwide to reduce energy use. For example better building designs and insulations can save energy. Today especially in countries that have strong winter make their buildings insulation to loss heats produced by burning natural gas or electric heater. These insulated buildings make ever cooler in summer and prevent from entering heat from outside. So the need of electricity energy for air conditioning is also reduced. In addition by setting many wind turbines, solar energy power plants can be replaced the massive use of fossil fuels and petroleum products. Wind turbines and solar power plants can be easily set up and is useful in many parts of the world. And it doesn't need higher technology compare to current wave turbines. And even a small house can easily have solar power plants to be used in heating and lighting.

3.3 Energy Market

In terms of commercial aspect, energy is divided into two parts as "commercial energy" and "non-commercial energy". Commercial energy sources are usually sold or traded in global markets as entity (like selling a ton of coal), or their equvalents (such as selling one kilowatt of electricity). Non-commercial energy sources are freely obtained, such as sunlight and water. They can be freely used (e.g. the case of solar cooking using the sun's heat). Although they do not have a commercial value as they exist, they can still be used commercially and for profit (Blazev, 2016).

Global energy markets start in exporting countries that have a lot of energy, mostly fossil, sources and can successfully export them by making a profit. If there is enough surplus after allocating enough energy for domestic use, it can be exported to countries all over the world. Thus, global market activities begin. According to the following figure, the key elements in the energy markets are (Blazev, 2016) :

- Exporting counties: Energy markets start in the producing countries that provide the necessary energy to those in need. If there is no energy production, there is no energy market.

- Importing coutries: The importing countries generate the energy demand taht is supplied either by internal means or by imports. Most coutries import at least one or another type of energy.
- Energy companies: The energy companies produce, buy, process, convert, and sell all kinds of energy, products and services. This category includes crude oil, mainly coal mining, and natural gas producing companies.
- Oil refineries: Oil refining is conducted by the energy companies and often by third parties (e.g. chemical companies).
- The Utilities: Generating and distributing the power is the business of the local and regional utilities. Because they manage the generation and distribution.of the electric power
- Customer base: The residential and commercial customers are drivers of the energy markets since they determine the overall energy demand in different countries.

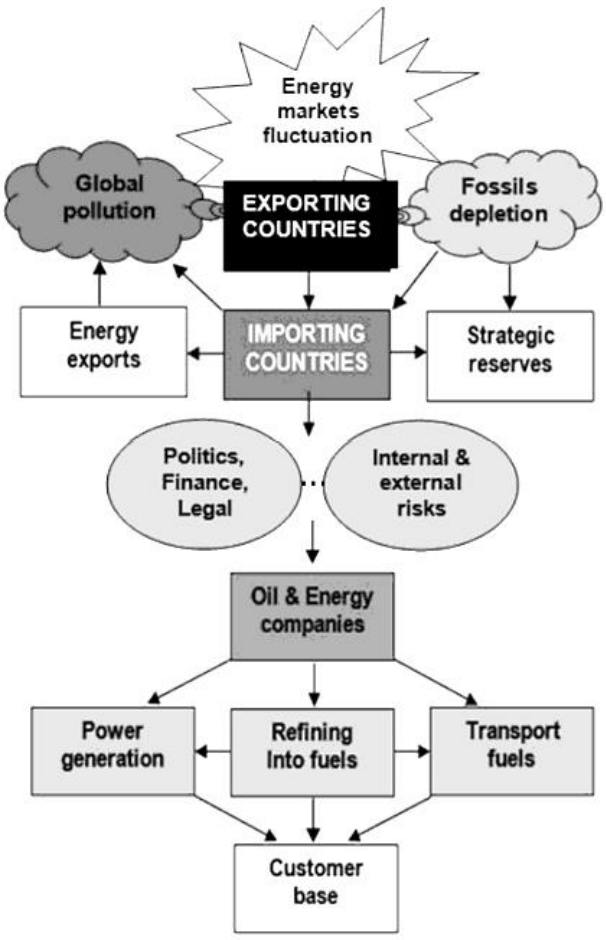

Figure 3.2: The Global Energy Markets

Source: Blazev, 2016

The global energy market is full of various of products, services and related activites. It contains complex and expensive equipment, processes, procedures and all kinds of projects driven by different people and entitles of different nationalities. Energy market is a huge and dynamic market, that has been undergoing some major, unpredictable and quite rapid changes lately. Some of the changes are good, some are bad. However, it is difficult to consider the good and bad sides of the equation, to follow the rapid trends and the associated risks, to understand and predict by itself (Blazev, 2016). Building and developing of production capacity and transport and distribution networks in energy sector's industries have often been conducted by private enterprises. However, governments have quickly considered the strategic importance of energy industries and have decided to play a significant role in their development (Favennec, 2011).

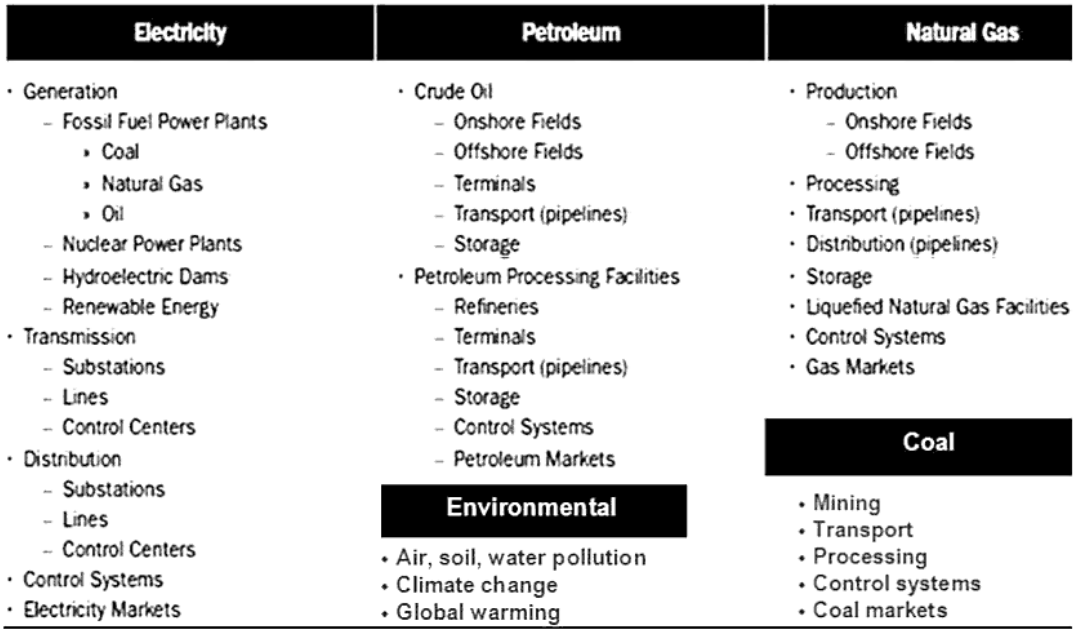

Figure 3.3: The Energy Sector and the Related Markets

Source: Blazev A. S. 2016

In order of importance and priority, the major risks to the proper function of the energy markets can be categorized as follows (Blazev, 2016) :

- Short-to-mid-term price fluctuations
- Pending and inevitable depletion of fossil energy sources
- Increasing global socio-political unrest and criminal activities
- Increasing environmental problems.

3.4 Energy Demand

It is estimated that the energy demand Global-scale will increase substantially in the next few decades. This is basicly for the estimated growth of the world population and the economy, and industrial growth of developing countries (e.g. China and India). In addition, reducing the amount of greenhouse gas emissions- particularly carbon dioxide emissions from fossils fuel- is required to tackle climate change and achieve global sustainability. The way to solve these issues is managing energy use more effectively. Energy management is a significant strategy for energy users seeking to avoid energy price volatility and reduce the use of resource. It can also ensure further benefits for overall effectiveness and social responsibility of an organization. (Energy Institute, 2019).

The figure below shows the projected increase in the total energy consumption of OECD and non-OECD Countries between 1990 and 2040. Accordingly, from 2010 to 2040, more than 85 percent of the increase in global energy demand occurs among the developing countries outside the OECD, driven by strong economic growth and increasing populations. On the other hand, with their slower estimated economic growth and little or no estimated population growth, OECD member countries are already more mature energy consumers (U.S. Energy Information Administration, 2013).

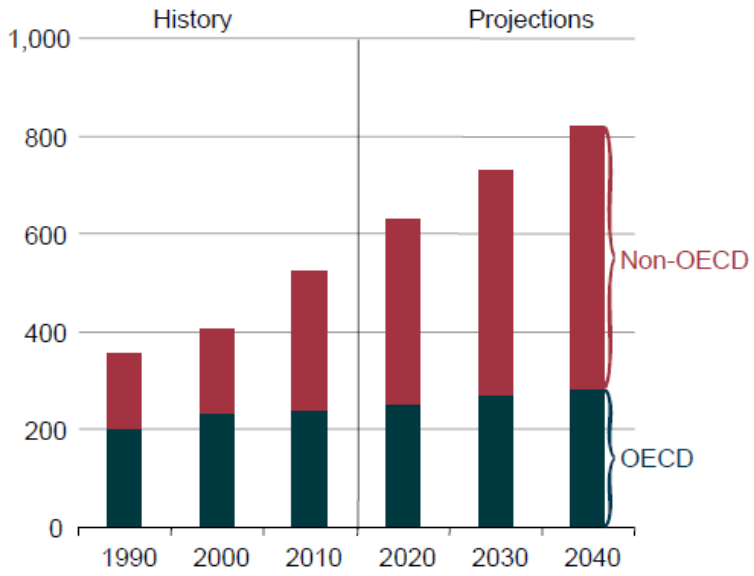

Figure 3.4: Historical and Projected World Total Energy Consumption, 1990-2040 (quadrillion Btu)

Source: U.S. Energy Information Administration (EIA), 2013

These is a link between economic growth and increased demand. Particularly during the post-war boom years of 1945-1975, energy consumption grew at the same pace as wealth measured by GDP. However currently, energy consumption is increasing more slowly than GDP. In the early 1980s, after ten times increase in the price of oil, a significant decline was observed in oil demand and overall energy demand. The price increase in the early 2000s was linked to strong worldwide growth. Energy demand fell only with the economic crisis (Favennec, 2011).

After World War II, from 1945 to 2010, the consumption of commercial primary energy is going from 2 Gtoe to 11 Gtoe. This increase was the chain reaction of unprecedented economic growth. These are commercial energy consumption. Non-commercial energy consumption, mainly biomass is roughly 1.5 Gtoe.The world can be divided into three groups depending on the three types of energy system throughout the history. Wood and man power are traditionally used especially in Sub-Saharan Africa and in Amazon, coal and steam are traditionally used in China and India. And oil is used in the OECD countries and in oil producing countries (Favennec, 2011).

Favennec (2011) shows the wealth as a key determinant of energy consumption for a country. For instance, a citizenship of the U.S. has an average annual income of 40,000$ (per capita GDP). This income amount is 40 times much higher than that of the income of a citizenship of Senegal. The energy consumption by an American citizenship is 8 tons of oil per year and that is 40 times greater than that of a Senegal Citizenship (Favennec, 2011).

Energy consumption increases very quickly with income when the latter is low or moderate for as long as industrialization in the country is growing. Then, when services play a greater role in the economy, energy consumption increases more slowly than income. So the ratio between electricity demand and economic growth is 0.6 in developed countries while the ratio is greater than 1 in developing countries (Favennec, 2011).

It can be statted that energy consumption and wealth of the country are related. Nevertheless, using only necessary amount of energy and saving energy can reduce environmental pollution and can protect the nature either in less percentage.

In addition, there are also some factors that influence countrys' energy consumption:

- Climate has a direct effect on energy consuming. Lighting home is indirectly related to the climate. Long nights in winter need to consume more energy than summer. Countries located in the cold regions consume more energy in winter. The energy consumption of these countries in the summer is relatively very low, because light time of day is long and air condition is rarely necessary. Countries situated in tropical regions consume energy continuously in air conditioning system. No heating system is needed for these countries even in winter. In the same way, burning fossil fuels has also negative effect on climate. It is leading to the global warming.
- Geography and land scape also have effect on energy consuming. Planning transportation networks also consumes a lot of energy depending on the terrain conditons. Transportation networks include building roads, building railways and building airports etc. Energy consuming facilities such as water desalination process is also included.
- Industrial and energy production process also consume large amount of energy. For example mining processes like production crude oil, coal, natural gas etc. Building a ship also consumes large amount of energy.

A continuous supply of energy is required for sustainable economic development. Especially having or controlling the petrol, which is a continuous energy for many countries in the world economic, shows that petrol is an indispensable source in terms of politics. There were many conflicts and wars to establish dominance on petrol reserves in history and is continuing to be seen in today also.

There are some legal regulations that give rise to privilege to every country on their oil issues. The situation of oil reserves of countries and the important weight of petroleum in economy are shaped by the petroleum laws.

Oil market has a structure of complex and dynamic. The complex structure is independent on each other and/or has a lot of things effecting each other and it is connected to qualitative political, economic, socio-cultural and technological factor. As oil industry is capital intensive and large scale in nature, companies working in this industry have a big economic power. And it can also apply strategy and policy to national and international level.

The first oil crisis came out from the effect of Arap – Israil war in 1973, has changed the world petroleum security structure and state-company-market relations. Consequently, in order to increase the USA oil security, it has begun to watch new policies with the effective thinking of reducing petroleum demand, looking for partners to collaborate with and using military power in oil sectors.

3.5 Outlook on the Developments of the Enegry Sources

Data regarding the developments on the energy production, consumption and prices in the world in 2018 are explained by using the graphs below (BP Statistical Review of World Energy, 2019; International Energy Agency, 2019).

3.5.1 Developments on the Global energy

The consumption of primary energy sources on Global-scale increased fastly in 2018, led by renewables and natural gas. However, carbon emissions increased at the highest rate for 7 years. The main energy developments are:

- The consumption of primary energy increased 2.9 % last year, nearly double its 10year average of 1.5 % per year, and the fastest since 2010.
- By fuel, the growth of energy consumption was led by natural gas. It is seen that all fuels increased faster than 10 year averages of them, apart from the renewable sources, although renewables still made up the 2d highest increment to energy growth.
- China, the U.S. and India together made up more than 2/3 of the global increase of energy demand, with U.S. consumption growing at its fastest rate for thirty years.

