FINANCING RENEWABLE ENERGY INVESTMENTS:

A CASE STUDY OF TURKEY

BY

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ÖZET

YENİLENEBİLİR ENERJİ YATIRIMLARININ FİNANSMANI: TÜRKİYE UYGULAMASI

KOÇ, EŞŞE

Sürdürülebilir Enerji Yüksek Lisans Programı, Sosyal Bilimler Enstitüsü

Tez Danışmanı: Prof. Dr. Cumhur Coşkun Küçüközmen

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Enerji, modern ekonominin ve dünya refahının temel sağlayıcısıdır.Artan enerji talebini karşılamak ve iklim değişikliğine cevap vermek 21.yüzyılın en önemli küresel problemlerindendir. Bu zorlukların üstesinden gelmek için, özel sektor yenilenebilir enerjiye yatırım yapmalıdır.Ancak bu yatırımları fonlamak için finans açığı bulunmaktadır. Gerekli temiz enerji arzını temin etmekte finans sektörünü önemli rol oynamaktadır.

Bu tez Türkiye'de yenilenebilir enerji yatırımlarında engelleri ve riskleri analiz ederek yenilenebilir enerji yatırımları için en uygun finansman araçlarını ortaya koymaktadır.Tezde kullanılan yöntem vaka incelemesi yöntemine dayanmaktadır.Yenilenebilir enerji yatırımları için finansman arayanların ve finansman araçlarının türleri için öngörülen riskleri ve engelleri anlamayı amaçlayan bu tez, alanında uzman kişilerle açık uçlu röportajlardan elde edilen verilerle desteklenmektedir.Veriler, Türkiye'de yenilenebilir enerji sektörünün mevcut durumu ve geleceği ile ilgili bilgileri kapsamaktadır.Bu çalışmada elde edilen bilgiler işletmeler ve bireylerin yatırım yapmak ve geleceği öngörmeleri için veri üretmek amacıyla kullanılabilir.Buna ek olaraktez; yatirimcinin enerji sektörünün gerçekliğini ve Türkiye'deki gelişimini daha iyi anlamalarına olanak tanıyan orijinal bir veri kümesini muhafaza etmektedir.

Sektor paydaslari ile yapilan görüşmeler sonuç bolumunde bir tablo halinde verilmiştir.Yapilan gorusmelerdenelde edilen cikarim Turkiyede orta ve buyuk olcekli yenilenebilir enerji yatirim projelerinin finansman, teknik ve yasal anlamda dusuk düzeyde engelle karsilastiklari ancak politik riske maruz kalabilecekleri, kucuk capli projelerin hukuksal, finansal ve teknolojik enegellere önemli olcude maruz kaldiklari yönündedir.Ek olarak karbon emisyonu azaltimi ve yenilenebilir enerji yatirimlarinin artmasi için karbon vergisinin etkin bir yöntem olabileceği sonucuna varilmistir.

Anahtar Kelimeler: Yenilenebilir Enerji, Proje Finansmanı, Yeşil Finans, İklim Değişikliği, Karbon Vergisi

ABSTRACT

FINANCING RENEWABLE ENERGY INVESTMENTS:

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KOÇ, EŞŞE

Sustainable Energy Master Program, Graduate School of Social Sciences

Supervisor: Prof. Dr. Cumhur Coşkun Küçüközmen

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Energy is the engine of the modern economy andit is essential for the welfare of the modern world. Meeting the increasing energy demand and responding to climate change will be a global challenge of the 21st century. In order to tackle these challenges, business and government must invest in renewable energy; however, there is a finance gap that must be filled in order to secure the required clean energy supply.

The methodused in this thesisis based on qualitative content analysis in case study research. This thesis is supported by an open ended interview, and the aim is to understand the risks and barriers to those seeking to finance renewable energy investments through various types of financing instruments. The interview collects qualitative and quantitative data from range of sectors. The data covers information on the current situation and the future of the renewable energy sector in Turkey. The information this thesis gathers may beused to extract knowledge which public and private companiesand individuals may use to make decisions, assess the renewableinvestment position of the country and plan for future investments. In addition, the thesis maintain an original data set that allows government, private sector and academia to better understand the reality of the renewable energy sector and resource development in Turkey.

As a consequence, the thesis provided that even though the finance sector has had increased involvement with the energy sector,long-term financing is still a major issue challenging renewable energy investments in Turkey. While the large and

medium-scale renewable energy investment projects are exposed to financial, technical and legalrisks and barriers in medium to low level, small-scale renewable energy projects are exposed tohigh level.In addition, political risk will be encounter barrier in high level for renewable energy investments in Turkey. The interviews and face-to-face questionnaires that have been made with sector shareholders are illustrated in the conclusion chapter. Moreover, this thesis confirms the carbon tax would be an effective tool reducing carbon emissions and to expand renewable energy investments in Turkey.

Keywords: Renewable Energy, Project Financing, Green Finance, Climate Change, Carbon Tax.

To my family

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CHAPTER 1

1.1.INTRODUCTION

In 2010, world governments confirmed in the Cancun Agreement at the United Nations Climate Change Meeting, that emissions must be reduced to prevent an increase in global average temperature of more than $2^{o}C$ above pre-industrial levels (IEA Geothermal, 2017).Then, in 2012, an international agreement was reached to draw up a comprehensive United Nations Global Climate Change Deal by 2015 that would extend the Kyoto protocol until that deal comes into force and, representatives of world governments met again in 2014 at Limaand were engaged in the landmark deal in Paris(Authority of the House of Commons, 2014).

The Paris Agreement, which went into effect on 4 November, is a significant stepforward in the deal onglobal warming (Environment, 2017).For the first time at the Paris ClimateConference, the participation of 195 countries of the United Nations reached a universal and legally binding agreement on global climate, putting in place a global action plan to keep the global temperature to an increase of only 2°c or below. In the signed treaty, a framework was laid out to prevent climate change and the possible effects resulting for global warming. This climate treaty will enter into force in 2020. However, meeting climate goals is going to be extremely challenging and require great strides inthe efficiency and pace of de-carbonization. Implementing the current international commitments will only curtail the foreseen increase in carbon emissions from an average of 650 million tons per year in 2000 to around 150 million tons per year in 2040(IEA, 2016a).Economic and political concern about energy supply security and climate change risks are making renewable energy the main focus of both worldgovernments andorganizations in private sector. Accordingly, tackling global warming and increasing the share of renewable energy in Turkey`s mixed energy requirements, investment on renewable energy is gaining momentum to transition to a low-carbon economy.

Due to the required level to limit climate change, entities in private sector will need to make significant investments in renewable energy.

Accordind to Chris Field, “Understanding that climate change is a challenge but making out this challenge and tackling it creatively can make climate-change

adaptation an important way to help build a more vibrant world in the near-term and beyond." (IPCC, 2014). In addition, the United Nations have launched its 'Sustainable Energy for All' initiative and sets global targets that double the share of renewable energy by 2030 (IEA, 2016a).

Turkey is the country which experiences the fastest increase in energy demand among theOECD countries over the past 10 years. Annually, Turkey's electric energy consumption growth has been around 6 % on average. This has resulted in years of high growth rates in the country within the energy sector. When looking at yearly electricity consumption of Turkey, it was 141.2 billion kWh in 2003 and has nearly doubled to 274.8 billion kWh in 2016 (EXIST, 2017). Official forecasts by the Ministry of Energy and Natural Resources show that this trend will continue in the medium and long term. The gross electricity consumption in Turkey in 2016 was 167.1 billion kWh. This figure increased by 4.7% in July 2017, by reaching 278.4 billion kWh. "In July 2017, 34% of Turkey electricity generation was obtained from natural gas, 31% from coal, 24% from hydropower 6% from wind, 2% from geothermal and 3% from other sources"(Republic of Turkey Ministry of Energy and Natural Resources, 2017a).Due to level requirement to limit climate change, entities in private sector will need to make significant investments in renewable energy.

However, finding financial solution from public and concessional sources has turned out to not be easy. The finance sector approaches to renewable energy investments like other investments. It seeks to make a return commeasurable to the risk it undertakes. Risk and return is the central focus of any finance or investment decision. Each kind of renewable energy investmenthas its own characteristics barriers and risks that require an additional level of understanding. Barriers refer to inadequate financing, such as aninsufficiency long term loans, high transaction costs. Risks include the technical risks, regulatory and policy risks, country and financial risks. These two factors of barriers and risks will affect which types of instruments will be most suitable in Turkey, with the aim of attracting a significant additional investment base.

The main objective of the thesis is to gather as much information as possible to explain events in the finance sector that will support renewable energy investments

in Turkey. Doing so forecast the most desirable outcome accurately and fairly by incorporating a number of different viewpoints. In addition, this thesis serves as a guideline for decisions that will be made by governments, entrepreneurs and industry via qualitative and quantitative analyses of financing frameworks and policies for renewable energy investments in Turkey.

Renewable energy is multidisciplinary area thus it is required both technical appraisal and descriptive approach in order to get most feasible financial method. One of the objectives of this thesis is to close theknowledge gap in the literature about financing renewable energy by exploring basic forecasting methods of analysts' cash flow forecasts. To explain the thesis objective, the relevant data will be collected from the internet, National Statistics Institute, World Bank, Energy Exchange Istanbul (EXIST), Republic of Turkey Energy Market Regulatory Authority(EMRA), Republic of Turkey Ministry of Energy and Natural Resources as well as BP, IEA, WEC of reliable reports of international agencies.

The following questions about the latest developments on renewable energy investments in Turkey were directly asked of senior bankers, academicians, investors, policy makers, and regional and international decision makers.

What are the challenges faced by the financing of renewable energy, and how can these be overcome?

1. What are the most significant new risks faced by the renewable energy industry and how can renewable energy investments reduce risk and thus attract necessary capital?
2. What will be the road map to manage renewable energy investment with the potential uncertainties and political risk that are attached?
3. What is the potential role and future contribution of banks in renewable energy investments and how can the financial sector engage with the renewable energy investments in Turkey?

The designment of the thesis is as follows: Chapter two is the Literature Review and Methodology. This chapter examines several concepts of case studies from different viewpoints. The concept of the case study will be also explained in this chapter.

Chapter three gives general definitions of different renewable energy resources. In addition, it briefly explains the world's energy demand and renewable energy development as a secondary energy resource.

The fourth chapter of this thesis explains a wide range of available financial instruments in terms of supporting renewable energy investmentsglobally.

Chapter five demonstrates a simple assessment of a solar energy investment.In addition, the fifth chapter of this thesis analyzes preparing projections of cash flow statement for renewable energy investments in Turkey.

Through various interviews, the sixth chapter of the thesis illustrates the energy outlook of Turkey. It scrutinizes potential risks and barriers to those seeking to finance renewable energy investments and what types of financing instruments can be used to mitigate these issues.

The seventh chapter considers which of these available instruments are already applied, and are convenient for Turkey in order to support renewable energy investment.

Chapter eight is the conclusion chapter. The main aim of this chapter is to demonstrate the results and conclusions by summarizing the findings of the thesis. It gives the main conclusions of the thesis then associates them with the previously mentioned research questions.
The next chapter is focusing on methodological framework of the thesis and literature review.

CHAPTER 2

2.1.METHODOLOGY

The method used in this thesis will be based on qualitative content analysis in case Study Research. This method involves using multiple sources and techniques in the data gathering process. With the aim of understanding the risks and barriers for those seeking financing in renewable energy investments and the types of financing instruments that can be applied this thesis takes ınto account various interviews on the field of renewable energy. The tools to collect data include interviews, documentation review and literature review. A case study is not an answer, outcome, alternative, or solution to the problems encountered by the managers depicted in the story. Instead, it provides sufficient detail for readers to help better understand the nature and scope of the encountered problems, and serves as a general assessment report for discussion and learning (O'Rourke, 2003). In order to keep uniformity and consistency among the data in the open-ended interviews, which includes the facts, opinions and unexpected perceptions, it is preferred that the interviewees use the provided checklist as guidance.Therefore, it is important that the method of interviewbeing conducted is explained.

An open-ended interview is one way of gathering information from people through dialogue between interviewer and interviewee(Sproull, 1995). An interviewer asks a series of questions to a participant, who then answers the questions. The interview is considered open-ended because even though the questions are predetermined, the interviewer usually has no knowledge of what the participant response will be.

Qualitative analysis through open-ended surveys are mostly used in organizational research to aggregate new data about a subject or an experience , to clarify quantitative findings, and to discover different formats of respondents' experiences (Sproull, 1995). "Open-ended survey responses are extremely useful in helping to explain then gain insight into organizational issues. At the same time surveys generate both an interesting and challenging type of text to analyze" (Jackson, 2002). In the 1970s and 1980s the integration of qualitative research had been used in clinical research(DiCicco, 2006). This qualitative research incorporates many different fields such as cultural analysis, action research, natural research, descriptive

research, theory development, content analysis, etc. This process reveals perceptions and events in a holistic manner for the natural environment (Yıldırım, 2005)**.** Moreover, the term ‘‘qualitative methods’’ commonly shows data collection techniques based on various types of discussion between researchers and respondents(Crouch, 2006). Interviews are one of the most frequently used of the qualitative methods. In this type of analysis, the interviewer does not ask questions to prove a hypothesis but will improve the hypothesis according to the answers given to the questions (David, 2011).

Three types of data are collected in qualitative surveys.

• Survey data

• Data on processes

• Data on perception

Each type of the qualitative research can be conducted in several different ways. For this reason, it is possible to develop different research patterns according to the subject. In regard to Bryman, characteristics of qualitative researches in general are as below (Bryman, 2012).

Table 1: The process of a Case Study

Data collection	*The researcher reaches the data directly from its source*
Making of descriptions	*Detailed descriptions are made for in-depth understanding of contexts and phenomena*
Process oriented	*It focuses on how and why cases and behaviors are realized*
Inductive data analysis	*Convincing generalizations are made from the information obtained by synthesizing*
From participant point of view	*Focuses on the understanding and interpretations of the participant*
Flexibility in research designs	*The research pattern varies and evolves according to the state of the study. In this section, qualitative research that based on interview with sector stakeholders is involved*
Natural Environment	*When conducting research, the cases are studied in environments where events or behaviors occur*

The questions which have been prepared for the inquiry are as follows;

1. Could you please introduce yourself?

2. Do you have a role in the renewable energy policy of Turkey? If yes, can you please briefly describe it?

3. Do you have a role in the finance sector or any connection with the financial sector?

4. What are the challenges faced by the financing of renewable energy projects, and how can these problems be overcome?

5. What are the most significant current and emerging risks faced by the renewable energy industry and how can renewable energy investments reduce risky and thus attract necessary capital?

6. Do you have a strategy paper (document) in regard to manage renewable energy investment risks (and uncertainty) and political risk?

7. What is the potential role and future contribution of banks in renewable energy finance in Turkey?

8. What is your opinion regarding how to engage the financial sector with the renewable energy investments in Turkey?

9. Are there necessary incentives supporting renewable investments? In other words, are supporting procedures for renewable investments attractive enough?

10. Do you think the renewable energy development could be the tool to minimize foreign energy dependency of Turkey?

11. Do you think the carbon tax implementation can be used as a tool to expand renewable energy investments?

As a result of the nature of open ended interviews the answers has not been respondedwithfollowing order of inquiry. The aim of preparing these questions is to examine which occurred by using open ended method to get more detailed answers.

2.2. LITERATURE REVIEW

The literature on financing renewable energy is very rich. However, the majority of this literature is based on the empirical analysis and writingswhich determine the ways in which supportfor renewable energy is very limited.The main aim of this thesis isto examine themain drivers of renewable energy investments by putting an

emphasis on the role and effectiveness of the finance sector.The thesis contributes to the literature by updating the field with a larger group of participants. Among the available literature, this thesis tackles case studies of renewable energy investments in Turkey via different point of view.

Even though financing renewable energy is a global issue, there is no single way to solve the issue. In recent years there has been significant growth in renewable energy investments thus the financial sectors have developed many instruments to get involved in this fast growing sector.

Several kinds of financing instruments can be applied to the expansion of renewable energy investments. These can be distinguished into two different groups. First, those used to pay for renewable energy investments as well as many other goods and services which are*"classical"* financing instruments. Then there are*"specialized"*financing instruments that are specifically designed to fund renewableenergy investments which include other clean energy installations to deal with market barriers that may arise(Leventis, 2016).From perception of this study renewable energy financing instruments will work well as a starting point to understand the meaning of financing renewable energy.Leventis and others mostly focuses on financing energy efficiency via public private engagement. This study designs a typology of efficiency financing, giving a framework for understanding the pros and cons of different products. Moreover, this report offers an overview and categorization of current energy efficiency financing products and activity; it describes and discusses a typology framework for thinking about the larger context of financing products.

In energy related papers,Kuloglu and Oncel provided an overview of the concept of green finance products or services. They examined the feasibility of the green funding applicationsin practice around the world. The conclusion reached was that suitable investment for green financing in Turkey has not yet been fully realized. There have been a variety of technical and financial challenges for renewable resources. Which means these new green technologies have a harder time in a market dominated by fossil fuels (Kuloğlu, 2015). Fortunately, according to the latest edition ofWorld Energy Outlook, major transformations in the global energy system will be

taking place over the next decades, leading to a growth in renewables and natural gas which will cut drastically into market shares of fossil fuel (IEA, 2016a).This will makerenewableenergy and natural gas dominant forces in the race to meet the world's energy demand growth going into the 2040 and beyond. Another study in literature is prepared by Kumbaroğlu that focuses on sectoral decomposition analysis of Turkish CO2 emissionsusing an aggregate economic equilibrium model. The economic costs of different policy measures to reduce CO2 emissions in Turkey are explored.This research concludes new technological investments, financial assistance and targeted policies are necessary for a sustainable energy sector. Alsoeconomic growth and technological transformation in the energy generation mix are significantly affected by emission mitigations (Kumbaroğlu, 2011).

Another example is a case study on reduction of greenhouse gas emissions using carbon tax in Turkey.In this study, each stage of the energy sector such as generation, transmission, and consumption are modeled with an in-depth technological detail.This study brings to light how the sector reacts to emission taxes in a comprehensive way (Kumbaroğlu, 2017).

The purpose of financing renewable energyinvestmentsin general as;

1. Decreasing energy dependency and global warming.
2. Preventing risk that could occur with the energy supply.
3. Reducing the energy supply risks in terms of economic impact.

In the following chapter, renewable energy and kinds of renewable energy will be defined.

CHAPTER 3

3.1. DEFINITION OF RENEWABLE ENERGY

According to International Energy Agency (IEA), “renewable energy that is derived from natural processes that are replenished at a higher rate than they are consumed”. Renewable energyhas many forms such as bioenergy, geothermal, hydropower, solar photovoltaic (PV), concentrating solar power (CSP), wind and marine (tide and wave) (IEA, 2012). By using conversion technologies for energy generated, these resources should not damage the planet’s climate and ecosystem.

“In 2014, world Total Primary Energy Supply (TPES) was 13,700 MillionTons of OilEquivalent (Mtoe), of which 13.8%, or 1,894 Mtoe (up 2.6% on 2013), was produced from renewable energy sources”. In 2016, the share of renewable energy in global final energy consumption was16.7%.(IEA, 2016b).

3.2. RENEWABLE ENERGY RESOURCES

Renewable energy resources will be examined according tothe classification of International Energy Agency(IEA)as a generally accepted and common practice.

3.2.1. WIND ENERGY

Wind energy is kinetic energy that exploits the wind for electricity generation with wind turbines (IEA, 2017) . Wind energy, like other power green technologies is based on renewable resources, and is widely available all over the world. This contributes to the supply of affordable and secure energy production.

“In 2015, wind turbines produced 22.9% of renewable electricity in theOrganization for Economic Cooperation and Development. Among the organization for economic cooperation and development regions, wind electricity production was the highest in Europe in 2015. Between 1990 and 2015, wind power increased from 4.0 TWh to 565.8 TWh, achieving an average annual growth rate of 22.1%. This is the second fastest growth rate of renewable electricity after solar photovoltaic” (IEA, 2016b).

3.2.2. SOLAR ENERGY

Solar energy is the energy derived from the sun. This energy is in the form of solar radiation, making the generation of solar electricity possible. Electricity can be produced directly from photovoltaic cells (Photovoltaic literally means “light” and “electric”). “These cells are made from materials which exhibit the photovoltaic effect. When sunshine hits the photovoltaic cell, the photons of light excite the electrons in the cell and cause them to flow, generating electricity**”**(Farm, 2012)**.**

This form of energy relies on the power of nuclear fusion from the core of the sun. This energy can be collected and converted in a few different ways. Industry needs large amounts of electricity and process heat at various temperature levels. More efficient technologies may help to make solar-generated electricity a primary bearer of industries' energy needs. Solar power and solar heating and cooling can combine to address these needs, including those of agriculture, craft industry, cooking and desalination(IEA, 2011)**.** According to Gunes Enerjisi Potansiyel Atlasi (GEPA)the average annual total sunshine duration of Turkey is 2640 hours, and average annual total radiation intensity is 1,311 kWh / m² (NukTE, 2007).

3.2.3. HYDROPOWER

Hydropower is a form of renewable energy obtained by water. Humankind has been using hydropower for centuries as a means of running mills and generating mechanical energy for industry. The form that generates electricity has been in existence since 1881 when the first Niagara Falls power station was brought online. Hydropower is based on capturing the kinetic energy of falling or flowing water. It produces electricity by utilizing stored water in a reservoir, then the water outpours by gravity through penstocks to water turbines located below the dam (Smith, 2008).

Many countries gave priority to its development which took into account the economic, technical, and environmental benefits of hydropower. According to the World Energy Council, hydropower is the most flexible and consistent of the renewable energy resources in terms of meeting base load electricity needs via

pumped storage technology. Hydropower is the leading renewable source for electricity generation globally, generating 71% of all renewable electricity at the end of 2015(WEC, 2016a). Between 2007 and 2015 the global hydropower capacity increased by more than 30% (WEC, 2016a).

3.2.4. GEOTHERMAL ENERGY

“Direct-use of geothermal energy is one of the oldest and most common forms of utilizing geothermal energy”(Boyd, 2015). Geothermal energy comes from the natural heat of the earth’s inner core and is created by the decay of radioactive isotopes of uranium, thorium and potassium, and requires a conveyor for the hot water or steam at a shallow depth that can be drilled into and pumped through to generate heat or electricity through a steam-driven turbine(IEA Geothermal, 2017).At the end of 2015, global installed geothermal power capacity reached 13.2 GW (WEC, 2016b)

3.2.5. TIDAL AND WAVE ENERGY

The energy in waves comes from the motion of the ocean and the changing heights and speed of the surges (Ocean Energy Coincil, 2007).Worldwide, the technically harvestable tidal energy resource from those areas closest to the coast is estimated by several sources to be around 1 terawatts (TW) (IRENA, 2014).

“All coastal areas experience two high tides and two low tides over a period of slightly more than 24 hours. For those tidal differences to be harnessed into electricity, the difference must be at leastmore than five meters between the low and high tides.” (U.S. Department of Energy, 2013) Nevertheless, there are only about 40 places on earth with tidal ranges of the magnitude that can generate electricity (U.S. Department of Energy, 2013). World Energy Outlook 2012 shows that electricity generation from tidal and wave energy, will increase to 60 TWh in 2035, with capacity growing to 15 GW which is currently 1 GW (IEA, 2012).