Primary Energy: Consumption*					Grow th rate per annum		Share
Million tonnes oil equivalent	2015	2016	2017	2018	2018	2007-17	2018
Total North America	**2736,2**	**2737,2**	**2755,5**	**2832,0**	**2,8%**	**-0,2%**	**20,4%**
Total S. & Cent. America	**695,3**	**691,1**	**699,8**	**702,0**	**0,3%**	**1,8%**	**5,1%**
Total Europe	**1996,8**	**2027,5**	**2050,0**	**2050,7**	**♦**	**-0,6%**	**14,8%**
Total CIS	**867,9**	**881,5**	**891,2**	**930,5**	**4,4%**	**0,5%**	**6,7%**
Total Middle East	**843,7**	**864,9**	**881,4**	**902,3**	**2,4%**	**3,8%**	**6,5%**
Total Africa	**430,1**	**439,4**	**448,6**	**461,5**	**2,9%**	**2,7%**	**3,3%**
Total Asia Pacific	**5475,7**	**5587,0**	**5748,0**	**5985,8**	**4,1%**	**3,2%**	**43,2%**
Total World	**13045,6**	**13228,6**	**13474,6**	**13864,9**	**2,9%**	**1,5%**	**100,0%**
of w hich: OECD	5495,7	5530,6	5586,9	**5669,0**	1,5%	-0,2%	40,9%
Non-OECD	7549,9	7698,0	7887,7	**8195,9**	3,9%	3,0%	59,1%
European Union #	1652,9	1670,4	1691,8	**1688,2**	-0,2%	-0,8%	12,2%

* In this review , primary energy comprises commercially-traded fuels, including modern renew ables used to generate electricity.
^ Less than 0.05.
♦ Less than 0.05%.
n/a not available.
USSR includes Georgia, Ukraine and the Baltic States.
Excludes Estonia, Latvia and Lithuania prior to 1985 and Slovenia prior to 1990.
CIS : Commonw ealth of Independent States

Figure 3.5: Global Primary Energy Consumption by Region

Source: It is complied from the dates of "BP Statistical Review of World Energy - all data, 1965-2018". https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html (25.06.2019)

	Energy Demand (Mtoe)	Growth rate (%)	Shares (%)	
	2018	2017-2018	2000	2018
Total Primary Energy Demand	14 301	2,3%	100%	100%
Coal	3 778	0,7%	23%	26%
Oil	4 488	1,2%	37%	31%
Gas	3 253	4,6%	21%	23%
Nuclear	710	3,3%	7%	5%
Hydro	364	3,1%	2%	3%
Biomass and waste	1 418	2,5%	10%	10%
Other renewables	289	14,0%	1%	2%

Figure 3.6: Global Energy Demand by Source

Source: International Energy Agency (IEA), 2019

	Total Primary Energy Demand (Mtoe)	Growth Rate (%)
	2018	2017-2018
United States	2 227	3,7%
China	3 155	3,5%
India	933	4,0%
Europe	2 010	0,2%
Rest of the World	5 568	1,8%
WORLD	14 301	2,3%

Figure 3.7: Global Energy Demand by Region

Source: International Energy Agency (IEA), 2019

Average global energy consumption per capita increased by 1.8% in 2018 to 76 GJ/head in 2018. Growth in 2018 was much higher than historical average (0.3% for the period 2007-17). North America is the region with the highest consumption per capita (240 GJ/head), followed by (161 GJ/head) in CIS and the Middle East (149 GJ/head). Africa remains the region with the lowest average consumption (15 GJ/head). South and Central America and Europe were the only regions in which average consumption per head decreased in 2018.

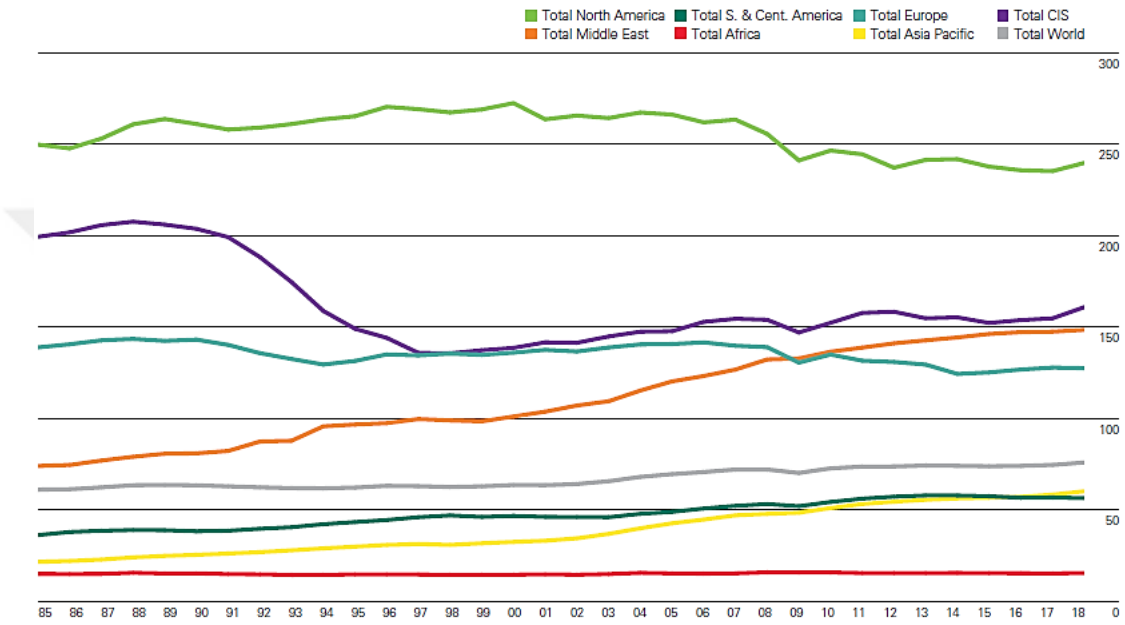

Figure 3.8: Energy Per Capita by Region (Gigajoules per head)

Source: BP Statistical Review of World Energy ,2019

3.5.2 Oil

- in 2017, the annual average oil price rose to $71.31 per barrel, up from $54.19/ barrel
- Oil consumption increased by an above average 1.4 million barrels per day (b/d), or 1.5%. China (680,000 b/d) and the U.S. (500,000 b/d) were the biggest contributors to growth.
- Global oil production increased by 2.2 million (b/d). Nearly all of the net increase was made up by the U.S., with their growth in production (2.2 million b/d) a record for any country in any year. In addition, production growth in Canada (410,000 b/d) and Saudi Arabia (390,000 b/d) was outweighed by declines in Venezuela (-580,000 b/d) and Iran (-310,000 b/d).

- In 2017, refinery throughput increased by 960,000 (b/d), down from 1.5 million (b/d). However, average utilization of refinery climbed to its highest level since 2007.

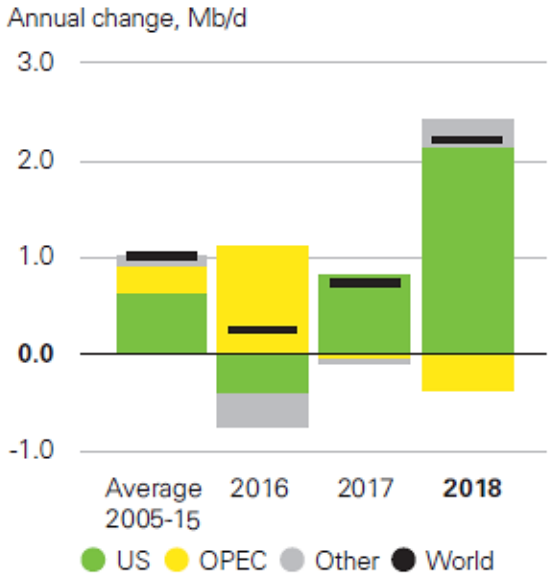

Figure 3.9: Global Oil Production

Source: BP Statistical Review of World Energy, 2019

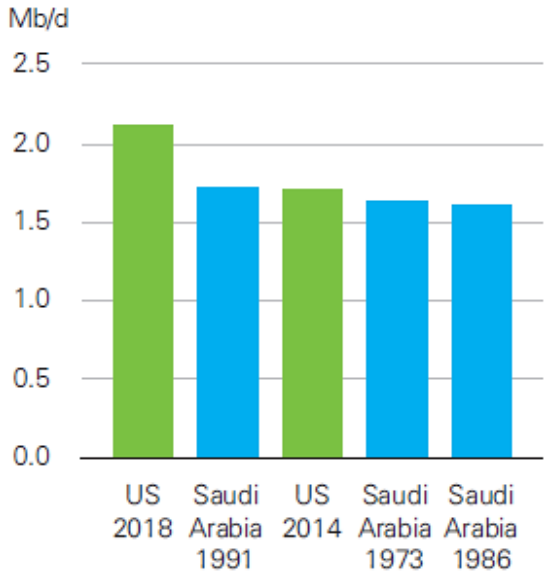

Figure 3.10: Largest Annual Increases in Oil Production

Source: BP Statistical Review of World Energy, 2019

3.5.3 Natural Gas

- The consumption of natural gas increased by 195 billion cubic metres (bcm), or 5.3 %. It is one of the fastest growth rates since 1984.
- The Gas consumption growth was driven mostly by the U.S. with 78 bcm, supported by China with 43 bcm, Russia with 23 bcm and Iran with 16 bcm.
- The natural gas production on Global-scale rose by 190 (bcm), or 5.2 %. Nearly 1/2 of this came from the U.S. with 86 bcm that was a record of the biggest annual growth in history. Russia with 34 bcm, Iran with 19 bcm, and Australia with 17 bcm were the next biggest rate.
- Growth of interregional natural gas trade was 39 (bcm) or 4.3 %, more than double the 10 year average, driven mostly by LNG (Liquefied natural gas).
- The supply of Liquefied natural gas growth came mostly from Australia with 15 bcm, the U.S. with 11 bcm and Russia with 9 bcm. China made up almost 1/2 of the increase of imports with 21 bcm.

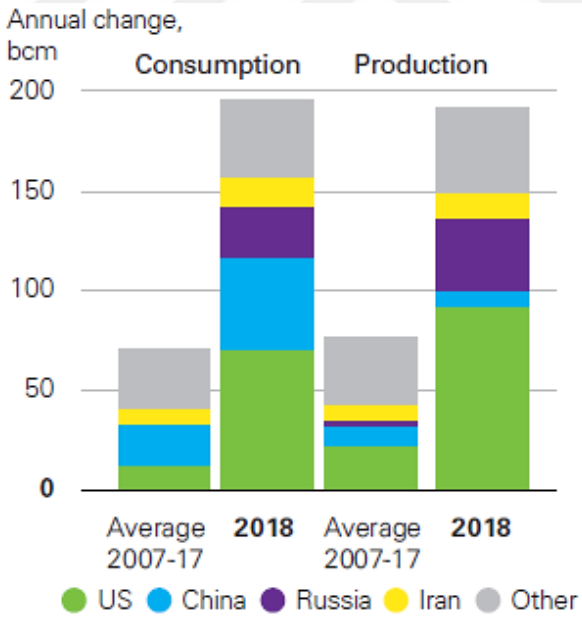

Figure 3.11: Natural Gas Consumption and Production Growth

Source: BP Statistical Review of World Energy, 2019

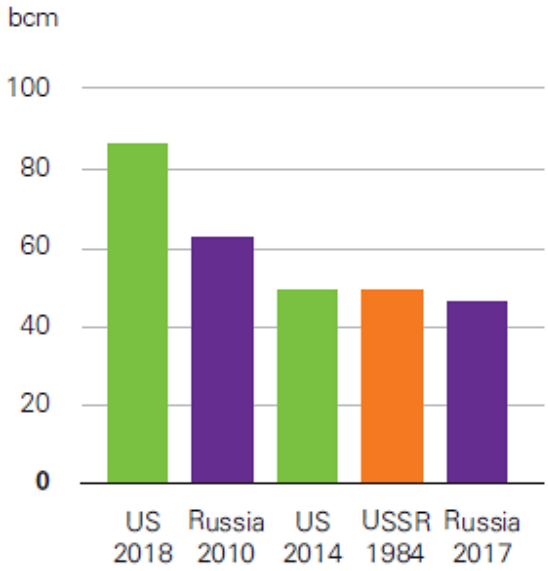

Figure 3.12: Largest Annual Increases in Gas Production

Source: BP Statistical Review of World Energy, 2019

3.5.4 Coal

- The consumption of coal increased by 1.4 %, double its 10 year average growth.
- Consumption growth was driven by India with 36 mtoe and China with 16 mtoe. OECD demand decreased to the lowest level since 1975.
- The share of coal in primary energy decreased to 27.2 %, the lowest for 15 years.
- The coal production on Global-scale rose by 162 (mtoe), or 4.3 %. China 82 (mtoe), and Indonesia 51 (mtoe) supplied the biggest increments.