3.2.6. BIOENERGY

Bioenergy is the energy that is derived from biomass materials such as wood, plants, agricultural and forestry residues, organic components of garbage (municipal solid waste), and algae, wicker or animal wastes. Biomass is classified as a source of renewable energy like other renewables which is any organic material that has stored sunlight in the form of chemical energy. Humans have utilized biomass for thousands of years.A well-known example of biomass is wood. It can be burned for heat or shaped into building materials.

“Across Europe the biggest source of green energy is biomass. It supplies around 65% of renewable power - usually electricity generated from burning wood pellets but its real impact on the climate and on forests is controversial”(McGrath, 2017). Some studiesassert that wood is not carbon neutral because when biomass is burnt in the presence of oxygen, it produces carbon dioxide and emissions from pellets are higher than coal. Therefore, subsidies for biomass must be reviewed right away. In addition, according to the author, current regulations do not take into account the emissions from the burning of wood at all, assuming that they are balanced by the planting of new trees (Brack, 2017).

“The fact that forests have grown over the previous 20 or 100 years means they are storing large amounts of carbon, you cannot pretend it doesn't make an impact on the atmosphere if you cut them down and burn them" (McGrath, 2017).

“Biogases had the third highest growth rate at 13.2%, followed by solar thermal which grew at 11.7% and liquid biofuels which grew at 10.4% per year, but again, both from low bases. Hydro and solid biofuels basically grew in line with overall TPES of 2.5% and 1.5% per year respectively” (IEA, 2016b). OECD countries (mainly in South Asia and sub-Saharan Africa) have the biggest share in bioenergy use because of the traditional use of biomass. It is generally used in non-commercial buildings and for residential cooking and heating.

It will be analyzed current renewable energy investment in developing countries in the following chapter.

CHAPTER 4

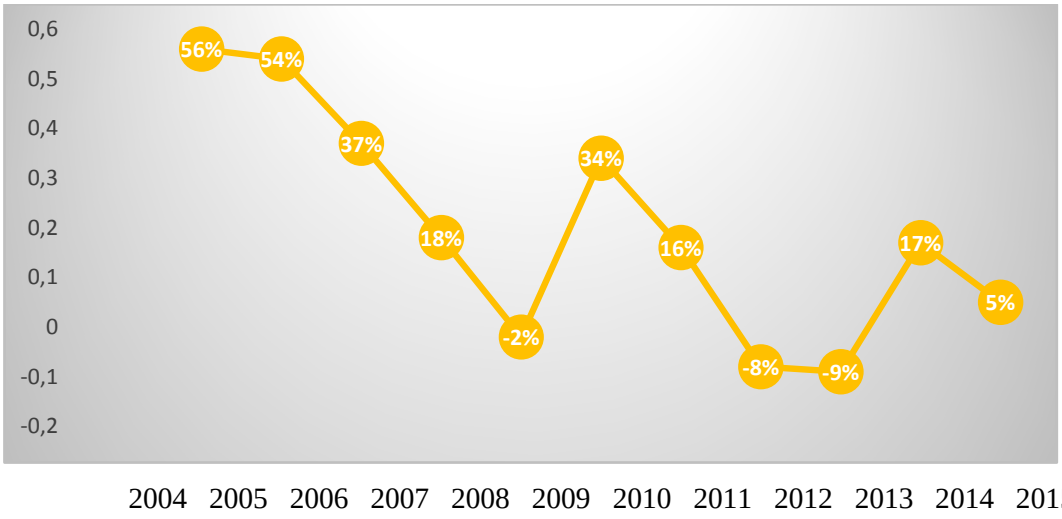
4.1. CURRENT RENEWABLE ENERGY INVESTMENT FLOWS IN DEVELOPING COUNTRIES

The world's energy demand is constantly increasing to meet the needs of the growing population, improving living conditions in the process. The upcoming decline in fossil fuels that have been used for centuries to meet energy needs, on top of the direct contribution that fossil-based energy production has to adversely affect climate change has pushed human beings to find and implement the use of alternative energy sources. The future ofrenewable energy offers great potential in many segments of the economy. The developing of renewable energy will be great importance to ease the effect of the energy crisis and environmental pollution resulting from the rapid economic growth taking place in this 21st century world.

Two very complex areas which are finance and renewable energy that will have to be studied by policy makers of developing countries in order to find a long-term solutionfor energy security, climate change, and sustainable economy.In order to detain the effects of climate change and ensure the energy supply security, governments will have tocollaborate with the international and local finance sectors. There will need to be support to make surethe renewable energy sectorflourishes with steady regulatory frameworks, policy certainty, and ongoing commitments are vital.

Even if renewable energy markets include a variety of technologies and sub-sectors at different stages of maturity, there is relatively advanced knowledge and experience about developing structure and financing tools that successfully canalize investment into renewable energy markets(IRENA, 2012)**.**The invested money on renewable energy between the years 2014 to 2015 is shown in the following figure.

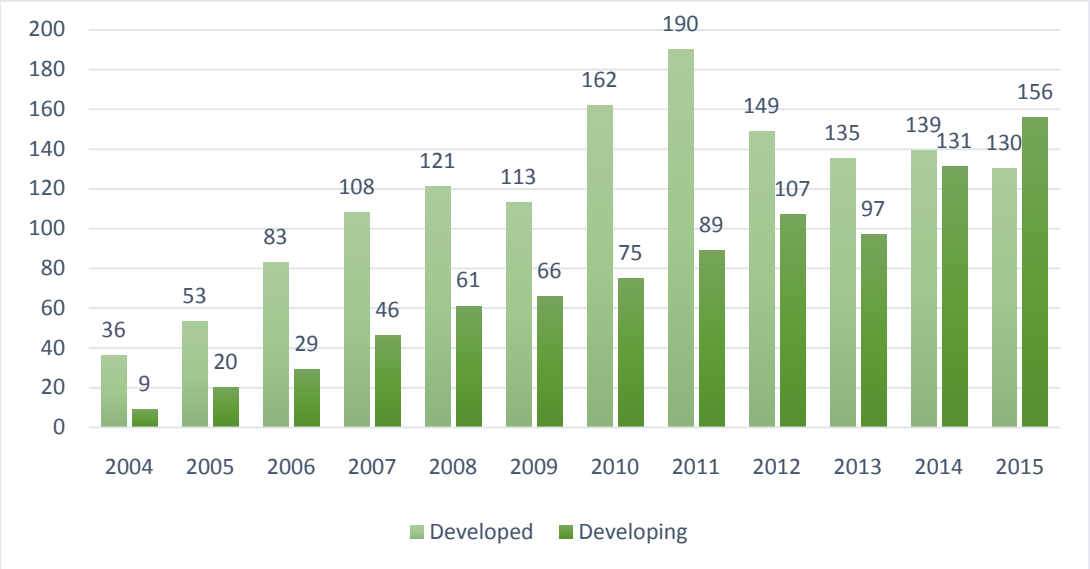
Figure 1: Global Investment in Renewable Energy, 2004-2015, ($ Billion)



Source: (FS – UNEP Collaborating Centre, 2017)

The share of private finance without government finance has grown significantly over the last decades. Despite this increase in private finance, less than 1% of the increased pool of capital is being channeled to long-term investment (The Global Comission on the Economy and Climate, 2016).This chart shows that investments in the developed worldrenewable energy has been on a trending on a downward slope since 2011. This decline has been lessened because of the US where there was Treasury grants and Federal Loan Guarantee programs they have expired for early invested companies, and mostly of Europe, where allocations fell by 60% between 2011 and 2015. In addition, cuts in supporting existing projects in Spain, Romania and other countries, slowing investments of solar energy in Germany and Italy, and a significant decline in the cost of photovoltaic panels over recent years are some significant reasons for downward trends in renewable energy investments in developed countries. However, the strong investment in the United Kingdom in recent years has caused growth of the offshore wind sector in the North Sea showing a positive investment in Europe.

Figure 2: Global Investment in Renewable Energy: Developed & Developing Countries, 2004-2015 ($ Billion)

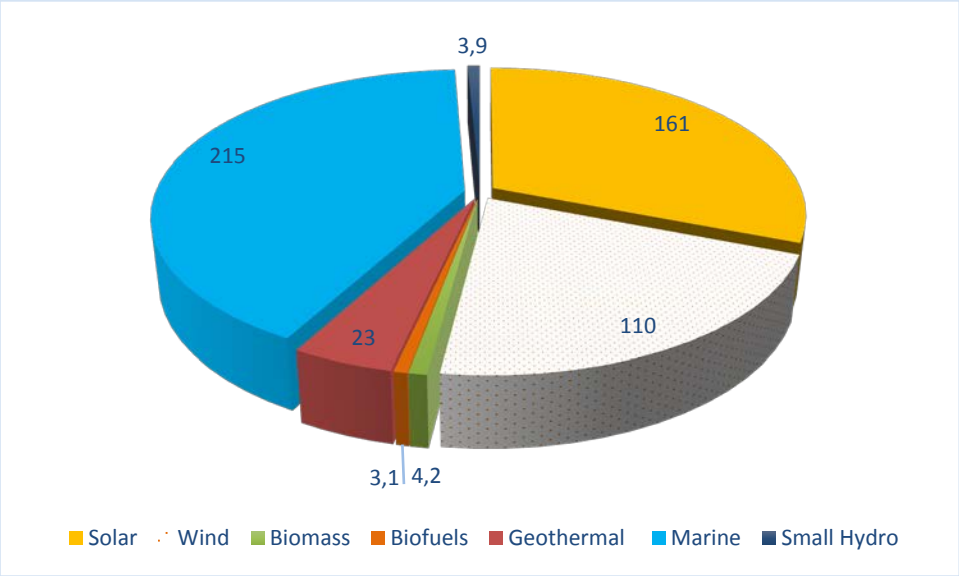


Source: (FS – UNEP Collaborating Centre, 2017)

Before 2005, renewable energy technologies have been perceived as luxury goods by developing countries. This misconception has since changed and developing countries and now are investing in renewable energy. 2015 was the first year that developing countries investing in renewable energies was higher than developed countries. Figure 2 shows that developed world investments on renewable energy peaked at $190 billion since 2004. While the developing world invested $156 billion on renewable energyin 2015. This is a remarkable increase of 17 times the equivalent figure in 2004. Developed countries invested $130 billion in 2015 with an 8% decline, the lowest recorded since 2009.

China, India and Brazil are main drivers of developing countries, in terms of, investing on renewable energy. Record breaking investment is occurring in China, India and Brazil increasing their commitment to renewables in 2015. Developing countries, with the exception of those countries mentioned before, have increased their investments by 30% in 2015, reaching $36 billion, about 12 times compared to 2004. Chile made a big leap in solar project financing with 151% highertranslates into a $3.4 billion increase. In addition, Turkey, Morocco, and Uruguay made investments in excess of $1 billion in 2015 (FS-UNEP, 2016).

Fıgure 3. Global Investment in Renewable Energy by Sector, 2015, ($ Billion)



Source: (FS – UNEP Collaborating Centre, 2017)

Figure 3 shows a sector breakdown for global investment. Renewable energy resources have become increasingly dominant over the last few years with wind and solar energy leading the way, and this has continued in 2015. Solar has increased 12% to $161 billion, and wind a 4% boost to $110 billion. Whereas Biomass energy fell by 6% to $4.2 billion; small hydropower projects decreased by 29% to $3.9 billion; Biofuels, which is the second largest sector after the wind during 2006, fell 35% to $3.1 billion; Geothermal is down 2% to $23 billion; and wave and tidal were down 42% to $215 million.

4.2. TYPE OF FINANCIAL METHODS IN DEVELOPING COUNTRIES

Renewable energy sector in developing countries has been already pre-screened and thoroughly reviewed by main financiers and investors (Hamilton, 2010). The need for investment in renewable energy continues to accelerate, and renewable energy markets are still relatively young and fluctuating in developing world. Investors have been categorized into eight broad categories; governments, banks, equity firms, insurance companies, pension funds, clean energy companies, and start-up project developers(NCE, 2016). Public resources from national budgets have historically been a major source of funds and finance for infrastructure and energy investments; however, public sources are out of this thesis's scope.

A wide range of financing instruments can be applied in terms of the scaling up of renewable energy investments.The term “renewable energy financing instruments” refers to debt or debt-like products that support the installation of renewable energy projects by allowing costs to be extend over time. The impact of domestic funds is also critical to provide renewable energy investments. Investors and shareholders can play a critical role in boosting renewable energy. Private finance for sustainable infrastructure can come from many sources, especially from companies own corporate funds and project finance. In addition,equity investments in renewable energy come from an ownership stake, Private Equity Funds, Infrastructure Funds and Pension Funds. Those funds are put into companies' financial structure or directly in asset of the projects. The most anticipated application in renewable energy investments financing model is a combination of equity and external source model.

4.2.1. BANKS

Banks play a very important role in economic life. They can contribute to sustainability by financing renewable energy while playing management roles. Among the renewable energy investment functions realized by banks corporate lending, project finance, mezzanine finance, and refinancing takes place. Even though the method of financing varies according to the type of investment, technology level and the degree of associated risk, debt finance is usually supplied by banks, whereas equity finance is often assured by equity, infrastructure and pension funds.

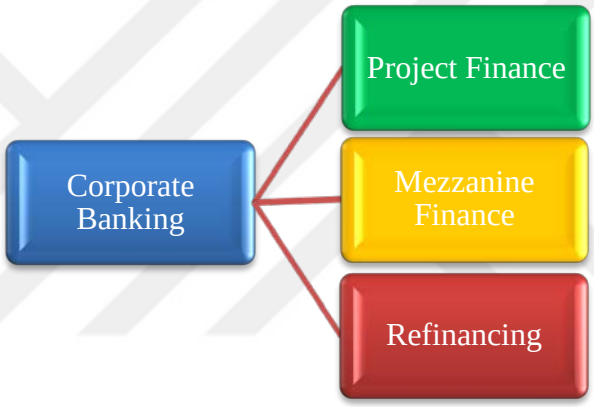
For many developing countries, national development banks are pioneering actors in renewable energy investments financing. On top of that,multilateral development banks (MDBs) often establish partnerships with national banks for renewable energy investments. As well as providing concessional debt.Multilateral development banks transfer their experience trough the preparation, analysis of technical and financial documents for renewable energy projects. The facilities prepared by multilateral development banks. Investments in electricity generation from renewable sources, electricity distribution, transmission capacity to improve efficiency, reduce losses and enable the integration of renewables into the grid are those investments that

within the scope of the financing facilities(EBRD, 2016). In addition, they provide increasing the capacity of local funding agencies.

4.2.2. CORPORATE BANKING

Corporate banking involves products that will meet the needs of complex financial system of large corporations' enterprises, businesses and governments. The financial strength, debt repayment and stability of institutional clients are evaluated by the experts. Then special financial solutions are produced for the clients' needs. These banks set limits on the use of the funds they establish and determine certain general conditions.

Figure 4: Division of Corporate Banking's Instruments



4.2.3. PROJECT FINANCE

Commercial banks, individuals and investors can also provide project finance. A renewable energy company has two sources of funding its investments, either debt from banks, financial intermediaries, or its own asset. Banks lend money to renewable energy investments to get income and depth repair from this financial transaction.

One of the most obvious problems of developing countries' economies is the shortage of capital. For economic development it is absolutely necessary to carry out new investments to develop existing investments, to modernize them, to increase their capacities, and to run the business activities without financing constraints. Project financing which is one of the renewable energy market funding methods, seen as a potential area to create competitive advantage in the banking sector, has been

increasingly important in the economy. The most important resource for the financing investments and business activities is undoubtedly the entrepreneur's own resources. However, the inadequacy of equity requires entrepreneurs to use external resources like loans. Therefore, project finance has become more and more evident with the increase in high-end investments in Turkey recently. This is preferred by investors in terms of reducing capital cost and allocating risks. Banks and investors, who are financing the project, prefer to act jointly in order to put the projects into practice that are only in the project phase due to the lack of funds(Akbay, 2015).

During periods when project finance is not widely used, government bonds and traditional financing methods have been used as a source of financing for the large-scale infrastructure and other heavy investment projects. However, because of high financing costs of government bond exports other traditional methods project financing has gained importance.

In the 1970s, project financing began to be used in energy supply research projects to reduce rising energy prices. For example, British Petroleum invested $945 million for the 'Forties Field' project in the North Sea. This endeavor was funded with the project financing technique. In addition, the continuation of high energy prices caused the US Congress to adopt a new law which is called the Public Utility Regulatory Policy Act (PURPA) that encouraging energy investments (Office of Electricity Delivery & Energy Reliability, 1978). This legislation allowed local institutions to purchase long-term outputs of power from energy plant and created a natural desire to fund new power plants with project financing. The financing needs of new power plants have been funded with project financing and guaranteed with long term purchase agreements. During the 1980s, two-thirds of the projects completed were energy projects in America. For this reason, project financing was used as extensively with energy financing until the early 1990 (Esty, 2002).

Since there is no other source of income in the project loans other than the income that the debtor will receive from the financed assets, the state of payment from debts

are very low or nonexistent (BDDK, 2007). Project financing is a process that requires substantial and qualification labor until the financing of the project is achieved from the intellectual level. In addition, each stage of project requires a separation of skilled work because of the need for regular control and follow-up inspections after the activity has being completed. It takes a certain period of time for the investment to be completed, to be put into operation, and to start funding. The beginning of the repayment period of the loan begins on the date that the initial investment is opened for business and the fund starts to generate. For this reason, project loans are mainly used as medium and long term. In order for a loan to be called a project loan, the prerequisite activity need to be based on new investment, additional investment, renewal investment, and complex purchasing activities. Project Credits are loans with at least one year grace period and average six years term. Longer periods may be required for the nature of the project. For example, energy projects could be maximum 12 year maturity with 3 years grace period.

4.2.4. MEZZANINE FINANCE

In this method of financing, the issuer provides the investors via borrowing or acquiring partial or controlling share of the company. “This type of lending takes shape between the high level of senior bank debt and the equity ownership of a project or company” (FS-UNEP, 2016). Mezzanine loans would be riskier than a senior debt or a project loan because regular repayments of the mezzanine loan come after senior debt (Justice, 2009). Whereas, mezzanine loans are usually of a shorter duration they can be quite expensive for borrowers. It creates a greater return to the lender from banks or other financial institutions. The mezzanine loan may be a good way for renewable energy investments, when the project finance loan is inadequate.

4.2.5. REFINANCING

Refinancing is the closing of an allocated loan by using another loan with more advantageous interest rates. With refinancing replaces existing debt arrangements with new ones that have a lower interest rate can be used by other debt arrangements fora bank for additional lines of credit. Refinancing is the method of clearing the debt which has already cleared by using another bank credit with more advantageous

interest rates. Reasons for refinancing preferred by borrowers are not only attracted by interest rates but also available attractiveness of duration of the loan facility of the market loans. Loans usually become more expensive over time because of the increasing risk of changes to regulation or market conditions. However, during the financial crisis, banks do not want to take the existing risk ofnew ventures. Thus, it is difficult to find financial resources for long-term investments such as renewable energyinvestments.

4.2.6. VENTURE CAPITAL, PRIVATE EQUITY AND FUNDS

"Venture capital financing is generally targeted at new technologies and companies with a high growth potential"(The World Bank, 2011). Utility companies, developers, commercial banks, and other private investor groups will a main driver in decisions on REIs. In addition there iscrowd funding, an alternative equity finance method which allows small contributions from a large number of individuals to be channeled to projects that require big investments.

Agrawal (2013) stated that "The financing of early-stage creative projects and ventures are typically geographically localized since these types of funding decisions are usually predicated on personal relationships and due diligence requiring face-to-face interactions in response to high levels of risk, uncertainty, and information asymmetry"(Agrawal, 2013). Thus the dialog between lenders and investors whoseworking with a team of equally ambitious people all with the aim of providing solutions and guidance on renewable energy investment projects are crucial.

Private Equity Firms focus on ongoing stages and more complete projects. Investors are generally expected to cash in their investment to make a profitwithin 3 to 5 years (IRENA, 2012). Strong sponsors including multilateral development banks are a big potential for the bond market. Given the relatively stable cash flows offered by renewable energy projects the potential for bond finance is tremendous once projects are operational. In addition, several new investors have been increasing their investments in renewable energy while making strides in alternative assets opportunities.

Even though currently venture debt is usually riskier for lenders and more expensivefor enterprises than other forms of financial instruments, it may help enterprises access cheaper forms of debt in the future. When we look at institutional investors such as pension funds, they invest larger amounts of money and have an even longer time period with lower risk appetite.

The following chapter demonstrates a simple assessment of a solar energy investment.

CHAPTER 5

5.1. SIMPLE ASSESSMENT OF A SOLAR ENERGY INVESTMENT

5.1.1. SUMMARY

It is showed the table at above an example of the summary of 15-megawatt solar energy investment. In case of exception for the assumption of the initial start-up capital and investment period financing fund will be provided by the sponsors, 70% of the total investment (Fixed Cost + VAT of Investment) will be financed with "Loan" and "30%" with "Equity".

While investment capital refers the resources necessary for the construction and the equipment of a project, the initial operating capital refers the whole resources required to operate the project. If the initial operating capital, an indispensable role in activating the project, is not counted for significant problems may arise during the operation phase of the project. The starting operating capital determined in the project financing should be keep in balance. It should be set high enough to prevent an unexpected financial need and at the same time low enough to leave a significant amount of funding over what it needs. Completion of the plant that makes up the fixed investment is not enough for the facility to pass through to production. In order for the plant to produce goods or services, resources such as raw materials, auxiliary materials, operating materials, electricity-fuel-water, and labor as well as a certain expenditures that will be required for the delivery and sale of the manufactured goods or services. The capital required to operate the plant is the initial operating capital.

Table 2:Key Project Description Data	
Project Borrower	Ultraso Enerji Ltd. Şti. was established in 2016 in order to produce electricity from sun. The majority shares (97%) of Ultraso will belong to Mix Enerji after receiving required permission from Energy Market Regulatory Authority (EPDK). In order to operate solar power plant Ultraso will use another Mix Enerji's subsidiary's (Er Enerji) license
Project Sponsors	Mix Enerji was established in 1999 in order to produce electricity from domestic and renewable sources. The company headquarters are in Antalya. Mıx Enerji started to operate its first electricity power plant (Hydro Power Plant) in 2001
Working Capital	1.000.000-TL
Objective of the Loan	Ultraso Solar Power Plant Project
Project Description	Total installed power of 15 MW.
Type Of Investment,	Solar Energy Investment
Location Of Investment	Ermenek
Currency	USD
Project Cost	25.779.840
Fix Investment Amount	24.658.837
VAT paid	477.691
Financial Expenses	663.312
Project Schedule	Start of Construction: December 2017 Start of Operation: December 2019
Key Parties Involved:	M bank Mix Enerji Enerji Üretim A.Ş. Ultraso Enerji Ltd. Şti.
Loan Amount	18.000.000
Maturity	(10) 1+9
Installment Perıod	6 month
Interest Rate	%7
Principal Payments	Start from 12 months after first disbursement.
Interest payment	Semi-annual following the first disbursement.
Commitment Fee	0.6% from loan amount that has not been utilized.
Debt - Equity ratio	70%-30%

Source: Author

5.1.2 PROJECT FINANCIAL ANALYSIS

The project-financing plan covering total investment is shown below. Project cost is based on the market assumption.