	Coal Primary Energy Demand (Mtce)	Growth Rate (%)
	2018	2017-2018
United States	451	-4,5%
China	2 771	1,0%
India	600	5,0%
Europe	462	-2,6%
Rest of the World	1 113	1,4%
WORLD	5 397	0,7%

Figure 3.13: Coal Primary Energy Demand by Region

Source: International Energy Agency (IEA), 2019

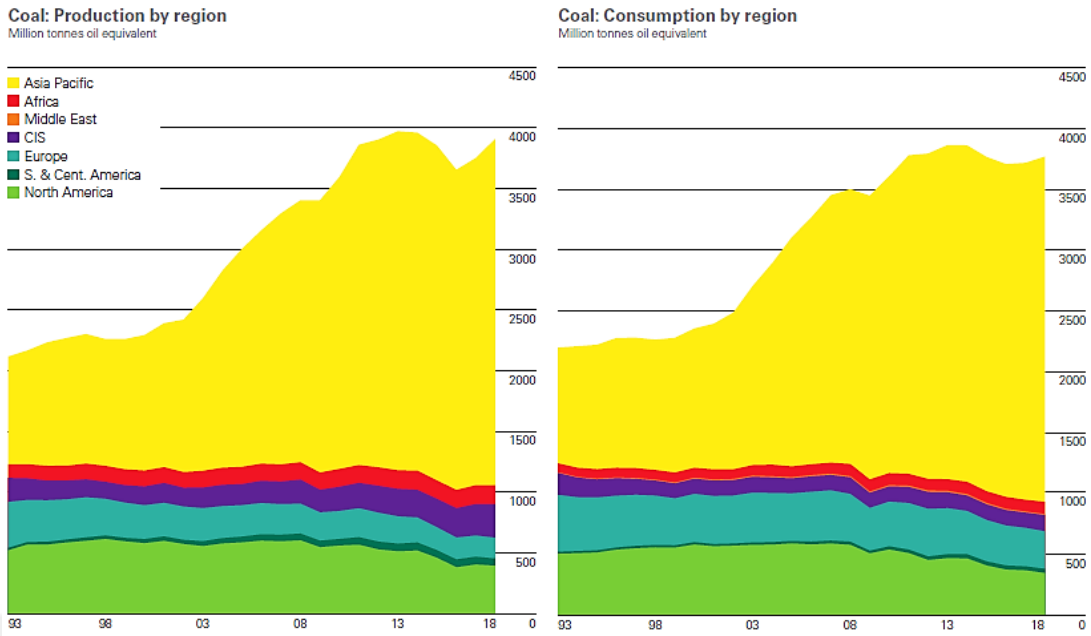

Figure 3.14: Coal Production and Consumption by Region (Million tonnes oil equivalent)

Source: BP Statistical Review of World Energy, 2019

3.5.5 Renewables, hydro and nuclear

- Renewable power rose by 14.5 %, slightly below the historical average, eventhough its growth in energy terms 71 (mtoe) was close to 2017's record breaking growth.
- Solar generation rose by 30 (mtoe), only below the growth in wind with 32 mtoe, and supplied more than 40 % of renewables growth.
- Again, China reached the biggest contributor to renewables increase with 32 mtoe, surpassing increase in OECD with 26 mtoe.
- Hydroelectric production grew by an above average 3.1 %, with European production rebounding by 9.8 % (12.9 mtoe), nearly offsetting its steep decrease in the previous year.
- Nuclear production grew by 2.4 %, its largest increase since 2010. China with 10 mtoe contributed nearly 3 quarters of global increase, with Japan (5 mtoe) the 2s largest growh.

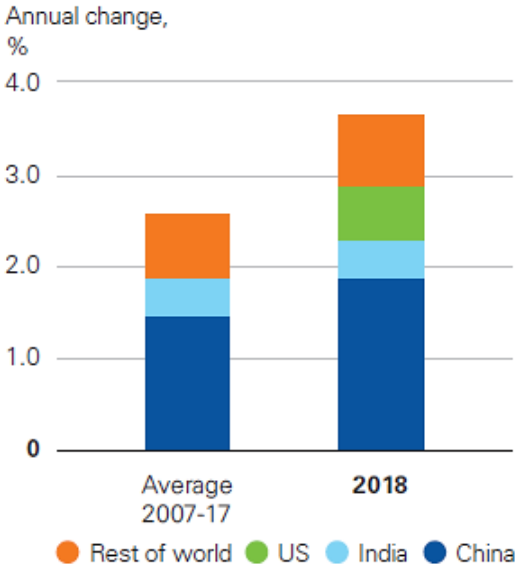

Figure 3.15: Growth in Power Generation Contributions by Region

Source: BP Statistical Review of World Energy, 2019

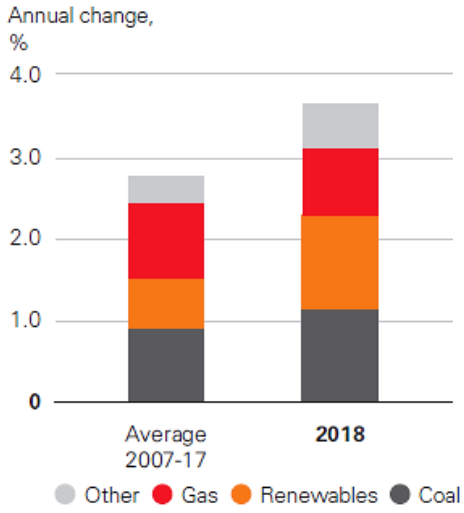

Figure 3.16: Growth in Power Generation Contributions by Fuel

Source: BP Statistical Review of World Energy, 2019

	Renewables generation (TWh)	Growth Rate (%)
	2018	2017-2018
United States	744	4,1%
China	1 854	10,9%
India	291	10,6%
Europe	1 462	8,5%
Rest of the World	2 449	4,0%
WORLD	6 800	7,1%

Figure 3.17: Change in Renewables Generation by Country, 2017-2018.

Source: International Energy Agency (IEA), 2019

3.5.6 Electricity

- Electricity production increased by an above average 3.9 %, buoyed by China (which made up more than 1/2 of the growth), India and the US.
- Renewables made up 1/3 of the net increase in power production, followed closely by coal and then natural gas.
- The renewables' share in power production rose from 8.4 % to 9.3 %. Coal still made up the biggest share of power production at 38 %.

	Electricity Generation (TWh)	Growth rate (%)	Shares (%)	
	2018	2017-2018	2000	2018
Total Generation	26 672	3,9%	100%	100%
Coal	10 116	2,6%	39%	38%
Oil	903	-3,9%	8%	3%
Gas	6 091	4,0%	18%	23%
Nuclear	2 724	3,3%	17%	10%
Hydro	4 239	3,1%	17%	16%
Biomass and waste	669	7,4%	1%	3%
Wind	1 217	12,2%	0%	5%
Solar photovoltaics	570	31,2%	0%	2%
Other renewables	144	4,2%	1%	1%

Figure 3.18: Change in Electricity Generation by Source, 2017-2018.

Source: International Energy Agency (IEA), 2019

Natural gas is a dominant fuel for power generation in North America followed by coal. In South & Central America, hydro accounts for more than half of power generation. In Europe nuclear, coal, renewables and gas all have a prominent role. In CIS and the Middle East, natural gas is by far the most important fuel for power generation. In Africa, natural gas and coal make up almost 70 % of the electricity generated. Coal remains the most important fuel in Asia Pacific.

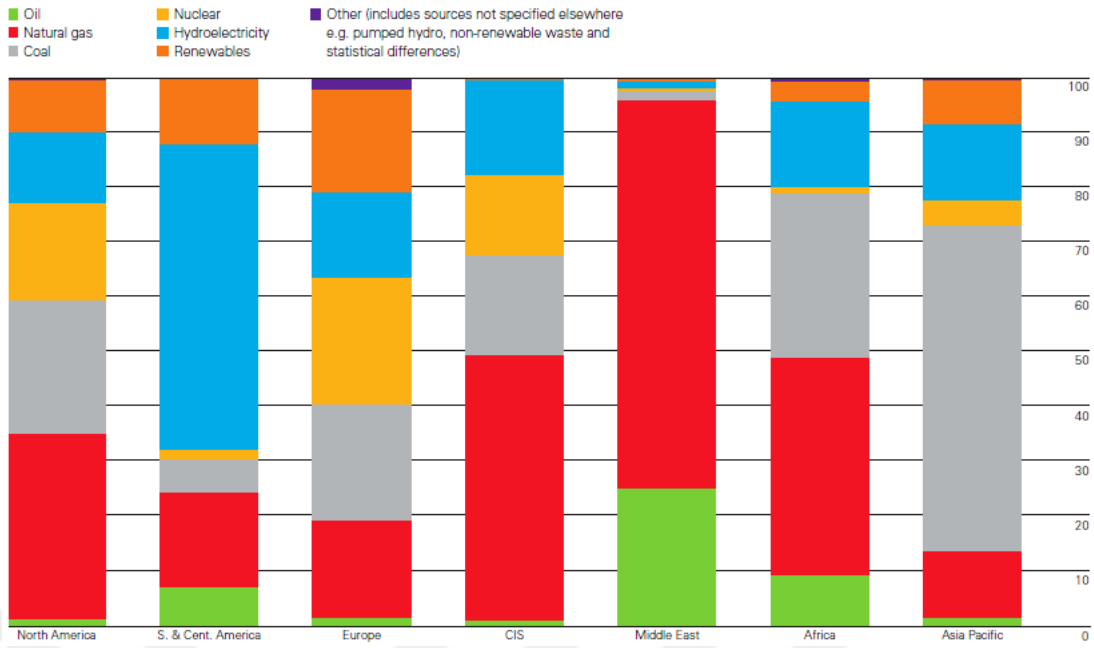

Figure 3.19: Regional Electricity Generation by Fuel 2018, Percentage

Source: BP Statistical Review of World Energy, 2019

3.6 Energy Prices

All types of energy sources including oil, coal, natural gas, nuclear, biomass, hydroelectricity, wood or renewables, are needed to meet world demand. There is a competition between energy sources, and their prices are also linked together. In fact the analysis of the price is simple like all other things in the market. The higher the price will make the less user or consumers. Increasing the price have the result of slow consumption. If the fuel price increase, the price of the products in the market also increase too. Thus consumption will finally decrease.

There are two types of energy pricing systems which is corcerned by Americans. These are "vechicle fuels including gasoline and diesel" and "electric power". Gasoline and diesel prices are mostly depended on the crude oil's price. For this reason, they fluctuate in direct proportion with the global oil prices. However, rarely because of the reasons such as natural diasters or economic difficulties, the fuel prices may change course away from the price of crude oil. Electricity prices are largely based on fossil prices. However, the U.S. is almost 100% dependent on local energy sources such as coal and natural gas for electricity generation. However, some factors that can be controlled very little or not at all have to be considered. These pricing systems are explained below (Blazev, 2016) :

- **Vehicle Fuel Pricing**

The price of vehicle fuels; gasoline, diesel, and jet fuel is determined by numbers of factors, but crude oil's price is almost ¾ of the price at the gas pump. According to the table below, the price at the gas pump is driven mostly by the prices of crude oil. Oil prices change over time, which increases gas pump prices accordingly. Sometimes the change in price is insignificant, but sometimes it is great.

Service	*Gas*	*Diesel*
Crude oil	67%	61%
Taxes	13	14
Oil refining	11	15
Distribution	9	10

Figure 3.20 : Fuel Price Structure

Source: Blazev, 2016

- **Electric Power Pricing**

To price the electric power is much more complicated. It is even further increasing because of the introduction of new technologies like micro grids, smart grid, and renewable energy generation. This leads new pricing strategies to be developed as necessary to capture the dynamics of supply and demand in the market. Developing a new electricity pricing strategy is one of the most significant and complex aspects of today's energy debate.

There are lots of factors affecting electricity pricing and that change with advances in technological capacity. These factors affect pricing schemes regardless of which pricing model is applied. Prices fluctuate by location such as region, country, city, state or city, and by input source such as petroleum, oil, coal, solar etc. The main factors generally affecting electricity and energy prices are given below:

- Peak and demand rates are the instruments helping the power companies to pay their bills and make capital investments for meeting the current and highest expected demands.
- Alternative energy technologies can help to reduce the rates, however despite advances in recent years their use is limited becasue of the high implementation costs, uncertainty in their long-term operation, legal constraints, and recently due to conflicts with utilities operations.
- The state and local taxes imposed on utilities change according to state and time, affecting energy rates.
- The power generation or input source determines the energy price delivered to the customers. A mix of energy sources is ideal for trimming peak rates.
- Environmental considerations complicate the situation and limit the choice of the utilities, forcing them to use technologies with a smaller carbon footprint such as solar and wind, that are more expensive to use.
- The capital expenditure and maintenance of the transmission network is as important as the distance from the energy source. For example, greater losses are expected from long-distance power transmission, which increases rates even further.

3.6.1 The effect of oil prices on the economy

Energy plays a key role in many sectors, particularly in transportation, and in economic and social activities. The following are examples of this (Favennec, 2011)

- During World War II, the availability of crude oil for fuel production was a priority in German strategic decisions. After taking over the Romanian oil fields, one of the German targets in the declaration of war to invade the Soviet Union and Russia was the control of oil deposits in Baku and Volga. In fact, German troops were defeated in Stalingrad, and therefore failed to take control of Russian oil. After a while, Rommel headed for the Middle East, where giant oil fields had just been discovered. But British troops and lack of fuel prevented him from achieving his purpose. Germany had to make coal liquefaction for fuel production.
- In the third world countries, any shortage of petroleum products makes the collection of food resources difficult and makes it even more impossible to move to cities and thus feed the city's population. In the 1970s, high oil prices had particularly detrimental consequences for many African countries. In order not to buy oil, they had to cut the harvest because there was no transportation for them.

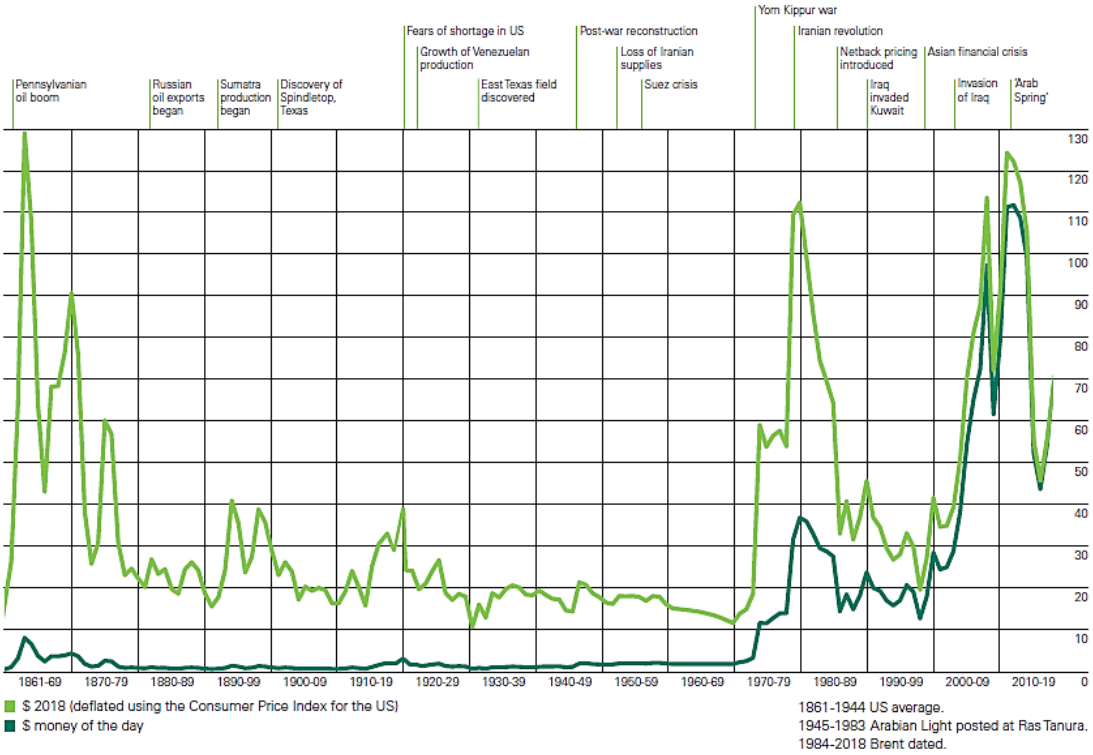

Figure 3.21: Crude Oil Prices, 1861-2018, by World Events (US dollars per barrel)
Source: BP Statistical Review of World Energy, 2019

The petroleum industries have very particular characteristics. In the Middle East, the size of deposits is such that the price of production costs are only a few dollars per barrel. Oil is liquid and it can be transported everywhere easily and inexpensively even for over long distances (Favennec, 2011).