Table 3:Total Investment Cost Items Breakdown (15MW) (USD)

Investment Components		Realized Investment	Planned Investment	Total
1	Land Cost	2.880.000	0	**2.880.000**
2	Facility Cost	0	19.125.000	**19.125.000**
3	Consultancy Expenses	1.953.837	700.0000	**2.653.837**
4	Project Cost	4.833.837	19.825.000	**24.658.837**
5	Value added tax Paid	351.691	126.000	**477.691**
6	Total Investment Cost	5.185.528	19.951.000	**25.136.528**

Source: Author

The Equipment of Solar Energy Investment

- Solar Panel
- Invertor
- Steel Construction
- Cabling
- Mounting
- Logistics
- Power Distribution Unit
- Fence
- Camera
- Other

Capacity:

It is measure of the solar panel to estimate the cost and profit of the investment. The life of investment together with other factors mostly depends on the solar panel efficiency. Business capacities are defined as maximum level of output that a company can sustain to make a product or provide a servicewithin a certain period of time. For example if a machine can run 21 hours a day, except for rest, maintenance, and repair the machine's daily capacity is 21 hours. There are several kinds of capacity in terms of production procedure. It will be examine the theoretical, practical, and actual capacity.

Theoretical Maximum Throughput:

Itis the maximum amount of production an operation, machine or equipment can reach without any delay, failure, or interruption. In other words, the maximum capacity is the "technically feasible," and does not consider any deterioration in production, labor, raw material bottlenecks, or other production bottlenecks and costs. However, it is very difficult, even impossible, to keep the estimated of real production capacity of a plant permanently at maximum capacity because of maintenance-repairs, standby, pauses, mounting, adjustment, ready for operation, working delays, and other delays. Such delays and pauses are called “interruption of business continuity".

Practical Capacity:

If these mentioned interruption factors are removed from maximum capacity, normal or practical capacity is achieved. For instance the installed capacity of an enterprise's production facilities is 60.000 tons per year, while the normal or practical capacity can be 50.000 tons. Although it varies according to different conditions and industries, practical capacity is around 75-80% of the maximum capacity.

Actual Capacity:

Actual capacity always gives "achievable production" and in this respect is the realistic "full capacity". However, there are situations in which the operator does not require full capacity or need to operate at normal capacity, such as lower production due to lower demand levels or higher production due to the higher demand levels.

Capacity Utilization Rate:

Capacity Utilization Rate is the ratio of actual capacity to normal capacity. This ratio indicates how much of the normal capacity is used as a percentage. When capacity planning is made, it is necessary to consider the expected sales volume of the operator besides the existing capacity.

Table 4: The capacity of a solar panel

Total Panel Area (**m²**)			Panel Efficiency (**%**)		
Surface area of solar panel	The number of panel	Total	Maximum power output	Surface area of solar panel	Efficiency
0,72	10.196	7.340,94	0,1175	0,72	16,3%

Source: Author

5.1.3. FINANCIAL PLAN

Table 5: Total Investment Cost and Financing in USD

Distribution of project cost throughout the years inUS$	**2017**	**2018**	**2019**	**USD**	**in**
fixed investment expenditures	4.833.837	6.608.333	13.216.667	24.658.837	96%
VAT in paid	351.691	42.000	84.000	477.691	2%
Equity /Co-financing	0	0	663.312	663.312	3%
Grand Total	**5.185.528**	**6.650.333**	**13.963.979**	**25.799.840**	100%

Financing structure of Project in US$	**2017**	**2018**	**2019**	**USD**	**in**
Loan	0	6.000.000	12.000.000	18.000.000	70%
Equity /Co-financing	5.185.528	650.333	1.963.979	7.799.840	30%
Grand Total	**5.185.528**	**6.650.333**	**13.963.979**	**25.799.840**	100%

Source: Author

According to borrower, base assumptions are provided below.

- Any shortfall in projected revenues shall be paid by shareholders.

- Additional financial debt is permitted

- Cost overrun be paid by shareholders.

- There will be no changes, which could affect the completion of the project and financing plan.

Table 6: Cash Flow Projection

USD	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	TOPLAM
Beginning Period Cash	0	0	0	1.439.904	1.126.554	798.015	559.121	413.511	360.948	398.267	523.286	0
Loan 1	0	6.000.000	12.000.000	0	0	0	0	0	0	0	0	18.000.000
EBITDA	0	0	2.049.002	2.750.868	2.728.706	2.704.169	2.678.841	2.655.887	2.628.976	2.600.482	2.572.296	23.369.226
EBITDA(P)(Project-1)	0	0	2.049.001	2.750.868	2.728.706	2.704.169	2.678.841	2.655.887	2.628.976	2.600.482	2.572.296	23.369.226
Equity/Shareholder Financing	5.185.528	650.333	1.973.979	0	0	0	0	0	0	0	0	7.799.840
VAT(+)	0	0	368.820	108.870	0	0	0	0	0	0	0	477.691
Total Cash Inflow	5.185.528	6.650.333	16.381.801	4.299.642	3.855.260	3.502.184	3.237.962	3.069.398	2.989.924	2.998.749	3.095.582	49.646.757
CAPEX 1	4.832.837	6.608.333	13.216.667	0	0	0	0	0	0	0	0	24.658.837
VAT(-)	351.691	42.000	84.000	0	0	0	0	0	0	0	0	477.691
Repayment 1	0	0	1.610.681	3.113.194	2.973.931	2.837.339	2.695.405	2.556.141	2.416.878	2.278.760	2.138.352	22.620.680
Principal	0	0	947.368	1.894.737	1.894.737	1.894.737	1.894.737	1.894.737	1.894.737	1.894.737	1.894.737	16.105.263
Interest	0	0	663.312	1.218.457	1.079.194	942.602	800.668	661.405	522.141	384.023	243.615	6.515.417
Corporate Tax	0	0	30.549	59.894	83.314	105.725	129.046	152.308	174.779	196.703	465.736	1.398.055
Total Cash Outflow	5.185.528	6.650.333	14.941.897	3.173.088	3.057.245	2.943.064	2.824.451	2.708.450	2.591.657	2.475.463	2.604.088	49.155.263
Periodic Cash	0	0	1.439.904	-313.350	-328.539	-238.895	-145.610	-52.562	37.319	125.018	-31.792	491.494
Cumulative Cash	0	0	1.439.904	1.126.554	798.015	559.121	413.511	360.948	398.267	523.286	491.494	491.494

Source: Author

5.1.4. IDENTIFIED RISKS

It is performed on Ultraso Solar Power Plant Project allowed to identify the following technical, financial and environmental risks.

Table 7: Identified Risks

Project risk profile	High	Medium	Low
Technical risks			
Construction risk			X
Implementation delays		X	
Technology risks			X
Operation risks		X	
Changes of initial parameters			X
Financial risks			
Price risks			X
Capital Cost Evaluation			X
Interest rate changes		X	
Foreign exchange risk			X
Loan risk		X	
Carbon finance risk		X	
Environmental, Social (E&S) and Permitting risks			
Potential disregarded environmental impacts on physical environmental compounds			X
Potential disregarded issues related to local health and safety			X
Potential disregarded social issue			X
Permitting issues			X

Source: Author

The objective of the technical review and evaluation of the reports is to reach a conclusion on whether the project investment is efficient. Then the technical reports prepared to examine vital points of the project such astechnical, financial and environmental risks.

Technical Risks

As summarized in the table above and described in more detail below, there are no technical aspects which can be considered at high risk, but most of the categories can still be considered at medium risk.

The construction risk is considered low. From the geological point of view, there is evidence of the knowledge of ground that the ground is suitable for the installation of the solar panels. In addition, this point can affect the construction costs and, to some extent, the schedule of the project.

The implementation delay risk is considered medium. In particular, the climate condition does not guarantee that the construction schedule submitted will be respected.

The operation risk is considered medium.The low price of solar panels in combination with high price service enhances the uncertainty on the quality level of mechanical equipment and on the consequent maintenance requirements.

The technology risk is estimated low because a verifiable list of references outside China would have helped in better understanding the matter and in the global market of solar panels and wind turbines should guarantee the good quality of products.

The risk of change of initial parameters used for the electricity calculation is classified as medium.

Financial Risks

A risk, particularly, for those providing financing. During construction phase, the following points can be summarized as follows.

* The feasibility report should include revenue / cost items and be prepared consistent with market analysis,
* Identification of permissions, licenses and concession of the project,
* Establishment of a cash flow projection in accordance with the technical and financial feasibility of the project,
* Determining the need for loans and determining the most appropriate loan / equity amount,
* Determination of how equity funding will be provided by sponsors and establishment of collateral structure of the loan,
* Preparing repayment plans in line with revenue from the project.

None of the financial risks identified during project appraisal are considered higher than a medium level. The financial risks categorized as being low.

Price risk is estimated to be low as the sponsor company has an electricity distribution, which will be a guaranteed client for Ultraso because Turkish government provides premiums for locally produced components in addition to base feed-in tariff rate. In the base case scenario, sales revenues are calculated using the average of the spot market prices that vary according to the time of consumption. The base case scenario does not include any carbon revenues, as the risk of not obtaining the potential carbon financing is real.

The risk associated to capital cost evaluation is considered low. The main uncertainty lays in construction costs, which could be a bit underestimated.

Market interest rate risk is considered medium as the loan is based on a floating rate of interest.

Foreign Exchange rate risk is low as the loan because thechosen currency is USD.

The loan risk is considered as medium, because, even though the company has a very strong liquidity position, the funding requirements of ongoing projects will have an adverse effect.

The risk associated to carbon finance risk is medium because of risk of generating less emission reductions than expected. This risk is connected to the possible changes in the Grid Emission Factor in Turkey and is evaluated medium. Another reason is recent low trend on the international carbon market.

Environmental Risks

License, environmental permits, approvals, licenses and agreements should be taken for the project before the loans are used. Any problems with public institutions after the use of credit will cause the project to be canceled. This could lead to a number of adverse events as well as credit risk for all parties involved in the project.

Getting permission from related authorities is another challenging part of the renewable energy investment projects.

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Assessed environmental potential risks, rated as low level. Potential disregarded social issue to be faced carrying on proper stakeholder engagement actions and no relevant issues about local community health and safety are expected.

5.1.5 PROJECT BENEFITS

This Solar Energy Project is expected to contribute to the Turkish energy share by producing 15 MW green energy.

The project will also contribute to the sustainable development of the country and in particular:

• Securing energy supply, reducing dependency on foreign sources and associated price variations;

• Reducing emissions of greenhouse gases and other pollutants (e.g. particulates, Sulphur dioxide, nitrogen oxides) replacing electricity generated from fossil fuels;

• Creating jobs for local peoplewhere the investments occur;

•Supporting local economy through utilization of local services such as subcontractors, equipment manufacturers (e.g. cables, mats and transformers, general construction material) and service providers (hotels, restaurants, etc.);

• Promoting renewable energy technology in Turkey.

The energy outlook of Turkey is elaborated in the next chapter. Moreover, it is going to be scrutinized in the same chapter about potential risks and barriers those seeking financing for renewable energy investments will encounter and the types of financing instruments used to mitigate these issues from various interviews.