Millions or sometimes even billions of dollars are required to make a very large investments to produce oil or natural gas from their reserves, to develop a coal mine, to build a nuclear power plants and to build a hydroelectric dam. The capital investment must be compansated when the investment is made because production needs to be a maximum capacity. Otherwise the unit costs will increase.

Variations in oil price result in an important shifts of sources from major producing countries to major consuming countries. The impact on the inflation is also significant. Impact of prices for poor countries is another issue as well. Eventhough for emerging countries, it is relatively easy to tolerate a substantially higher energy bill, the same wasn't true for less developed countries for whom prices' increase was shifting. On the other hand, a high price is required for productive countries, because most of them rely on almost exclusively on oil and gas revenues to balance their budgets, and the minimum oil price required to achieve this varies greatly from one country to another country (Favennec, 2011).

The oil prices are one of the important indicators in terms of the world and country economic performance. The effect of the increasing price on economy is generally depended on the share of oil cost in national income, saving on the consumption of end of users and the efficient use of energy with the use of alternative energy sources.

The trade shift that came out by the result of increasing oil price are because of transferring an accurate income from oil importing countries to oil exporting countries. For oil exporting countries, export revenues arising from the increasing price directly increase the real national income. However in general, countries with net oil importers resulting in economic stagnation in countries where they have directly exported are falling in demand for other exported goods and depending on this, income from oil sales are at higher price.

Increasing oil price in oil importing countries, while raising in inflation and input costs, the demand for non-oil products are also lead to fall. Not to go to the

government spending retrenchment, while tax revenues are falling in one side, the budget is increasing in the other side, in this situation when interest rate is increase, the result of showing wages resistant to real decline make pressure on the nominal wage level as a increasing type of oil price.

Decreasing in demand will increase unemployment at least for short period to add the pressure on prices. Together with the confidence of world business and rising consumer prices, the effects are multiplying exponentially.

3.7 Renewable Energy and Economic Development

Using energy effectively is important to success the aim of sustainable development. Nowadays in the World, energy consumption is increasing rapidly due to rapid increasing world population. So energy demand is also increasing for urbanization, industrialization, widespread use of technology and electronic products, etc. so the energy supply security become important. Countries has explored new renewables to reduce their dependence on fossil fuels imported from oil producing countries. According to the researches, there is a relationship between the GDP per capita and renewable energy. So increasing the renewable energy production will have positive effect on the economic growth for a short term and for a long term.

It is accepted that there is a mutual theoric relationship between energy consumption and economic development. The increased national income brings more energy demand by raising consumption and investment. Energy allows more production by developing technics. In this context, renewable energy supports economic development by contributing to the development of capital intensive and labor intensive production technologies. Also renewable energy helps creating additional employment and also helps to increase the welfare level. On the other hand, renewable energy is based on local resources. So energy import bills can be decreased and domestic consumption and investment expenditures can be increased for having renewable energy resource in local.

Renewable energy is defined as the energy obtained from constantly renewed natural processes. The renewable energy concept is used for various of energy sources like solar, wind, geothermal, biomass, hydro (ocean, tidal, wave) and hydrogen, which are found in nature and survive. Due to the indigenous nature of renewable energy sources, reducing the dependence of countries on external energy sources, and being

uninterrupted and clean energy sources, they have a special importance in terms of sustainable energy. Thus, renewable energy's contribution in final energy generation on global-scale increased from 8.5 % in 2013 to 19.1 % in 2014 and to 23.7 % in 2015. This means that almost 1/5 of the energy consumed in the world is supplied from renewables (Bayraç and Cildir, 2017).

Technological developments, financial advances and new market opportunities have the affect of reducing the costs of electricity production by the use of renewables, particularly solar and wind. Using wind and solar energy, especially in coastal areas, has reached a competitive position with fossil fuels even without calculating externalities (Amin, 2017).

Despite the numerous advantages of renewable energy sources, the main reasons for their low share in total energy production are; sustaining subsidies for fossil fuels, not including the total cost of pollution in the cost of fossil fuels and the high initial costs of renewable energy investments. In addition, energy demand in developed countries is increasing slowly and it takes time to change the existing energy infrastructure and the habits related to energy consumption. In developing countries, energy demand has been increasing rapidly and fossil fuels are key to meet this demand. On the other hand, it is currently unlikely that renewable energy sources can compete with fossil fuels in terms of pricing. Thus, renewable energy investments, which are almost impossible for themselves to develop rapidly and to compete with fossil fuel technologies, should be encouraged by the state to reach an optimal level (Bayraç and Çildir, 2017).

3.7.1 The Environmental Kuznets Curve

A number of researchers have investigated the environmental impact of energy consumption, financial development, trade openness and urbanization under a hypothesis titled "Environmental Kuznets Curve (EKC)". EKC suggests an inverse U-shaped relationship between pollution emissions and economic growth Accordingly, pollution emissions increase because of the economic growth at early stages, however, after a certain level of income, impacts begin to diminish as environmental quality demand rises at higher level of income. Although many studies have investigated the existence of the EKC hypothesis, there is still no consensus (Yasin et al., 2019).

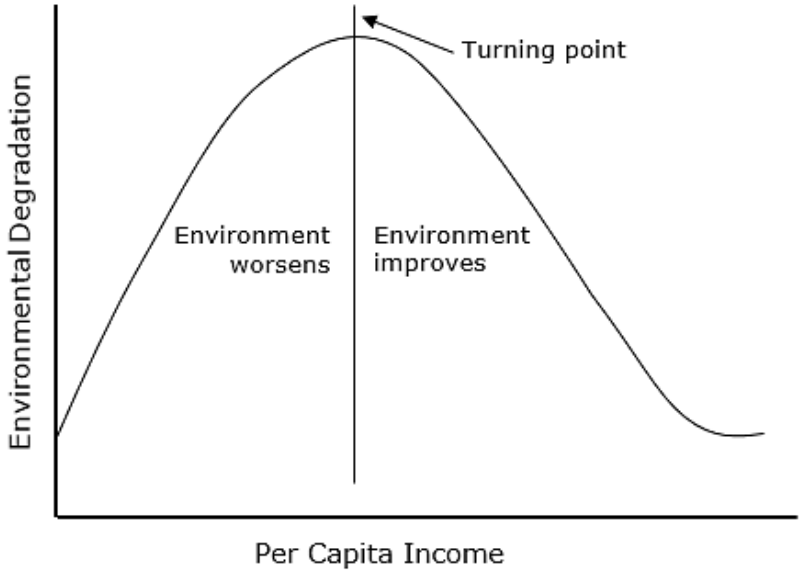

Figure 3.22 : The Environmental Kuznets Curve

Source: Intelligent Economist, 2019

The Environmental Kuznets Curve follows the hypothetical relationship between development and equality. The difference is that it looks at environmental equality. Before the EKC hypothesis, it was mostly assumed that developed economies had destroyed the environment faster than undeveloped countries. But, with this curve, the relationship between the health of environment and the economy of environment was reanalyzed. The idea is based on that while economic development is growing, the environment will deteriorate until a certain level where the country achieves a certain average income. Then money is reinvested into the environment, then the eco-system is restored. However, it is argued by critics that economic growth doesn't always cause a better environment, and sometimes it can be the opposite (Intelligent Economist, 2019).

In the economic literature, the EKC hypothesis proves that CO2 emissions will decrease in the long run with the increase in per capita income. Accordingly, it is stated that the growth in per capita income level will increase income inequality in the first stage, but the income inequality will decrease with the increase in per capita income level in the advanced stages of economic growth. In the early 90s, inverse U-shaped relationship between income inequality and per capita income which is expressed in the long term, is found between environmental pollution and per capita income level. It is suggested that the increase in the per capita income level in the early stages of economic development will increase the CO2 emission level per

capita, but the increase in the income level in the later stages of the development will cause a decrease in the CO2 emission level. The main reason for this is that in the early stages of development, policymakers focused solely on the level of economic output and employment targets, and the transformation of the industrial structure based on the existing fossil fuel consumption into renewable energy sources was very costly. However, in the later stages of economic development, with the growth in per capita income level, individuals' sensitivity to environmental issues will increase and policy makers will take an active role in protecting the environment with the legal arrangements they put into practice. According to this information, considering the EKC hypothesis, it will be expected that the increase in per capita income level will increase the demand for renewable energy sources in the long term and thus the share of environmentally friendly energy resources in the consumption of total energy (Bakırtaş and Çetin, 2016).

In the international literature, it is accepted that natural sources used in energy generation have an important effect on economic output. There are 2 types of supply and demand approaches (Bayraç and Çildir, 2017) :

- Supply Based Approach: The affect of natural sources that are used in energy production on economic growth is investigated with the function of traditional production. In the studies based on the Supply Directional Approach; The causality relationship between economic growth and energy consumption is examined using different country/country groups and several methods. The results are generally aimed at testing the causality relationship. According to the findings, renewable energy sources are an effective production factor on economic growth as well as labor and capital with other natural resources. This result supports the proposal to prioritize renewables to combat global warming.
- Demand Based Approach: The elements of renewable energy consumption are being searched. In these studies, which variables direct the renewables and what are their affects are discussed.

The major factors to determine the demand of renewables are (Bayrac and Cildir, 2017) :

- Political Factors: Tariffs, quotas, subsidies, public policies, Research and development expenditures,
- Socioeconomic Factors: Net energy imports, income level, CO2 emissions, fossil fuel prices, fossil fuel quantities in energy consumption,
- Country-specific Factors: Potential for renewables, deregulation activities in the electricity market, growth of population, rapid urbanization, environmental policies etc.

4. ENERGY POLICY AND INCENTIVES OF EU AND TURKEY

4.1 Energy Policy and Incentives of EU

According to following figure, in EU, the renewables'share in the consumption of gross final energy grew constantly between 2005 - 2016 to reach 17 %. Several support schemes which were put in place by EU Members, like auction / tender systems, tax credits, feed in tariffs, feed in premiums, quotas and grants, were the main reason of the increase. Reducing production costs thanks to the scaling up of technological developments and global production volumes along with a reduction in capital costs, have played a crucial role in renewable energy deployment as well. Technologies transforming solar energy to electricity (Photovoltaics) have reached the biggest cost reduction, with costs per kilowatt hour decreasing by 73 % between 2010 - 2017 (European Environment Agency, 2018).

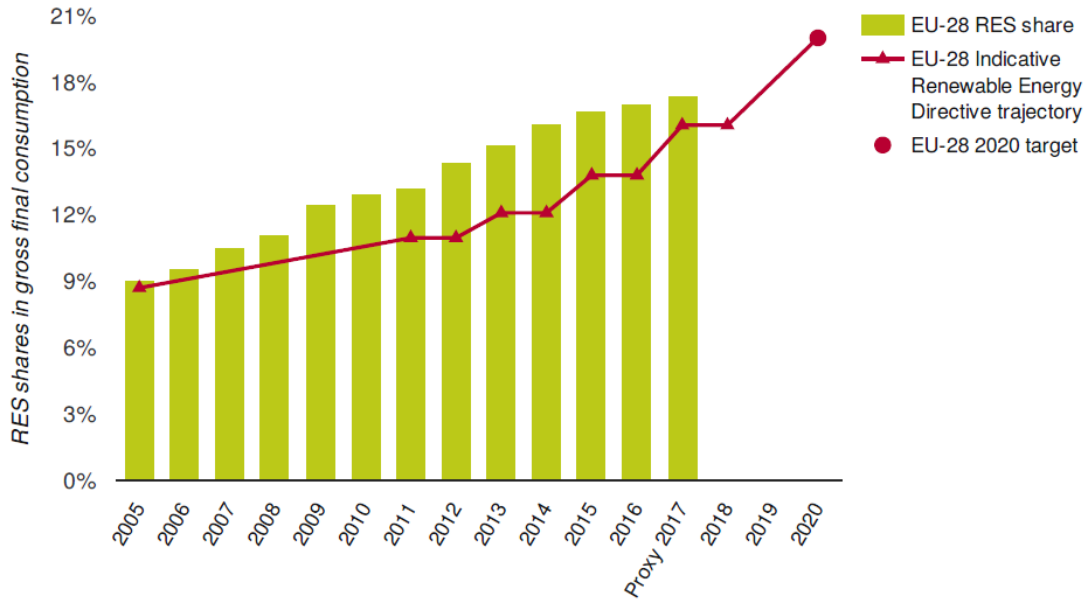

Figure 4.1: Share of Renewable Energy Sources in Gross Final Energy Consumption, EU

Source: European Environment Agency, 2018

According to the following figure, the renewables' contribution to the consumption of gross final energy varies between European countries. This shows the different starting points for advance of the renewable sources in each country and differences in the natural resources' availability to generate renewable energy. It also shows some extent, differences in policies for stimulating renewable energy sources. Fifteen EU countries doubled the shares of their renewable energy between 2005 and 2016. Bulgaria, Romania, the Czech Republic, Croatia, Denmark, Hungary, Estonia, Lithuania, Italy, Finland, and Sweden, as well as Iceland and Norway, have already achieved their 2020 targets. In 2016, the countries which are the furthest from their 2020 targets are United Kingdom, France, Luxembourg, Ireland and the Netherlands. Their progress in the deployment of renewable energy will play an important role in the prospects of the EU meeting its overall target (European Environment Agency, 2018).

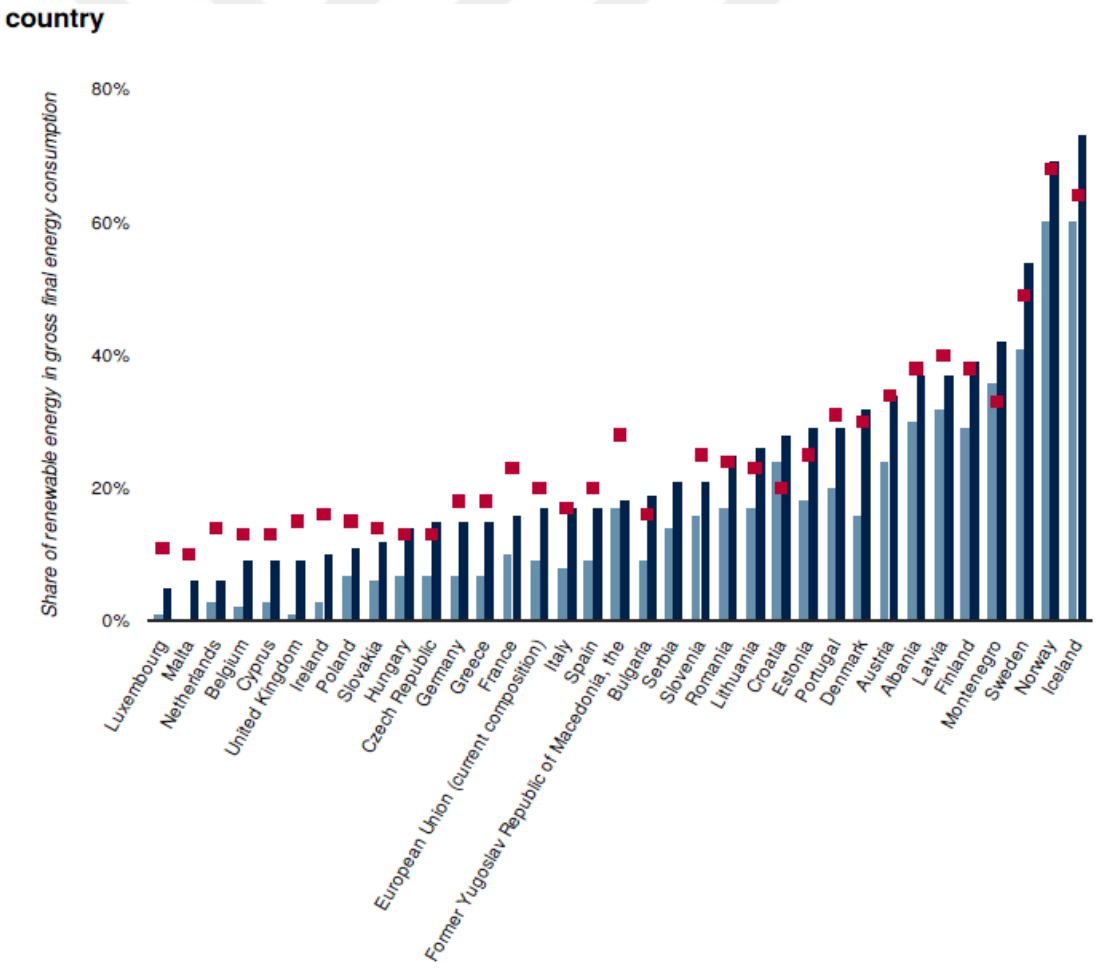

Figure 4.2: Share of Renewable Energy Sources in Gross Final Energy Consumption, by Country

Source: European Environment Agency, 2018

4.1.1 Structure of EU energy sector

The EU continues to meet its energy needs from petroleum, natural gas, coal and uranium, which is called primary energy sources. These resources will continue to play an important role in meeting the energy demand in the future. Compared to the rest of the world, the amount of these resources and reserves of the EU is important, but there are two more important tendencies than the EU. First, the energy resources and reserves of the EU are decreasing. The second is that a number of countries hold the EU's energy resources and reserves (Dursun, 2009).

The EU is the world's largest energy importer and the second largest consumer of energy after the US. Although the EU is one of the regions with the highest energy consumption in the world, it is dependent on foreign energy in terms of insufficient energy resources. The import dependency of the Union, which has to import 54% of the energy it consumes, increases every year. The high dependence on imported resources in terms of energy supply security in energy consumption necessitates that the Union formulate common policies in the field of energy. The dependency ratio of the Union, which was 62% in 1973, decreased to around 40% with the policies implemented in the 1980s, but again increased to 54% with the expansion process. This ratio is expected to increase to 57.4% - 59.1% by 2030. As of 2030, the EU is estimated to be 93% dependent on oil and 84% on natural gas. (Bayraç and Çildir 2017: 204). Therefore The EU sets rules with The Renewable Energy Directive (2009/28/EC) to achieve its 20% renewables target by 2020 (European Commission, 2019). The use of renewable energy sources is anticipated to play an significant role in reducing dependence of Union Countries on foreign sources.

4.1.2 The energy policy of EU

Providing consumers with cheaper energy, higher quality and uninterrupted service forms the basis of EU energy policy. Therefore, the individual is in the center of the EU's energy policy.

It is seen that the goals set by the EU energy policy have changed over time. Therefore, over time, the concept of energy efficiency has been evaluated with both supply and demand dimensions and efficiency in energy demand has been explained with the concept of energy saving, and environmental protection has also been

included in the objectives. In general, however, it is possible to list the objectives of the EU's energy policy as follows (Dursun, 2009) :

- Establishing the internal energy market,
- Reducing dependence on energy by providing security of energy supply,
- Ensuring the sustainability of energy by ensuring the security of energy roads,
- Developing an environment-friendly energy policy by combating climate change,
- Increasing efficiency by saving energy production and consumption,
- Ensuring competition in the energy market,
- Identifying and maintain an external energy policy to support these policies.

EU attaches importance to developing new energy systems in order to achieve these basic objectives. As a matter of fact, EU legislation includes regulations for the liberalization of energy markets in order to create high-competitive, safe and sustainable energy markets, to offer consumers more energy options, and to supply consumers at a cheaper price (Bayraç and Çildir, 2017).

EU Energy Policy aims to provide energy in a sustainable, reliable and competitive environment, to reduce greenhouse gas emissions by combating climate change, to contribute to the competitiveness of the economy, to provide energy sources to consumers in a reliable and economic way, carbon economy. In order to achieve these targets, it is considered as policy instruments to protect the share of coal in total energy consumption, increase the share of natural gas, allocate maximum security requirements for nuclear power plants and increase the share of renewable energy resources (Aytüre, 2013).

The developments related to the EU's energy policies are given below in chronological order (Aytüre, 2013; Bayraç and Çildir 2017; Commission of the European Communities, 2009; Dursun, 2009; European Commission, 2019; Yorkan, 2009) :

The EU's energy policy dates back to the 1950s. Two of the European Coal and Steel Community (ECSC), the European Atomic Energy Community (EURATOM) and

the European Economic Community (EEC), which make up the EU, are energy-related. In this context, EU energy policy is based on the Paris Treaty of 1951 establishing the ECSC on coal, and the Rome Treaty on nuclear in 1957, which led to the establishment of EURATOM.

The oil crises of 1973 and 1979 adversely affected energy importers, such as the EU member states. Supply cuts and price increases caused by crises have made energy an important place on the EU agenda. As part of the common market target, energy has become one of the EU's top priorities. After 1980, countries started to find strategies to protect their energy supplies from external shocks. The idea that a single market is necessary for energy has prevailed, the need for environmental protection has emerged and the priorities for energy systems that will protect the environment have been put on the agenda. In this context, the Commission Decision of September 1986 and the Commission's 1988 report on the establishment of the internal energy market, the Energy Charter in 1991, and in 1995 the "White Paper" titled "An Energy Policy for the EU" in which liberalization of the energy markets and the principles and objectives of the internal energy market were set out, has been declared.

In 1997 the Commission published a White Paper on renewable energy which announced a target to double the European Union's renewable energy share (from 6%) to 12% by 2010.

Since the 2000s, the EU has made various arrangements in line with its targets in energy policies with the directives it has issued. In this context, in 2000 "the Green Paper", and in 2003 "Intelligent Energy Europe Programme (2003-2006)", in 2006 "the Green Paper" titled "A European Strategy for Sustainable, Competitive and Secure Energy" were prepared. They have outlined the EU's energy policies.

Thus, the EU's sustainable development policies in the 1990s, which are environmentally priority; It has become a green growth model due to policies to reduce greenhouse gas emissions for climate change, to ensure energy security for instability in energy prices, and to increase technological innovation and competitiveness.

On 10 January 2007, the European Commission published the "Energy Policy for Europe" report setting new policies and new targets for the EU. The EU's new energy

policy includes recommendations on increasing supply security, protecting the environment and increasing competition in the domestic market. Within the scope of the new energy policy, the EU's 20-20-20 Targets has been determined.

Combating climate change for a sustainable energy policy is an important component of EU energy policy. For this purpose, the EU Climate and Energy Package, prepared by the European Commission and approved in March 2007, has identified the following three important objectives, which are expected to be achieved by 2020:

- It is aimed to reduce greenhouse gas rates by at least 20% by 2020 compared to 1990, and by 30% if a global target is set.
- Increasing the share of renewable energy in the energy supply to 20% by 2020 and the presence of at least 10% biofuels in gasoline and diesel fuels used in vehicles,
- 20% savings in primary energy consumption by 2020.

The original renewable energy directive (2009/28/EC) established an overall policy for the production and promotion of energy from renewable sources in the EU. Accordingly, all EU countries must fulfil at least 20% of total energy needs with renewables by 2020. It will be achieved through the attainment of individual national targets. They must also ensure that at least 10% of their transport fuels come from renewable sources by 2020. This Directive promotes cooperation amongst EU countries and with countries outside the EU, to help them meet their renewable energy targets.

The EU has published t"he EU 2020 Energy Strategy" dated 10 November 2010 in order to achieve its 2020 target. In this context, five priority areas have been determined to achieve the objectives of increasing competitiveness, sustainability and energy supply security. These fields are; energy efficiency, the creation of a European integrated energy market, access to safe and reliable energy, the EU's leadership in new and innovative energy technologies, and the strengthening of the external dimension of the EU energy market.

The amount of renewable energy production that is targeted to be reached in 2020 is estimated to be 550-600 TWh. Reducing primary energy use will also improve EU's energy security by reducing EU's imports of fossil fuels and will also create employment growth in green jobs. As a matter of fact, in the renewable energy

market, approximately 1.5 million people are serving in the EU countries and 8.1 million people in the world.

In October 2014, the EU Commission revised renewable energy target to 27% for 2030.

In 2018 December, the revised renewable energy directive 2018/2001/EU came into force, as a part of the Clean energy for all Europeans package. Its aim is to keep the EU the global leader in renewable energy sources and, supporting the EU to meet its emissions reduction commitments under the Paris Agreement. This revised directive established a new binding renewables target for the EU for 2030 of at minimum 32 percent, with a clause for a possible upwards revision by 2023.

Under the new Governance regulation, that is a part of the Clean energy for all Europeans package as well, EU countries are needed drafting 10 year NECP (National Energy and Climate Plans) for 2021 – 2030. They have to outline how to meet the new 2030 targets for renewables and for energy efficiency. Member States required submitting a draft NECP by 31.12.2018 and should be ready to submit the final plans to the European Commission by 31.12.2019. In addition, most of the other new components of the new directive require to be transposed into national law by Member States by 30.06.2021.

To achieve the 2020 targets, each EU member has its own national objectives. Fulfillment of these national objectives will ensure the fulfillment of the EU's objective. How the EU members reach their national goals is up to their own decisions. Therefore, it is up to the members to focus on which renewable energies. The main reason for this is that each country has different potentials for using renewable energy. Nevertheless, each EU member has to inform the European Commission of the action plan and the estimates of its achievement. National targets’s progress is evaluated every 2 years when EU countries publish their national progress reports for renewables.

4.1.3 EU renewable energy incentives

Different mechanisms are being developed in many countries to promote the use of renewable energy sources. The thirteen common support policies are discussed in the table below in three separate categories (KPMG, 2013).

Regulatory Policies
– Renewable energy targets – Feed-in tariff/premium payment – Electric utility quota obligation/renewable portfolio standard – Net metering – Biofuels obligation/mandate – Heat obligation/mandate – Tradable renewable energy credit
Fiscal Incentives
– Capital subsidy, grant and rebate – Investment and production tax credits – Reductions in sales taxes, energy taxes, CO2 taxes, VAT and other taxes – Energy production payment
Public Financing
– Public investment, loans and grants – Public competitive bidding/ tendering

Figure 4.3: The Twelve Most Common Policies to Promote the Use of Renewables
Source: KPMG International, 2013

The impact of incentive and support policies on countries has been realized over the years. As a matter of fact, in the early 1980s and 1990s, only a few countries had renewable energy support policies, and between 1995 and 2005, many countries and cities started to adopt these support policies. In 2005, it was stated that around 55 countries adopted renewable energy support policies and this figure increased to 144 at the beginning of 2014 (Yılmaz, 2015).

When it comes to protection of the environment, it is important to produce and use environmentally friendly energy sources that will harm the environment as much as possible. Being aware of this, the EU supports the production of new and renewable energy and sets the priority target of increasing the proportion of energy obtained from renewable energy sources in total energy production and consumption (Franco and Herrera, 2005).

In this context, it was stated by the EU Commission that at least 20% of the total energy demands of each member country should be provided from renewable energy sources by 2020 in accordance with the 20-20-20 targets. In 2018, the EU Commission updated this target to 32% for 2030 (European Commission, 2019).

In order to reach this target, many countries have implemented important incentive policies that will pave the way for the related enterprises especially since the 2000s. Due to the different resource potentials of EU members and differences in renewable technology costs, a single support instrument is not sufficient for the development of renewable energy sources. Therefore, countries use combinations of these different incentive mechanisms both according to the market structure and the type of energy to be used. As a result of the incentive policies, as of 2015, the share of renewable energy resources in gross final energy consumption reached 16.7%. The highest rate was in Sweden with 53.9%. The countries with the least consumption of renewable energy sources are Malta and Luxembourg with 5% (Bayraç and Çildir, 2017).