CHAPTER 6

6.1.THE CASE STUDY OF TURKEY

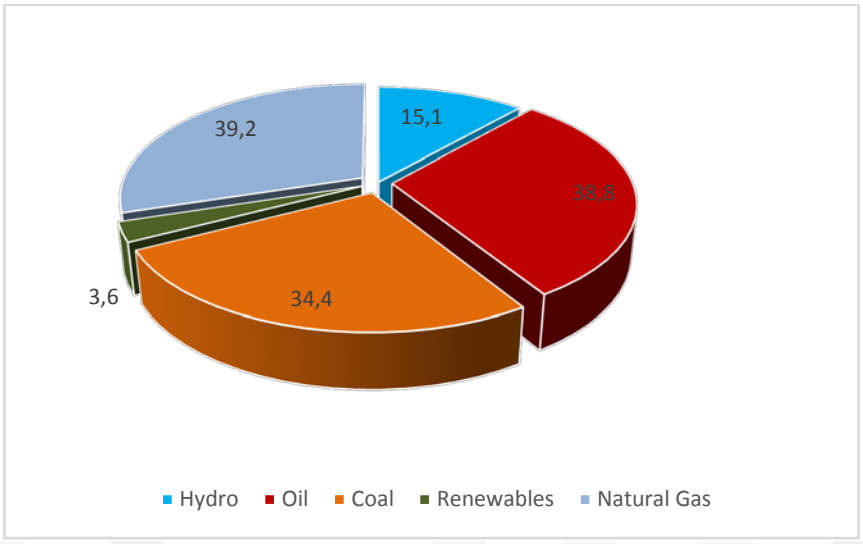
INTRODUCTION

Turkey is heavily dependent on external energy supplies, meeting only about a quarter of its annual requirements through domestic production. It is particularly dependent on imports of natural gas, the major fuel used for electricity generation, and for oil, importing over 90 percent of its requirements for both. Turkey's high level of dependence reflects not only its lack of domestic energy resources but also its easy access to the production of its energy rich neighbors in the Middle East and Eurasia, for which it serves as an energy transit hub. Turkish energy consumption and with it dependency on imports grew rapidly through 2015 reflecting its high economic growth rates since the turn of the century. In fact, it had the faster energy consumption growth than any OECD country. Turkey suffered a hiatus in economic growth resulting from the failed coup attempt in 2015 and the attendant political uncertainties. But the economy is well on the road to recovery. OECD projects a 3.7 percent growth rate in 2018, close to the 2000-15 norm meaning that energy consumption and dependency should continue to rise barring effective remedial measures (Koc, 2017).

The rise in energy demand increases electricity energy imports and causes an increase in Turkey's foreign trade deficit. With the aim of reducing import dependency, foreign trade deficit, providing supply security, and mitigating electricity costs, the Turkish Government should propose to increase the share of indigenous energy sources in its energy mix. The primary energy consumption in Turkey, natural gas, takes the biggest share with a 39.2 Million tons oil equivalent, followed by oil 38.8%, coal 34.4%, 5.1% hydro and then with 3.6% are renewables as shown in Figure 4 (BP, 2016). The share of import oil in Turkey's energy consumption is 93% and natural gas is 99%. This makes Turkey one of the top 25 energy consuming nation energy consumption in the world.

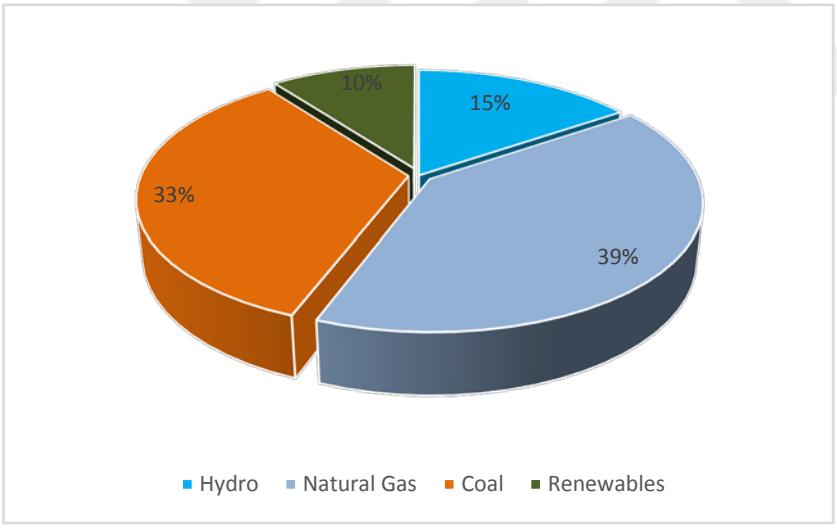
(Karakosta, 2016). The nation's domestic electricity demand is increasing 6% per year.

Figure 5: Turkey Primary Energy Consumption 2015



Source: (BP, 2016)

Figure 6: Turkey Electricity Generation by Fuel Type



Source: (EXIST, 2017)

As a result of economic growth, Turkish primary energy consumption has nearly doubled over ten years to reach 207 terawatt hours (TWh) in 2015 (IEA, 2016) or 131.3Million tons oil equivalent (BP, 2016).This shows that Turkey has been experiencing a rapid energy demand growth since 2001. Together with increasing energy consumption and lack of primary fossil energy resources, Turkey willcontinue being import-dependent country. To deal with high energy dependency Turkey must utilize more of its own resources such as coal and renewables.

According to the Turkish Energy Strategic Plan, the share of the natural gas in electricity generation needs to be reduced to 38% by the end of 2019. It is also set a target, which around 30% of Turkey's energy generation capacity will come from renewable sources by 2023.

Within the scope of Tenth Development Program (2014-2018) and Energy Strategic Plan (2015-2019), Turkish governmentplannedfor coal expansions, exploration of new coal mine fields, coal fired power plants investment, and rehabilitation of existing state own coal power plants. In order to provide sustainable economic growth rate, there need to be an evaluation of all possible indigenous energy resources for power generation. This will have to be a main priority for Turkey. For this purposethe Turkish government subsidiesnew incentive programs that applied for coal are VAT exemption, tax deduction, social security premium support (employer's share), interest rate support, land allocation (Ministry of Economics, 2015).

Providing that Turkish strategy will be the use of indigenous sources more extensively, the government needs topropose some attractive incentives for the renewable energy sector. The Turkish government will need topromote indigenous resources in a new ways. Power purchase agreements are investment guarantees provided by Treasury or purchase guarantee of electricity for certain period of time with a fixed price.

Turkey will pave the ways of renewable energy investments via global climate funds. An example is a program called "Partnership for Market Readiness (PMR)". This fund is focus of World Bank Group "Trust Fund". It is a $125 million USD fund provided by 13 donor countryin order to encourage the work of carbon pricing and market-based / non-market based carbon reduction mechanisms for 18 developing "practitioner countries," which Turkey happens to be one of(EPIAS, 2016).

The Partnership for Market Readiness program offers assistance to Turkey under three main headings;

a) Carbon Emission Monitoring, Reporting, Verification (CEMRV)

b) Market Based Emission Reduction Mechanisms (Implementation of Emission Trading System
c) Stakeholder Engagement and Awareness

“Preparation Phase" or the first phase, took place in Turkey between 2013 and 2014. The estimated budget the Turkish government allocated for this phase was$350.000 USD. Then came the “Implementation Phase" or the second phase starting2014 and running through to the end of 2017. This Phase was allocated 3,000,000.USD to implement the market preparation components and pilot applications specified in the Partnership for Market Readiness document.

By the end of 2017, it is planned to have allocate an additional Partnership for Market Readiness or other funding and budget, in the order of$2,000,000.USD, to spread pilot applications to a wider scale.

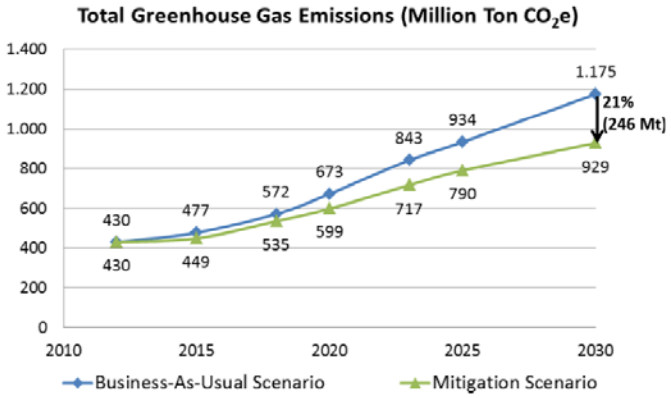
The aim to inform the public and private sector stakeholders about the Emission Trading System (ETS) in the related 12-month implementation period will be carried out under the following components;

- ETS Design Parameters
- Creating ETS Scenarios
- Evaluation of Policy Interactions (Interaction of Existing and Planned Policy Strategies)
- Corporate, Legal and Technical Gap Analysis
- ETS Road Map for Public Institutions
- ETS Roadmap for Private Sector

At the end of the implementation period, the Partnership for Market Readiness will conduct an Analytical Report-1 covering the Emissions Trading System. Than the Partnership for Market Readiness Analytical Report-2 reports will cover the Carbon Tax, Energy Efficiency-Renewable Energy Certification System, Sectorial Credits and Result-Focused Financing methods will be developed.

Turkey`s national emission commitment were set forth in the Paris Agreement on September 30, 2015. According to the signed commitment, an emission reduction of 21% needs to be cut from the usual greenhouse gas emission by 2030.

Figure 7 Total Greenhouse Emission of Turkey



Source: (EPIAS, 2016)

Turkish government will need to use a variety of policy instruments to provide its national contribution for Paris Agreement.

a) Improve the share of renewable energy its energy mix;
b) Increasing energy efficiency in industrial facilities
c) Energy performance certificate for energy consumption
d) Regular waste landfills instead of wild storage facilities and electricity generation from garbage

It is foreseen that 21% emission reduction target for Turkey could be achieved by investing in renewable energy until 2030. For this reason, there is not a chance for other policies than renewable energy to have contributions that will affect the signed intentional agreement in the Paris climate change convention (Republic of Turkey Ministry and Natural Resources, 2017a).

6.2.**FINANCING BARRIERS**

The risk profile of renewable energyinvestments varies and we divided two groups, being financing barriers and project risks. When looking critically at green investments or renewable energy investments, a main point failure will be ventures encountering financing barriers. It is shown by the results given in the table below, collected from international and local energy project experts.

Table 8: Barriers and Risks

FINANCING BARRIERS				RISKS OF PROJECT						
	Lack of Long-Long Term Financing	Lack Of Project Financing	Project Development Costs	Short Of Equity Finance	Small Scale of Projects	High Financial Cost	High Exposure to Regulatory Risk	Uncertainties Over Carbon Financing	High Costs of Resource Assessments	Uncertainties Over Resource Adequacy
On Grid										
Wind	**L**	**L**	**M**	**M**	**L**	**H**	**M**	**M**	**M**	**L**
Solar	**L**	**L**	**L**	**L**	**L**	**H**	**L**	**L**	**M**	**L**
Small hydro	**H**	**H**	**M**	**M**	**H**	**H**	**H**	**L**	**H**	**M**
Biomass	**L**	**L**	**H**	**M**	**M**	**H**	**M**	**H**	**H**	**M**
Geothermal	**L**	**L**	**H**	**M**	**L**	**H**	**L**	**H**	**M**	**L**
Offgrid	-	-	-	-	-	-	-	-	-	-
Solar	**H**	**H**	**M**	**H**	**L**	**H**	**L**	**L**	**M**	**L**

Source: Author

Note:L = Low effect (mitigation of risks is optional); M= Medium effect(mitigation of risks is favorable); H = High effect (mitigation of risks is required).

6.2.1.Insufficient Long-Term Financing

Renewable energy investments may characterized by relatively high initial capital costs and low ongoing operating costs(The World Bank, 2011). With the technologies being utilized in these projects, renewable energy investments will need long-term funding. The financing is often hard to obtain in Turkey due to lack of national saving. Large funding hurdles for renewable energy investment may be lacking capital market funds. In situations where financial resources are constrained there will be inevitably directed towards the lowest return rate and the highest return on investment opportunities in the shortest time.

CEO of VakıfBank Mr. Halil Aydogan said, “It is extremely proud that our issuance with the lowest coupon payment and the highest rating for Turkey has been granted such an award. As the pioneer bank of Turkey in the international capital markets, receiving such an award will contribute to the recognition, image and brand value

amongst the covered bond investors whom we target, especially in Europe" (Vakifbank, 2016).

6.2.2 Lack of Project Financing

Renewable energy investments needs to be able to access funds via a project financing methods that guarantee loans to ensure positive future project cash flows during operations (The World Bank, 2011). There might be limited recourse funding for this type of financing allowing renewable energy investmentsspread the costs of project over the project lifetime. High up-front funding costs are the most risky stage in any future project. This will be in the planning phase, so has no guarantee that the project will come to an operational state that will create cash flow. There will be needed for a share of the project to be funded from equity. The alternative is to rely on equity funding, payments which can be delayed until the later years of the investment. Even though there is a high capital investment required by these endeavors with less familiarity of potential project sponsors, renewable energy investments will be able to find project financing to attract equity financing and potentially corporate financing for investment costs because of the high power purchase guarantee and higher electricity price in Turkey.

Project finance will contribute to meetcarbon emission reduction target of Turkey as well as enable grid infrastructure for improved influence of renewable power plants into the energy system.

6.2.3.Costs of Project Development

While many projects bitten by slow, expensive, unforeseen project development, and approval processes, renewable energy investments will be no different from other major projects. Often, renewable energy investments are located in environmentally and socially sensitive areas.Taking this into account, in order to set up the energy field in particular solar and wind projects land-use requirements can be quite critical. Those sources are often far from existing distribution grids. As a result, there should be well detailed negotiations over grid expansions and the funding of these projects.

Moreover, sponsors have to complete costly technical and financial due diligence reports for their renewable energy investments, that are needed to get finance. For instance, wind projects need at least one year of reliable site-specific data on wind resources to make an assessment to this feasibility that might be slow down the approval process because of concerns with regulations(The World Bank, 2011).All these process create a serious cost making it vital that renewable energy investments sponsors have access to suitable amounts of funds to cover the costs of project development. That kind of funds can usually come from equity or venture capital funds. According to this inquiry, while the small size of most potential renewable energy investments sponsors might have a problem obtaining adequate funding, medium to large scale renewable energy investments do not face this concern. There is plenty availability of risk capital in Turkey's financial markets for new projects.

6.3.RISKS OF PROJECT

6.3.1.Short of Equity Finance

In order to maintain the costs of ongoing activitiesproject sponsors are mostly need external financial sources; however, there are limited project sponsors with the willingness to fund renewable energy investments on corporate finance basis. The short of equityl also increases the external financing. Therefore, given the lack of alternatives loans will have to be secured by collaterals and future cash flows. While there is no significant problem about equity finance for medium and large scale projects, small scale projects suffer from limited equity finance in Turkey.

6.3.2.Small Scale Projects

The small scale renewable energy investments face significant problems in terms of getting private financing. Neither larger financial institutions nor domestic and regional banks are willing to consider small scale projects in Turkey. The reason being, international commercial banks will only generally support projects $10 to $20 million (The World Bank, 2011). That means there is no enough interest by investors, thus, leads to drop financial returns and attractiveness to financiers. As a result of this inquiry, these smaller projects often struggle to attract funding from larger financiers.

6.3.3. High Financial Cost

In order to get foreign financial source, credit ratings are highly significant. In addition, reasons for sovereign borrowing costs can be caused by benchmark international return, the country risk, a spread determined by characteristics of the borrower, and bonds are reasons for sovereign borrowing costs (IMF, 2006). When these components are accounted for Turkey's borrowing cost can be relatively expensive. Recently, Turkey's cost of borrowing has been on the rise. Luckily, the rise has not dramatic compared with other years in the past (Financial Times, 2005). In addition, the decisions of Central Bank of the Republic of Turkey affect the borrowing cost of the country. For example, Turkey's central bank underpins the Lira by increasing borrowing costs for banks causing the currency fluctuating against the U.S. dollar. Turkey's central bank borrowing practices in conjunction with the international finance market has cause inflation in the Lira. (Bloomberg, 2017). These high costs of borrowing have worsened because of the high cost of funds in many developing financial markets like in Turkey. Therefore, according to interview participants the financial cost of renewable energy investments will be high.

As of June 2016, the banking sector earning has reached 180 billion TL in interest income with an annual growth rate of 21 percent. While interest expenses raised by 26 percent, net interest income is surged by 16 percent to 83 billion TL. Profit volume achieved was 19 billion, an increase of 40 percent. A main factor of this profit was an increase in interest margin average return on equity accessed 11.9 percent on an annual basis. Despite this increase, equity profitability remains below the cost of capital (TBB, 2016) because of inadequate local savings and high borrowing cost. Based on this data it could be said financing cost are still expensive in Turkey.

6.3.4. High Exposure to Regulatory Risk

When many energy investments face regulatory risk, renewable energy investments are vulnerable to frequent changes in the regulatory framework.Renewable energy investments lack of cost competitiveness because these investmentsmostly rely on a supportive regulatory framework, such as power purchase agreement and tax reduction. In order to allow thedissemination of renewable energy, tangible support for the producers is essential will be needed to be provided by legislation made by

the Turkish government. In addition, according to participantsinterviewed, the energy laws of Turkey are still immature and investors struggles as a result of bureaucracy and red tape. Even these laws are on the books there has not been time to full implement them. Basically there is no significant problem in terms of Regulatory risk but implementation of this low creates risk such as delaying investment. In the legislation, price support is provided for the electricity per kWh produced in various types of renewable energy source production facilities. At the same time, there is incentive application for the domestic production such as solar panel or wind turbine used in the generation facilities. When looking at statistics, it is clear that these incentives have increased the number of renewable energy plants in Turkey.

6.3.5. Uncertainties over Carbon Financing

In recent years, efforts to evaluate Turkey's renewable energy potential and to use new technologies in this area have gained momentum in order to reach Turkey's 2023 targets in energy field. As a result of the commitment of carbon financing gained importance in Turkey.The sale of Certified Emissions Reductions (CERs) via the Clean Development Mechanism (CDM) has a form of subsidy that is widely recognized. Recently, the carbon certificate has been usingrenewable energy investments in Turkey, which can help to find financial source. This can be added to the cash flow statement as revenue. However, there are higher uncertainties over the timing and the total revenue from the sale of CERs because carbon price is not certain yet. The main benchmark price is that created under the European Union Emissions Trading Scheme (ETS), which collapsed to almost zero during 2008 (The World Bank, 2011). For those reason there are less renewable energy projects that can get long term loans giving by carbon revenue as collateral. According to the inquiry, there is high risk and uncertainties about carbon financing in Turkey.

6.3.6. Uncertainties over Resource Adequacy

According to available data and participants, Turkey is quite suitable country for renewable energy investments.With geothermal projects challenges are somewhat different. An exploratory test is necessary to assessment of resources adequacy. Thissometimes fails to find adequate resources for exploration. Also, the drilling cost of geothermal can be quite expensive. Evenexploration is successfully done, there are

still risks about resource efficiency because of degradation of the geothermal reservoir over time. When the high cost of drilling, risk of failure, and degradation of the geothermal reservoir come together, it can deter the investment of geothermal projects. As a result, even though Turkey has significant amount of geothermal recourses, there has been little of the potentialutilized up in till until now.

6.3.7.The Cost of Technology

Different renewable energy investments have different degrees of exposure to the various identified barriers and risks. Each of them uses different sources and different technology, but all of them usually need to long-term funding on a project finance basis.Cost of renewable energy technology in Turkey is equivalent with any other European country. However, it is relatively expensive because of the exchange difference.

6.3.8. Country Risk

“The range of risks emerging from the political, legal, economic and social conditions of a country could have adverse consequences affecting investors and creditors”(Stanford University, 2003).

The risk for acountry divided into two groups, the political and macroeconomic. Changes in the current political situation of a country in which the project is being carried out can be included in the concept of political risk such as changes in tax burdens or changes in the incomes of the project or in the negative macroeconomic variables.

It is also possible that additional customs tax rate can be added in the procurement of the equipment and seize of the scope of the expropriation. This results due to a need for the company to have a form of strategic precaution.

The events in Libya are among the best examples that can be given to the country risk. Turkish companies were contractors in many highly budgeted projects located in the country before the events that happened in Libya. These companies where involved in airport, shopping center, hotel, housing, road, infrastructure, energy projects. More than 300 projects undertaken by Turkish companies have been negatively impacted by events.

The picture is worsening investor sentiment consolidated by the dropping of Turkey's sovereign credit rating to sub-investment-grade level.However, there has been a growth build up in Turkey despite political uncertainty. Turkey's growing economy requires more energy. Luckily there is a predicted upturn of 3 percent is expected in 2018(Williams, 2017).

According to European Bank for Reconstruction and Development forecasts, partly reflecting security and geopolitical risks that have also led to a downward trend for countries in the southern and eastern Mediterranean.

İt is going to be explained in the next chapter available instruments are already applied in Turkey in order to support renewable energy investment.

CHAPTER 7

7.1. APPLIED AND AVAILABLE FINANCIAL INSTRUMENT FOR RENEWABLE ENERGY IN TURKEY

While in a vacuum, there may exist a varied approach of financial instruments, for Turkey the “project financial method,” is best suited for dealing with the present landscape.

As discussed earlier, the definition of project financing is the creation of reversible or irreversible funding resource for the interest of tangibly support projects in a long term. This can be classified economically, where the providers make their decisions based on the calculated cash flows and assets of the project.Banks and investors, who are financing the project, prefer to act jointly in order to put the project intopractice.

One of the most evident issues for developing countries' economies is the inadequacy of capital. For economic development, capital is absolutely necessary to carry out new investments in order to develop existing investments, to modernize, increase capacities, and to run the business activities, without financial constraints. *Project financing* is one of the market funding methods and can be seen as a potential area to create competitive advantage in the banking sector. This has been an increasingly important prerogative for an economy. The most important resource for the financing of investments and business activities is undoubtedly the entrepreneur's own resources. However, the inadequacy of equity requires entrepreneurs to look outwards and use foreign resources as an alternative. Therefore, project financing has become more and more evident with the increase in high-end investments in Turkey during recent years, and is preferred by investors in terms of reducing capital cost and allocating risks.

Since there is no other source of income in the project loans other than the income that the debtor will receive from the financed assets, the state of payment of debts is very low or not at all (BDDK, 2007). Project financing is a process that requires substantial labor and qualification work until the financing of the project is achieved at a sufficient level. Additionally, each stage of the project requires sufficient oversight because of the need for regular control. It therefore takes a substantial

period of time for the investment to be completed, to be put into operation and to start funding (Guvemli, 2001). The beginning of the repayment period of the loan begins on the date that the initial investment is completed, opened for business and the fund starts to generate funds. For this reason, investment credits are mainly used as medium and long term. In order for a loan to be called as a project loan, the prerequisite activity is based on new investment, additional investment, renewal investment, and complex purchasing activities. Project Credits are loans with at least one year grace period and average six years term. Longer periods of time may be required for the nature of the project. For example, the energy project is an endeavor with a maximum 12 year maturity which might have a 3 year grace period.

The shareholders' equity and capital adequacy ratio in Turkey**,** from September 2015, has seen a growth trend in the banking sector's capital adequacy ratio, therefore, enabling a boost in energy financing. While the capital adequacy ratio was 15.8 percent as of June 2016, the core capital adequacy ratio was 13.6 percent (TBB, 2016).

The division of allocation is explained below. This data comes from a report, which includes project financing development in Turkey, and it includes 21 bank accounts as of December 2016 period. Project finance can be obtained using unsecured lending, secured lending or leases through abstract means for financing renewable energy investments.

Unsecured lending

It Includes revolving credits, credit cards, spot loan.

These products are not secured by collateral that could be used to mitigate a lender's losses in case of non-payment. These loans can be compared with secured loans. The fallback is they are expensive because of the absence of collateral. Conversely, it is easy to access the money and the application process does not take much time. It is ultimately a balancing of risks.

Secured lending

Mortgage, commercial loans, corporate loan are scope of this products.

This alternative is backed by collateral. This one is best suited for the expressed project finance. The taken collateral allows lenders to charge lower interest rates and

offer longer term financing. This top to bottom approach helps alleviate default throughout the dependent process.