Non-tax and tax incentives are applied in the EU. These incentives are used in the form of subsidies to increase revenue (Tariff Tax and Portfolio Standard etc.) and tax incentives to reduce costs. While the subsidies in the first group are used as the main policy tool, the tax incentives constituting the second group are more complementary. However, tax incentives are particularly effective tools in reducing the initial costs of renewable energy technologies and accelerating entry into the energy market. The main incentives for renewable energy production are: fixed price guarantee, premium system, mandatory quota and green certificate applications, various tax incentives and investment loans. Among these incentives, tariff guarantee covering fixed price and premium guarantee, investment credits and subsidies are based on public expenditures; tax incentives on public revenues; mandatory quota and green certificate practices are a regulation incentive policy. These incentives are explained below (Bayraç and Çildir, 2017).

4.1.3.1. Incentives on public expenditures

These incentives consist of direct expenditures realized under public legal entity. The main capital of these incentives provided in cash is provided from the funds created through budget income facilities or over the budget. These incentives are including tariff guarantee covering fixed price and premium guarantee, investment credits and subsidies.

- Tariff guarantee

The EU's main incentive policy, which differs from country to country, is considered by the Commission to be the most effective and cost-effective incentive mechanism. The price is determined according to the kWh of the electricity produced and differs according to the type of technology used. In this respect, technologies such as solar, which have high investment and maintenance costs, benefit from a much higher guarantee than wind. In Germany, Spain and Denmark, the tariff guarantee model, which is applied successfully, determines the price at a level very close to the production cost, thus providing investors with high assurance against price fluctuations and purchase guarantee in accordance with actual project costs. There are two different applications of tariff guarantee as fixed price guarantee which is not dependent on market price and premium guarantee which is dependent on market price.

-Fixed price guarantee: It is a long-term purchase agreement used to accelerate renewable energy investments. With this method, governments guarantee the purchase of energy from producers that produce their energy needs annually by using renewable energy sources. The amount of energy to be taken depends on the type of resource and its economic viability. In addition, sales and price risks are eliminated for the investor by providing a long-term price guarantee for a period ranging from 10 to 30 years.

The application of a fixed price guarantee is generally provided at the beginning of production facilities. In this way, support is provided for lowering the cost of the technologies used and increasing the amount of energy produced per unit. Thus, the financial burden on governments is reduced due to the falling tariff price as well as the falling costs. The fixed price guarantee is used in many member states such as Germany, Lithuania, Hungary and Bulgaria.

-Premium guarantee: In this application, unlike the fixed price guarantee, the producer is paid a premium above the market price instead of at a fixed price. No premium payment is made if the market price exceeds the specified minimum price. In Denmark, Spain, Estonia and Slovenia there is a fixed premium guarantee, while in the Czech Republic there is a premium guarantee according to the project. In Spain, premiums vary according to the hourly market.

- Investment loans

They are generally low-interest and long-term loans per installed kWh or a percentage of total costs for the development of renewable energy investments. Attractive loans for investments in the EU also play an important role. This practice, which contributes to the solution of the high capital cost problem, has been used effectively in Germany since the 1990s. Due to its advantages such as alleviating the burden on the public budget and spreading costs over time, there are some problems in dealing with those who do not pay their debt, although they are highly politically feasible.

- Subsidies

State grants to persons or institutions in the form of goods, money or services. In this context, the government finances a percentage of the investment cost as a grant to support renewable energy production.

4.1.3.2. Incentives on public revenues

Tax incentives are also used to increase the profitability of investments by reducing the costs of producers in the renewable energy production process. Tax incentives are among the most commonly used types of incentives and are defined as measures that alleviate or eliminate the tax burden in the sectors to be supported. These incentives can be applied in each of the production, investment and consumption phases, and research shows that tax incentives are very effective in reducing the initial costs of renewable energy technologies and accelerating the entry into the energy market. Since the 2000s, tax incentives have been used as a complementary policy throughout the EU. The main tax incentives used include exemptions and exceptions, discounts, depreciation regime, forward and backward offset of losses, tax holiday and tax deferral. In addition, taxation of fossil fuels at a higher rate or with additional taxes such as carbon tax constitutes tax measures.

Income tax benefits are directed to renewable energy capital expenditures such as machinery, equipment, land and fixtures. In Belgium, 40% of the expenditures for the installation of renewable energy and in France 50% of the cost of renewable equipment can be deducted from the income and corporate tax base. There is a minimum and maximum investment requirement to benefit from investment

allowance in Ireland. In some countries, a security and performance certificate is required to benefit from the discount.

Some countries prefer to apply direct income tax exemptions instead of investment or production allowances. In the Czech Republic, earnings from selling energy to the grid are exempt from income tax for 5 years. In Luxembourg, the sale of electricity from low-capacity solar panels is exempt from income tax.

There is the possibility of accelerated depreciation in renewable energy investments. While power plants are generally amortized over a period of 20-30 years, accelerated depreciation can be reduced to 15 years. R & D expenditures for renewable energy technologies can be deducted from income tax base. In addition, there are three different property tax incentives for renewable energy, exceptions, discounts and reimbursements. EU countries mostly prefer exceptions or discounts.

4.1.3.3 Regulatory incentives

the regulations of the state, in order to ensure the stability of the country's economy and to eliminate the imbalances in the markets, are called regulation. One of the main support tools used in the promotion of renewable energy is the implementation of the Renewable Portfolio Standard. In the 1970s, more technological R & D policies were focused on promoting renewable energy sources, and the renewable portfolio standard began to take its place as of the 2000s. Today, it is thought to be effective especially in attracting large pollutants to the renewable energy sector with the implementation of other incentive policies.

The renewable portfolio standard is an amount-based incentive tool. Mandatory targets or quotas are set for producers to generate a certain percentage of energy from renewable sources. Renewable energy certificates are produced for this purpose. Renewable energy credit, green certificate, green label or renewable energy certificate and so on. These certificates, which are called as kredi trade de, can be considered as a kind of environmental loan. The ability to buy and sell certificates allows the parties who do not fill their quota to reach their quotas by purchasing certificates, and those performing production above their quota may earn additional income by selling certificates. The value of green certificates is usually determined by the supply and demand conditions in the market.

The main disadvantage of the renewable portfolio standard is; it causes uncertainty about future electricity prices for producers as the price is determined by the market. To prevent this, prices are usually set to lower and upper limits to compensate for losses arising from market fluctuations. Another disadvantage is that it does not allow price differentiation for different renewable energy technologies. This encourages low-cost renewable energy technologies, while hampering the development of high-cost technologies at an early stage. The first country in the EU to adopt a renewable portfolio standard was the Netherlands in 1998. It is also used in a small number of countries such as England, Belgium and Poland.

4.1.3.4 Other non-tax incentives

In the promotion of renewable energies; alternative policy options such as public procurement / bidding system and net measurement / account / invoice are also used. Purpose of the bidding system is increasing the competitiveness of renewable energies. In this method, especially for large-scale projects, the electricity company undertakes to purchase electricity at a price above the market price for a period of 10-25 years, in accordance with the agreement with the winning entity. In this highly cost effective method, the lowest cost of the renewable energy tender will be awarded to the public and the cost of the investment to society is theoretically minimum. However, the limited effectiveness of this system is a major disadvantage. In practice, it is difficult to run projects as renewable energy producers offer very low prices to operate profitable power plants. France abandoned the tendering system in 2000 and England in 2003. However, some countries are still implementing this system.

In another method, Net Measurement, consumers are provided with the opportunity to produce their own electricity from renewable sources and sell more to the national grid at a high rate. In this model, which is one of the oldest policy tools, it is necessary to equip home, school or commercial buildings with renewable energy and to obtain a loan that can be used at any other time from the network for the extra electricity produced. Due to the focus on small-scale applications, its effectiveness has been suggested to be relatively low. In addition, it is stated that the investment security is quite low due to the fluctuation of the purchase price of the excess electricity produced.

4.1.4 History of European Union (EU) and Founder Treaties

4.1.4.1 The European Coal and Steel Community (ECSC)

European Coal and Steel Community (ECSC) was the first European Community and it was established in 18 April 1951, with the Paris Agreement. It consisted of six countries. They are Germany, France, Italy, Belgium, Luxembourg and Netherlands. An important feature was the setting up of a common High Authority to (European Commission, 2019) :

- Supervise the market;
- Monitor compliance with competition rules; and
- Ensure price transparency.

The main purpose of the organization was to avoid new wars by combating the interests of iron and steel resources which played an important role in international security and in economic growth.

4.1.4.2 The European Atomic Energy Community (EURATOM)

EURATOM (European Atomic Energy Community) is established in 1958 by one of the Treaties of Rome to form a common market for the development of atomic energy' peaceful use. The original members are West Germany, Belgium, Italy, France, the Netherlands and Luxembourg. It almost came to include all members of the EU.

The main reason of the establishment of this international organisation was the desire to facilitate the nuclear industry's establishment in Europe. This Communtiy also aimed coordinating research in atomic energy, promoting the construction of nuclear plants, establishing safety and health regulations, promoting the flow of information and the free personnel movement, and creating a common market to trade nuclear equipment and materials. The control of EURATOM did not spread to the military use of nuclear materials.

The treaty that established the community developed out of the Messina Conference in 1955, and became active in 1958. The Common Market for Trade in Nuclear Material, which eliminated import and export duties in the community, came into existence in 1959. From the start, EURATOM shared a Court of Justice and a parliament with the EEC and the ECSC; in 1967 the Commission and the Council of

Ministers of all 3 communities were merged. In 1993 EURATOM and the other 2 communities were subsumed under the EU. (Encyclopaedia Britannica, 2019).

4.1.4.3 The European Economic Community (EEC)

The European Economic Community (EEC) was established by signing Rome Treaty by the six ECSC members in 1957. This Community established a common market which featured the most barriers' elimination to move the goods, services, labour and capital, the most public policies' prohibition or private agreements which inhibit market competition, a common external trade policy, and a common agricultural policy (Encyclopaedıa Britannica, 2019).

EEC did not include any direct provisions on energy policy or other essential fuels. However, many provisions of the Rome Treaty establishing the European Economic Community regulate the activities of governments and companies in the energy sector, even though they are related to areas other than energy. The operation of the crude oil, natural gas and electricity markets was left to market conditions regulated by the general provisions of the Treaty of Rome. Moreover, structural regulations regarding these sectors were not included. Compared to the ECSC and EURATOM, which are more specific according to the European Economic Community, the prospect of oil exploration and extraction in the North Sea and the ability to import energy from third countries could be easily applied. Because of this feature, although the other two agreements contain specific energy-related regulations, energy-related regulations have been made mostly in accordance with the provisions of the EEC agreement (Dursun, 2009).

4.2 Energy Policy and Incentives of Turkey

4.2.1 Structure of Turkey's energy sector

Turkey's energy demand and natural resources has been increasing because of its developing economy growing population. In recent years, Turkey has recorded the fastest growth in electricity demand among OECD members, with an annual growth rate of 5,5% since 2002. It is estimated that Turkey's energy use will increase by 50% over the next decade. Turkey's installed capacity has exceeded 88 GW as of January 2019, that represents a threefold increase in 15 years (Republic of Turkey Ministry of Foreign Affairs, 2019).

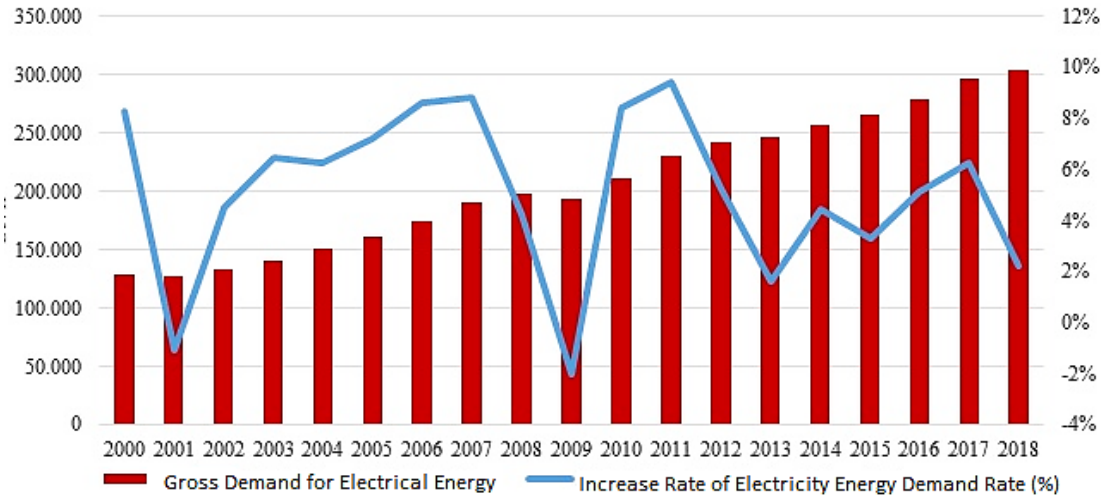

Figure 4.4: Turkey 's Gross Electricity Demand and Demand Growth Rate, 2000-2018

Source: Republic of Turkey Ministry of Foreign Affairs (MFA), 2019

According to the OECD report, in Turkey, greenhouse gas emissions continue to rise steadily in recent years. Turkey, should take concrete action to improve energy efficiency and to increase the use of renewable energy sources. Turkey's economy is largely dependent on coal, oil and gas. However, while investment incentives helped to double the use of renewable energy within a decade, the energy mix remained stable at 88% fossil fuels and 12% renewable energy levels due to rapidly increasing energy demand with the effect of economic growth and higher revenues. Turkey's greenhouse gas emissions during the period 2005-16, up 49% compared to a decline of 8% in the OECD area. OECD report made the following recommendations for Turkey (OECD, 2019) :

- Under the Paris Agreement, a long-term low-emission strategy that integrates climate and energy objectives should be adopted.
- The share of fossil fuels, especially coal, in the energy mixture should be reduced and the share of geothermal, solar and wind energy should be increased.
- Measurable energy efficiency targets should be set in the electricity, housing and transport sectors.
- More economic incentives should be provided for energy efficiency investments in buildings.
- A nationwide strategy should be developed to reduce air pollution.

- The vehicle and fuel taxation system should be reorganized to eliminate exemptions and integrate emission criteria. Tax exemptions for fossil fuel consumption should be eliminated.

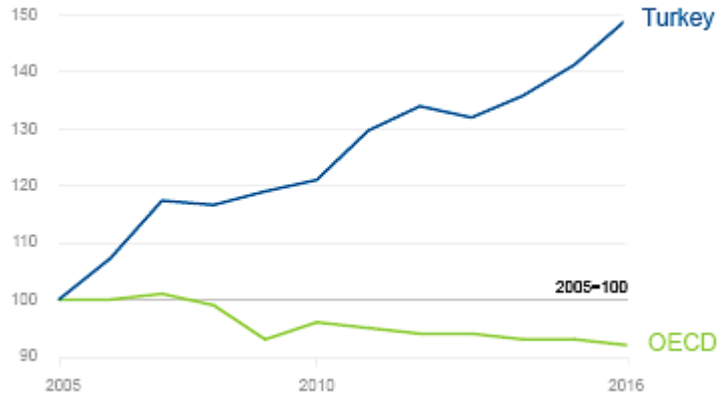

Figure 4.5: Steady Rise in Turkey's Greenhouse Emissions: Total emissions excluding land use, land use change and forestry, 2005-2016.

Source: OECD Environmental Performance Reviews: Turkey, 2019

Referring to Turkey's renewable energy resources, in general, it is seen that there is a large hydroelectric power. The share of hydroelectric energy in total renewable energy is approximately 90%. The most extensively used renewable energy source after hydroelectric energy sources is wind energy with the contribution of approximately 10% electricity production (Yılmaz, 2015).

4.2.2 The energy policy of Turkey

Renewable energy concept in Turkey is not based on very old. Turkey, in line with the development activities since the 2000s, wanted to take all the energy resources to meet the increasing energy demand. The first step towards liberalization in the energy sector was the establishment of the Energy Market Supervisory Board (Enerji Piyasası Denetim Kurulu-EPDK) in 2003. Thus, public and private sector investments were taken under control in line with the growth targets. In 2004, a new route was created by observing the most popular energy investments worldwide (Yılmaz, 2015). Turkey began to realize its domestic and renewable energy potential.

The Law (No.5346) using Renewable Energy Resources for Electricity Generation (Renewable Energy Law) came into force in 2005. However, due to the absence of secondary legislation, a relatively low fixed price guarantee was provided. As a result, investment in renewable energy resources remained limited between 2005 and

2010. However, with the amendments to the Renewable Energy Law in December 2010, higher fixed price guarantees and monetary/non-monetary incentives were introduced for some sources. Especially after the revision of fixed price guarantees, the interest of domestic and foreign investors to environmentally friendly energy resources has increased considerably (Yılmaz, 2015).

The Law on electricity generation from renewable energy sources dated 10.05.2005 provides various incentives such as exemption from service costs of projects, power generation facilities and R & D investments. The law also provides investors with advantages such as tax and land use reductions. In addition, the opportunity of unlicensed electricity production is provided as well as licensed (Yılmaz, 2015).

A new transformation process was initiated with the Energy Efficiency Law, that came into force in 2007. With the Energy Efficiency Strategy Paper published in 2012, 2023 energy efficiency targets have been established and the National Energy Efficiency Action Plan has been prepared (T.C. Enerji ve Tabii Kaynaklar Bakanlığı , 2018).

With 55 actions described in 6 categories (energy, buildings and services, transportation, industry and technology, agriculture and horizontal issues) within the scope of the National Energy Efficiency Action Plan to be implemented between 2017 and 2023. By 2023, a cumulative saving of 23.9 MTEP is expected and an investment of USD 10.9 billion is foreseen. With the 2017 prices, the cumulative savings to be achieved by 2033 is 30.2 billion USD. The effect of some savings will continue until 2040. The average payback period of the actions is 7 years (T.C. Enerji ve Tabii Kaynaklar Bakanlığı, 2018).

Total Investment Required (Million USD)							
2017	2018	2019	2020	2021	2022	2023	TOPLAM
958	1.279	1.593	1.681	1.748	1.824	1.846	10.928

Energy Saving															
2017		2018		2019		2020		2021		2022		2023		Kümülatif	
(kTEP)	(M$)	(kTEP)	(M$)	(kTEP)	(M$)	(kTEP)	(M$)	(kTEP)	(M$)	(kTEP)	(M$)	(kTEP)	(M$)	(kTEP)	(M$)
577	202	1.630	571	2.493	872	3.378	1.182	4.298	1.504	5.264	1.842	6.261	2.191	23.901	8.365

Energy Saving																				Kümülatif 2017-2033	
2024		2025		2026		2027		2028		2029		2030		2031		2032		2033			
(kTEP)	(M$)	(kTEP)	(M$)	(kTEP)	(M$)	(kTEP)	(M$)	(kTEP)	(M$)	(kTEP)	(M$)	(kTEP)	(M$)	(kTEP)	(M$)	(kTEP)	(M$)	(kTEP)	(M$)	(kTEP)	(M$)
6.261	2.191	6.261	2.191	6.261	2.191	6.261	2.191	6.248	2.187	6.248	2.187	6.248	2.187	6.248	2.187	6.216	2.175	6.216	2.175	86.369	30.228

Figure 4.6: Changes in Investments and Projected Savings by Years

Source: T.C. Enerji ve Tabii Kaynaklar Bakanlığı, 2018

Within the scope of Turkey's energy policies in recent years, relevant institutions and organizations are encouraged to use local, renewable and environmentally friendly energy resources and to evaluate them in electricity generation. Because Turkey is dependent on foreign energy almost around 70%, using local and renewable resources instead of fossil fuels as much as possible of businesses in the country is extremely important (Yılmaz, 2015).

Two major features of Turkish's energy markets are growing energy demand and dependency on imports. Turkey is taking required steps to reduce this dependency by its local and national energy strategies. The basic factors of Turkey's energy strategy is summarized below (Republic of Turkey Ministry of Foreign Affairs, 2019).

- Considering prioritizing increased energy demand and import dependency among energy supply security related activities
- Considering environmental concerns across the entire energy chain in the context of sustainable development
- Increasing efficiency and productivity and to creating transparent and competitive market conditions via reforms and liberalization.
- Increasing research and development activities related to energy technologies.

The application of these four basic principles aims to achieve the following objectives:

- Diversification of supply routes and resources for imported oil and natural gas,
- Increasing the proportion of renewable and local energy in Turkey's energy mixture,
- Increasing the efficiency of energy,
- Nuclear addition to Turkey's energy mixture.

Turkey's renewable energy policy targets are listed below (Yılmaz, 2015) :

- Increasing the use of renewable resources to generate electricity
- Promoting safe, economic and cost effective renewable energy production
- Increasing the diversity of energy resources
- Ensuring the reduction of greenhouse gas emissions
- Using waste products and protecting the environment
- Developing the relevant mechanical and electro-mechanical manufacturing sector
- Using all of the hydroelectric potential in electricity generation
- Increasing the installed capacity based on wind energy to 20.000 MW
- Operating 600 MW geothermal potential
- Making necessary arrangements for the use of solar and other renewable resources
- Reducing the share of natural gas in electricity generation below 30% as a result of the measures to be taken for the use of domestic and renewable energy sources.

4.2.3 The Role of Turkey in the regional energy trade

Turkey is a country which is located between the countries generating energy of its region with more than 75 percent of the proven gas and oil reservesof the world, and the developed energy consumer markets of Europe. This special natural features bring Turkey both certain opportunities and some responsibilities in terms of energy security. Turkey remains convinced of the requirement to strengthen this special role based on its geostrategic location. Thus, as developing the energy strategy, Turkey has the aim to strengthen its position between East West and South North Energy Corridors as well. The role of Turkey in the Global energy market with projects it

has undertaken are described below (Republic of Turkey Ministry of Foreign Affairs, 2019) :

The "East-West" gas pipeline projects which are envisaged to bring gas from Caspian and the Middle East regions to Europe through Turkey are referred to as "Southern Gas Corridor" (SGC). South Caucasus Pipeline (SCP), Baku-Tbilisi-Erzurum Natural Gas Pipeline (BTE), Turkey-Greece Interconnector (ITG) are the existing pipelines. Trans Anatolian Pipeline Project (TANAP) which constitutes the backbone of the Southern Gas Corridor was inaugurated on 12 June 2018. It is expected that Trans Adriatic Pipeline Project (TAP) will be completed in 2019 and thus, Azerbaijani gas will be delivered to Europe in 2020.

4.2.4 TURKEY-EU energy relations

Like EU, Turkey also lack in energy resources and has to depend on outside. Although Turkey is near to the Middle East, it doesn't have enough energy resources like fossils fuels. And the energy demand is increasing every year. So Turkey is needed to develop renewable energy by benefiting from the cooperations.

Energy is a significant factor in terms of Turkey and EU relations. As an indication of the importance given to regional energy cooperation, Turkey, with its indispensable position on providing Europe's energy security, joined the Energy Community with as an observer in 2006. Energy Community established in 2005. It is an international organization that aims establishing an competitive and integrated energy market among EU members and non-EU South Eastern European countries as well as other neighboring countries. Within the scope of Turkey's accession negotiations with the EU, the Energy Chapter's screening process was completed in 2007. Work on updating the Report on the screening of the Energy Chapter is currently being carried out by the EU side. Turkey-EU High Level Energy Dialogue was launched and the 1st meeting was held in Ankara on 16.03.2015. The second High Level Energy Dialogue Meeting was held in İstanbul on 28.01.2016 in Istanbul (Republic of Turkey Ministry of Foreign Affairs, 2019).

4.2.5 Renewable energy incentives in Turkey

The beginning of the renewable energy incentive policy in Turkey dates back to 2005. However, with the new regulations introduced after 2010, the orientation towards renewable energy gained momentum. The main incentives provided in the energy field in Turkey are, fixed price guarantee, unlicensed production, and financial incentives (tax exception, exemption from customs duty, etc.).

Renewable Energy incentives in Turkey is very low compared to developed countries. Renewables are significant in terms of the security of energy supply. In addition, investments in renewables will ensure higher potential for employment and contribute to reduce Turkey's a number of jobless. Therefore the organisations operating in this field should be promoted via effective incentives.

4.2.5.1 Fixed price guarantee

Fixed price guarantee is one of the most widely used support and incentive mechanisms in the world and Turkey as well. In this mechanism, a new fixed price guaranteed plan was introduced for each renewable energy source. Real and legal persons benefit from the related prices for a period of 10 years in case they send the electricity they generate above their needs to the distribution system. For example, according to the Law no. 6094, various fixed certain guarantees are applied to the energy facilities as shown in the table below (Yılmaz, 2015).

Table 4.1: Fixed Price Guarantee applied in Turkey

Based on Renewable Energy Sources Production Plant Type	**Prices to be applied (US dollar cent/kWh)**
a) Hydroelectric production facility	7,3
b) Wind Energy based production facility	7,3
c) Geothermal energy based production facility	10,5
d) Biomass based production facility (including landfill gas)	13.3
e) Solar energy based production facility	13,3

Source: Yılmaz, 2015

4.2.5.2 Unlicensed production right

The right to unlicensed generation is another important incentive mechanism used to attract investors to the renewable energy market after the fixed price guarantee system. The installed capacity of the generation facility based on renewable energy sources has been increased from 500 kW to 1 MW without the license and company

obligation. In addition, the Council of Ministers decided to increase the installed capacity of the generation facility based on renewable energy resources by 5 times (5 MW) in order to improve competition and ensure supply security (Yılmaz, 2015).

4.2.5.3 New incentives for encouraging investments in Turkey

The incentives provided by the new investment incentive program, which entered into force in June 2012, has been in effect since 1 January 2012. These supports are divided into four groups. These are: general and regional incentive practices, large scale investment incentives, strategic investment incentives (Akdeniz İhracatçı Birlikleri, 2015).

4.3. Evaluation of Turkey and the EU Energy Policy

Turkey's harmonization process with the EU energy acquis began immediately after the 1999 Helsinki Summit. The reform process initiated in 2001 for the restructuring of our energy sector in line with the EU energy internal market acquis is still ongoing. In this direction, Turkey, which has made great progress in legal studies, has not yet reached the desired point in the implementation phase (Yorkan, 2009).

Turkey's energy consumption is met from sources close to half-petroleum based. This poses a major burden on Turkey. Coal-based thermal power plants lose their efficiency in terms of operation and cost. Turkey's EU Energy is extremely important in terms of increasing the diversity and quality of the integration of energy policy. Turkey has a key role to play in energy, hydropower is a major manufacturer. Turkey's strategic location, Turkey is a country that makes passage for transporting oil and gas to Europe. Due to its strategic location, Turkey is is a gateway country for oil and gas transportation to Europe. The decision was taken to begin accession negotiations with Turkey upon the EU Council Summit dated 17 December 2004. Prior to the summit, the Commission issued three reports. In one of these reports, which are among the advantages of energy for Turkey's accession to the Union has come to the fore floor. Turkey, are also part of the EU's 12 Mediterranean countries, including the partnership system. In 1995, with the Barcelona Declaration, the Euro-Mediterranean Partnership was established and with particular reference to the development of energy cooperation, the important role of energy was recognized. Turkey, also participates in activities of the EU aimed at improving energy cooperation in the Black Sea region. Turkey, as well as activities related to energy connection infrastructure to promote investment, in activities that improve energy

links to the Balkans, took place. Turkey also is an active member of the Black Sea Regional Energy Center. This center carries out activities such as developing energy policies, implementing the Energy Charter Treaty, and encouraging investments. Turkey plays an important role in the EU's cooperation with the Caucasus and Central Asian Republics (Aytüre, 2013).

A successful national energy policy is linked to a successful international energy policy. According to experts, Turkey may take place among the top 10 economies in the coming years, however, it will be very difficult without energy (Bemberg, 2011).

As the geography where Turkey is rich than many developed countries in terms of renewable energy sources. However, making the necessary legal arrangements late, not enough awareness of citizens about renewable energy, 70% external dependency in energy, long-term fossil fuel agreements with foreign countries, are Turkey's most important obstacles. Since 2001, Turkey's energy sector with the right reforms, has gone through a restructuring process very seriously. Necessary laws regarding the markets have been enacted and secondary legislation arrangements have been largely completed. In this way, the majority of the steps that could be taken for a competitive and transparent energy market have been taken. 2005 for Turkey is a date that has been thrown concrete steps in terms of renewable energy. Government of Turkey, together with, Renewable Energy Law (No.5346) aimed at increasing the use of local sources for renewable energy. In this respect, it has implemented certain incentive practices for investors. Although such incentive and support mechanisms seem to be late to be implemented, these policies need to progress rapidly without a break (Yılmaz, 2015).

5. CONCLUSIONS

This thesis was intended to investigate the importance of the businesses operating in the renewable energy field to ensure sustainable economic development, and the adequacy of government support provided to these businesses in terms of Turkey by comparing with EU energy policies. In this context, it examined the structure of the renewable energy sector and renewable energy policies of the EU and Turkey were investigated.

The finding that renewable energy sources increase economic growth shows that it is necessary to support these sources in order to combat global warming. Accordingly, it is seen that renewable energy sources are encouraged in many countries and alternative energy investments are encouraged within energy policies. Empirical analysis shows that energy production from renewable sources positively affects economic growth in the short and long term. These findings show that renewable energy sources are an important component of economic growth.

EU imports 54% of its energy and by 2023 it is expected to increase to 70%. The high level of foreign dependence on energy is a risk for the EU. In addition, the fact that these resources are fossil fuels has made renewable energy-oriented action plans important in terms of EU environmental policies 2020, 2030 and 2050 and the Kyoto Protocol.

Today, EU energy policies are based on three basic principles. These include: establishing a competitive, transparent and fully integrated domestic market in the electricity and natural gas sectors; environmental protection and combating global climate change; and securing energy supply. The EU's long-term energy policy is to ensure energy supply: uninterrupted; at an affordable level for individual or industrial consumers; respectful to the environment; and in line with sustainable development.

Despite the numerous advantages of renewable energy sources, its share in total energy production in the EU is still as low as 17%. The main reasons for this are: maintaining subsidies for fossil fuels, not including the total cost of pollution in the cost of fossil fuels, and the high initial costs of new renewable energy investments. For these reasons, non-tax and tax incentives are given in the EU in order to reach an optimal level of renewable energy investments. In this way, it is aimed to contribute to the reduction of external dependence in energy.

The European Union has also affected Turkey's energy sector, which set targets for its energy policy. With Turkey's reform process began in alignment with the EU internal energy market, the energy sector is made more transparent and prices were determined in a more competitive environment. It contributed to the restructuring of energy institutions, the establishment of an independent supervisory authority, increasing energy efficiency and savings, investments in the rehabilitation and modernization of energy-related infrastructures, and the development of a stock-keeping mechanism for emergencies. In addition, that the Union's energy as our country is highly dependent on foreign supplies is considered as a distinct advantage for Turkey. The zoom on both sides of this energy supply security policy situation at the same time wishing to become Turkey's energy hub in the region will contribute to achieving this goal. This situation brings the energy supply security policies of both sides closer. This will contribute to achieving this target Turkey's seeking to become energy hub in its region.

Turkey, is a country providing secure and continuous supply of energy into EU energy market thanks to its importance in terms of security of energy routes, proximity to major energy centers, its potential to become an energy center. In this regard, Turkey is an important country for EU energy policy. Turkey will contribute to the achievement of the objectives of the EU's energy policy. Turkey's contribution will also positively affect membership negotiations conducted with the EU.

REFERENCES

Akdeniz İhracatçı Birlikleri (2015). *Yeni Teşvik Sistemi & Yatırımlarda Devlet Yardımı*. http://www.akib.org.tr/files/downloads/Ekler/Yeni_Tesvik_Sistemi.pdf

Albayrak, K. (2019). "Türkiye'nin Enerji Ekonomisi ve Cari Açık için Yenilenebilir Enerji Kaynaklarının Önemi". *Unpublished Master's Thesis.* KTO Karatay University, Social Sciences Institute. Konya.

Amin, A. Z. "The Falling Costs of Renewable Energy: No More Excuses", *The Huffington Post*, http://www.huffingtonpost.com/adnan-z-amin/post_10557_b_8600240.html (06.12.2017).

Australian Government Department of the Environment and Energy. "Greenhouse Effect". http://www.environment.gov.au/climate-change/climate-science-data/climate-science/greenhouse-effect (10.06.2019)

Aytüre, S. (2013). "Avrupa Birliğinin Enerji Politikasında Son Gelişmeler ve Türkiye'ye Yansımaları" Nevşehir Hacı Bektaş Veli Üniversitesi, *Sosyal Bilimler Enstitüsü Dergisi.* 3. 35-51.

Bakirtaş, İ. and Çetin, M. A. (2016). "Yenilenebilir Enerji Tüketimi İle Ekonomik Büyüme Arasındaki İlişki: G-20 Ülkeleri" *Sosyoekonomi*. Vol. 24(28), 131-145

Bayraç, H.N. and Çildir, M. (2017). "AB Yenilenebilir Enerji Politikalarının Ekonomik Büyüme Üzerindeki Etkisi". *Uluslararası Yönetim İktisat ve İşletme Dergisi. Vol.*13 (5). 201-212.

Bemberg, N. (2011). "Bir Enerji Konjonktürü Analizi: Türkiye'de Yabancı Enerji Yatırımlarının Geleceği". Enerji Platformu 2010, Konrad Adenauer Stiftung Vakfı Yayını. p.73-78. Ankara.

Blazev A. S. (2016). *Global Energy Market Trends*. The Fairmont Press.

BP Statistical Review of World Energy (2019). 68th ed. p.5

BP Statistical Review of World Energy - all data, 1965-2018 https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html (25.06.2019)

Colgan, J. D. (2013). "Fueling the Fire: Pathways from Oil to War", *International Security*, Vol.38, No.2, October 2013, 147-180.

Commission of the European Communities. "The Renewable Energy Progress Report". Brussels. COM(2009) 192 final. 24.04.2009

Çevikalp, S. (2019). "Yeşil Ekonomi Çerçevesinde Türkiye'nin Yenilenebilir Enerji Politikaları". *Unpublished Master's Thesis.* Marmara University, Social Sciences Institute. İstanbul.

Çubuk H., *Enerji Yönetimi*, http://www.yarbis.yildiz.edu.tr/web/userCourseMaterials/hcubuk_745a7bdfc5c070f95dccb3d70336c6c1.ppt (05.06.2019).

Dursun, S. (2009). "Avrupa Birliği'nin Enerji Politikası ve Türkiye". *Unpublished Doctoral Thesis*. Ankara University, Social Sciences Institute. Ankara.

Encyclopaedia Britannica. https://www.britannica.com/topic/European-Atomic-Energy-Community (10.06.2019).

Energy Institute. *Energy Essentials: A Guide to Energy Management* https://knowledge.energyinst.org/__data/assets/pdf_file/0010/198739/Energy-Essentials-A-guide-to-energy-management.pdf (05.06.2019).

European Commission (2019). *Renewable Energy Directive.* 22.08.2019 https://ec.europa.eu/energy/en/topics/renewable-energy/renewable-energy-directive/overview

European Commission (2019). "Treaty establishing the European Coal and Steel Community, ECSC Treaty". https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=legissum:xy0022 (10.06.2019).

European Environment Agency (EEA). "Civa: Çevre ve İnsan Sağlığı İçin Kalıcı Bir Tehdit", https://www.eea.europa.eu/tr/articles/civa-cevre-ve-insan-sagligi (13.11.2018).

Favennec, J.P. (2011). *The Geopolitics of Energy*, Editions Technip, Paris.

Fawkes, S. "21st Century Energy Management". *Energy Efficiency in Industrial Processes*. https://www.ee-ip.org/articles/detailed/34797d22b9f922980cdcc13e3cd53771/21st-century-energy-management/ (01.08.2018).

Franco, Y. and Herrera P. M. (2005). "New Economic Instruments to Foster Renewable Sources of Energy: An EC Law Approach". in H. Ashiabor, K. Deketelaere, L. Kreiser and J. Milne (eds.), Critical Issues in Environmental Taxation II. *Richmond Law & Tax*, 177-189.

International Atomic Energy Agency (IAEA) (2005). *Energy Indicators for Sustainable Development: Guidelines and Methodologies.* Vienna, Austria. April 2005.

International Energy Agency (IEA). *Global Energy & CO2 Status Report.* https://www.iea.org/geco/electricity/ (25.06.2019).

International Energy Agency (IEA). *Global Energy & CO2 Status Report.* https://www.iea.org/geco/data/ (25.06.2019).

Intelligent Economist. "The Environmental Kuznets Curve". https://www.intelligenteconomist.com/environmental-kuznets-curve/ (10.05.2019).

Jaffe A. M. and Elass J. (2015). "War and the Oil Price Cycle", *Journal of International Affairs*, Fall/Winter 2015, Vol.69, No.1, 121-137.

Johnson, S. "The Advantages & Disadvantages of Non-Renewable Energy Sources". https://sciencing.com/the-advantages-disadvantages-of-non-renewable-energy-sources-12293766.html (22.09.2017).

Kafalı, F. "Enerji ve Toplum". *HENDESE Bilim, Teknoloji ve Düşünce Dergisi.* Mart 2015, Yıl:3, Sayı: 4.

Kiraz, D.E. (2005). "Yenilenebilir Enerji Toplumsal Farkındalığının Tespiti ve Arttırılması Araştırmalarının Önemi". *Sağlıklı Kentler Birliği*, http://www.skb.gov.tr/wp-content/uploads/2016/10/Prof.-Dr.-Emine-Didem-EVCI-KIRAZ.pdf

Koç A., Yağlı H., Koç Y., Uğurlu İ. (2018). "Dünyada ve Türkiye'de Enerji Görünümünün Genel Değerlendirilmesi". *Engineer and Machinery*, Vol:59, No:692, p.86-114.

KPMG INTERNATIONAL. (2013). *Taxes and Incentives for Renewable Energy* https://assets.kpmg/content/dam/kpmg/pdf/2013/11/Taxes-and-Incentives-for-Renewable-Energy-2013-O-201310.pdf

OECD. "Turkey Needs to Step up İnvestment in Renewables to Curb Emissions". https://www.oecd.org/environment/turkey-needs-to-step-up-investment-in-renewables-to-curb-emissions.htm (15.06.2019).

Oxford Dictionaries. Oxford University Press. https://www.lexico.com/en/definition/energy (15.06.2019).

Rahmani, A. (2019). "Türkiye Ekonomisinde Yenilenebilir Enerji Tüketimi ve Ekonomik Büyüme İlişkisi: Bir Zaman Serisi Analizi". *Unpublished Master's Thesis*. Tekirdağ Namık Kemal University, Social Sciences Institute. Tekirdağ. p.4.

Republic of Turkey Ministry of Foreign Affairs. "Turkey's Energy Profile and Strategy" http://www.mfa.gov.tr/turkeys-energy-strategy.en.mfa (10.06.2019).

Sweeney, J. L. (2002). *Economics of Energy.* Vol: 4.9, Article:48. http://www.stanford.edu/~jsweeney/paper/Energy%20Economics.PDF (15.06.2019).

Şentürk, İ. (2012). "Kaynaklarına Göre Enerji Tüketiminin Ekonomik Büyümeye Etkileri". *Unpublished Doctoral Thesis*. Hacettepe University, Social Sciences Institute. Ankara

T.C. Enerji ve Tabii Kaynaklar Bakanlığı (2018). *Ulusal Enerji Verimliliği Eylem Planı, 2017-2023*. Ankara. http://www.yegm.gov.tr/document/20180102M1_2018.pdf

Thoubboron. K. "Advantages and Disadvantages of Renewable Energy" https://news.energysage.com/advantages-and-disadvantages-of-renewable-energy/ (25.10.2018)

Türkiye Barolar Birliği (2014). *Uluslararası Çevre Koruma Sözleşmeleri*. Türkiye Barolar Birliği Yayınları. Ankara.

U.S. Energy Information Administration (EIA). "What is Energy?". https://www.eia.gov/energyexplained/ (10.06.2019).

U.S. Energy Information Administration (EIA). *Monthly Energy Review*. (Table 1.3 and 10.1). April 2019. preliminary data.

U.S. Energy Information Administration (EIA) (2013). *International Energy Outlook 2013*. https://www.eia.gov/outlooks/ieo/pdf/0484(2013).pdf

World Commission on Environment and Development (WCED) (1987). *Our Common Future*. Oxford University Press. Oxford, UK.

World Health Organization (2000). *Climate Change and Stratospheric Ozone Depletion Early Effects on Our Health in Europe*, Ed. Kovats S. et al., WHO Regional Publications, European Series, No. 88, Denmark.

Yasin, I., Ahmad, N. and Chaudhary, M. A. (2019). "Catechizing the Environmental‐Impression of Urbanization, Financial Development, and Political Institutions: A Circumstance of Ecological Footprints in 110 Developed and Less‐Developed Countries". *Social Indicators Research.* https://doi.org/10.1007/s11205-019-02163-3

Yılmaz, O. (2015). "Yenilenebilir Enerjiye Yönelik Teşvikler ve Türkiye". *Unpublished Master's Thesis*. Adnan Menderes University, Social Sciences Institute. Aydın.

Yorkan, A. (2009). "Avrupa Birliği'nin Enerji Politikası ve Türkiye'ye Etkileri". *Bilge Strateji*, Cilt 1, Sayı 1. 24-39.

RESUME

HTET MYAT AUNG

Date of Birth : 27.03.1988

Place of Birth: Mogok, Mandalay Division, Myanmar.

Mobil : +905550527088

Email : samiolatr@hotmail.com

EDUCATION

2004-2008: Bechelor degree of University of Foreign Langes, Department of French, Mandalay, Myanmar.

2017-2019: Master of Business Administration Program, Department of Business Administration, Institute of Social Science, Istanbul Aydin University, Istanbul, Turkey.

PROFESSIONAL EXPERIENCES

2009 – 2011 : Private Lessons for High School Students

2011 – 2013 : Marketing

2016 – 2018 : Private English Lessons

SKILLS

Languages:

- Written: Burmese, French, English and Turkish
- Spoken: Burmese, French, English, Turkish and Chinese