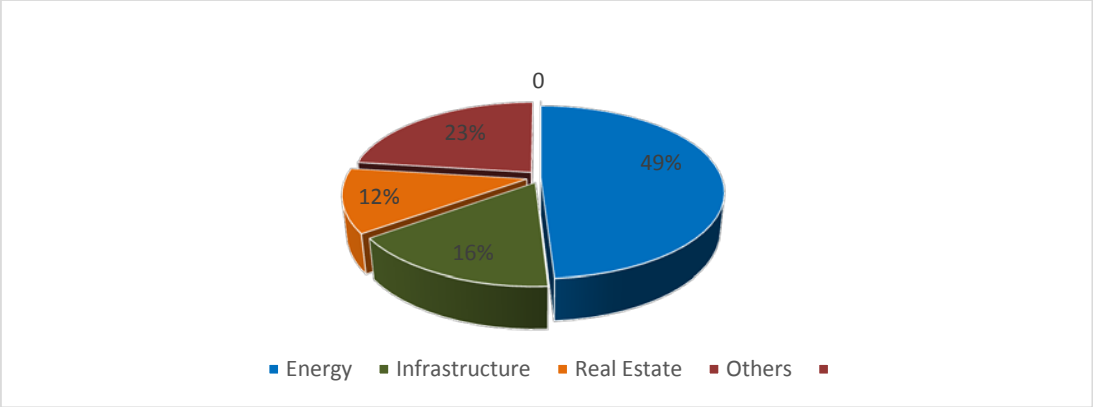
Leases

Leasing is the purchase of equipment by a leasing company rather than the purchase of the equipment by the investor. The investor takes ownership for a certain period of time. Compared to secured loans, leases have a quicker application process and can subsidize costs associated with operations and maintenance. The downside is higher monthly payments, therefore they are usually only offered for larger projects (Leventis, 2016).

Syndication Loans

Syndication loans are a financial instrument which utilizes money and capital markets, jointly offering lending through credits from more than one lender (TBB, 2015). In a syndicated loan, two or more lenders come together with similar terms and conditions, using common documentation and where a front bank heads the operation in order to meet a large amount of funding requirements.

Figure 8: The division of allocation by sectors in Turkey, 2016, (TL Billion)



Source:(TBB, 2017)

The risk balance of project financing loans increased by 31 percent compared to the same period of the previous year, increasing to 272 billion TL in December 2016. According to TBB, while 272 billion TL were allocated for Project financing, 132 billion TL of the amount was allocated for the energy project financing. Meaning, the risk balance of project financing loans has increased by 31 percent compared to the same period of the previous year. This increase amounted to 272 billion TL in the month of December 2016 (TBB, 2017). This chart includes not only renewable but

also the production, transmission and distribution of energy resources including all geothermal and renewable projects and the acquisition and privatization of energy projects.

When looking at the chart, it is seen that 49 percent of the credits used for project financing are energy, 16 percent are infrastructure, and 12 percent belong to the real estate sector. The share of other sectors in total is 23 percent.

7.2.THE PARTIES

IN PROJECT FINANCING

In project financing, it is necessary to identify the parties involved in the project because of the assumption of sharing the risks among the parties and sustainable management of the project.

Depending on the project type, different persons, institutions, and organizations are included in the process. The main aspects of project financing are listed below.

Sponsors of TheProject

Project sponsors are groups that undertake a part of the project cost which is responsible for the construction and operation of the project in order to earn investment income. Non-project assets owned by sponsors are not included in project financing.

Project Company

In project finance method, a common first step is to establish a Special Purpose Vehicle (SPV). The second step, is setting up necessary project agreements between the company and issuer. These agreements will continue to hold until the project has completed. The project, which is included in the scope of project financing, is carried out by the special purpose vehicle (SPV) composing of multiple parties and mainly established by the project owners in order to realize the project (Yescombe, 2002).

The project company, also called special purpose vehicle (SPV) is established for the purpose of carrying out a project determined by the sponsors. There is a separate

legal entity for the company that operates independently of the assets and for that company that self-sponsors.

Capitalists

Apart from the sponsors, it is the person, institutions and organizations that provide capital to the project.

Creditors

It is the sector which provides external resources outside the capital for completion of the project. These institutions are a huge undertaking and a large part of the risk. Conversely, these institutions try to minimize risk by taking project assets and future cash flows as a form of collateral. The lenders are involved in the preparation of cash flow statements, which determines the amount of the loan and therefore alleviates risk for the lender. This is done by calculating the feasibility and costs of the project together with its experts or external financial advisors relevant information from the feasibility report(Douglas-Hamilton, 1975)

Insurance companies

Assets and revenues obtained within the scope of the project are required to be secured. Insurance companies provide the project with protection from damage that may occur during the construction and operation phases of the project.

Leasing Companies

When in the case where the facilities, equipment and similar assets are obtained through leasing, there will be a leasing company involved in the project. Through the leasing company items for the project can be obtained for a limited time without purchasing them.

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International Investment and Development Banks

Many of the International Investment and Development Banks actively involved in project financing for developing countries have a very low cost for long-term infrastructure, agriculture, and renewable energy projects. These loans, which are granted under certain programs, can be given to the member countries, private or public institutions, or to the bank. The use of these loans will be the pre-determined by a representative, institutions, or organizations.

7.3. PROJECT FINANCING STEPS

Construction Phase

It is the period when the risk of project financing is at its highest. Failure to properly manage this process, which started with the preparation of the feasibility report, could lead to irreversible damage to the sponsors and lenders in the future. Generally, the most important part of this phase reflects the ideas of sponsors on how to make the project successful. These will be continued with the project feasibility study, to determine the financing needs of the sponsors. Therefore, all expenditure items to be included in the scope of the project should be determined by experts that are appropriate to the nature of the project.

The position of the firm's market share will be dependent on the amount of competitors in the energy market, the demand for the project product or service, and the geographical location of the project. The technological structure of the project will be crucial considered at this stage (Yalciner, 2011).

In this phase, a forward cash flow projection should be created in accordance with the technical and financial feasibility of the project. Any adverse event related to the project should be stress tested to measure the impact on projected cash flow. The most appropriate financial model will be created taking these factors in account.

The stress or "sensitivity" test examines the impact of changes to the project profitability. This is done, by re-creating the cash flow projection and modifying the basic indicators in the cash flow projection to examine potential outcomes. In other words, the stress test is a method of measuring the loss and risk level that may occur in different conditions using other variables under multitude of scenarios. In doing

this, the performance of the project can be measured and performance maximized under adverse conditions (Yescombe, 2002).

Negative fluctuations in the currency, increases in interest rates, or loss of income expected to be achieved as a result of the projects' operation, such as reduction in the price of the product / service or increases in production costs, under the prescribed capacity are the main parameters used when stress testing.

The income that will be provided from the project, repayment schedule can be created depending on the sector operated in. The repayments could be in equal installment, sculpted installment or variable installment. One of the things to note, is that the economic life of the project must last longer than the credit line funding it. This will allow for restructuring of the loan in the future. For example, a repayment schedule can be created with an eight years of maturity from the first utilization date witha one year grace period. The project's principal will be repaid in four equal installments over a period of year, orwith a five years of maturity from the first utilization date with the inclusion of a one year grace period. Repayments will be amortized as four variable installments in a year.

Within the scope of the project, the sponsor's credit requirement and the conditions with the banks will be used to respond to requirement theyare determined by negotiating before the credit determination. The negotiation will be depended on server factors such as amount of the collateral to be received, amount of the loan, cost of the loan, conditions to be incurred in the event of early closing or refinancing, and in particular amount of equity to be provided by the sponsor.In addition, if it is determined that there will be any kind shortfall in projected revenues shall shareholders will be obligated to cover the loss. Additional financial debt will be permitted, but cost overrun be paid by shareholders. This insures that there will be no changes that could affect the completion of the project and financing plan.

Since equity is an expensive item in the project, increases in equity of a project is preferred by the banks to reduces risks.

At this stage, the best loan / equity balance should be prepared by an analysis carried out by the bank or experts apart of an external independent consultancy firm. This analysis should consider the profitability of the project and the risk.

Creditors prefer to guarantee that the additional cost items may arise during the construction phase of the Project. It will be completed by the sponsors of the project. When the amount of the loan is determined, the operational financing requirements that can arise at the beginning of the operation to conclusion the investment can be determined (Guvemli, 2001). The project financing plan covering total investment is shown below. Project cost is based on the company's assumption.

Operational Phase

It is the process in which the project is active and income has started to be generated. In this period, most of the risks that may be encountered during the investment period are behind the project. The project revenues and loan repayments will have begun to be made. This is period where the projected revenues cash flow projection is actually realized.

However, risks continue in this period. It is not possible to anticipate any projections or shortfalls of projected revenues under the projected capacity, changes in contracts made with buyers, fluctuations in foreign exchange rates and interest rates, financial management problems, political risks, the situations that negatively affect the revenues from the project could be possible negative effects of this period.

7.4. COLLATERAL STRUCTURE OF THE PROJECT

In project financing repayments of the loan come from the project's cash flow.For this reason, the lenders will want to have control over all the assets and income of theSpecial Purpose Company (SPV).It is essential that the revenues obtained by the transfer of the account are used in the payment of project's credit. In addition, pledge of the shares belonging to the Special Purpose Company. This frequently used pledge put on the rights and property that are owned by the project company. The guarantees, provided or to be provided, shall constitute a security for all receivables of the Bank accrued and to accrue (Vakifbank, 2013).

In summary the guarantees received in project financing;

- Mortgage
- Assignment of claims
- Pledge or mortgage on the operating assets of the project company

- Arrangement of a transfer contract between the bank and the company in order to transfer the project subject investment to the business and to transfer the revenues under the project
- The General Agreement on Loan shall be signed by the original borrowing company partners of the company using the loan as joint guarantor at the minimum credit
- Upon transfer of the Project-related facilities to the operation, a transfer and or account pledge shall be established on the revenues under the project

An example that the electricity revenues to be obtained from EXIST (Energy Exchange Istanbul) by the company given as a collateral to the bank at the renewable energy investments.

7.5 TECHNICAL INDICATORS OF PROJECT PROFITABILITY

In order to get project finance the selected investment must be feasible. Calculating the feasibility the following criteria is below.

A.1. INVESTMENT AMOUNT AND SUB-DETAILS

Total Investment Amount:

The project investment consists of the resources required to establish the plant (Fixed Investment) and the initial operating capital required to operate the plant. Simply the sum of the fixed investment and the initial operating capital equals the total investment amount of the project.

Fixed Investment Amount:

From the birth of the entrepreneur's idea of investing to the physical realization of the investment, all of the expenditures made are fixed investment. One of the most important points in the preparation and evaluation of investment projects is the calculation of fixed investment amount. For this reason, the planned amount of investment should be made as realistic as possible. Fixed investment is divided into two groups. These are realized investments and investments to be realize. The actualized investment items are taken with the cost values and set as the investment

amount. The investment to be realized shall be calculated by including the price increases due to the date on which it will be realized and exchange rate differences. Expenditures are also calculated in domestic currency and foreign currency.

The items of fixed investment can be classified as follows.

Survey-Project and Consultancy Expenses:

The expenditures in this section consist of the development of the investment idea and the related research, preparation of the pre-feasibility project, and final projects. In order to be able to carry out an investment project, many technical knowledge and assistance are required, both, in the beginning and in the operating periods. These technical supports are in the form of actual service provision and technical information. Production methods of the manufacturing plant, product characteristics, laboratory establishment, operation techniques, new technologies and inventions to be applied, certain patents and know-how can be purchased are main elements of the projects. In addition, technical consultancy service can be obtained regarding the activity subject. These expenditures are shown in survey-project and consultancy expenses.

Land Price

While setting the land value, is determined by considering in some cases according to the present rates of the day in some cases the land value reflected in the records which is at an affordable level.

Construction Expenses

When the expenditures related to construction activities are determined, it should be examined whether all general acceptances are provided. Construction expenses can be handled in six ways which are main factory buildings and industrial facilities, auxiliary plants and transportation facilities and administrative and social facilities.

Machinery and Equipment Expenses

The components of the Project are quite ımportant because the efficiency rate of project depends on solar panel invertor.Shown the table below areComponents of a solar energy project.

Machinery and equipment costs for the production of goods or services are included in this section. Each of the machine-hardware must be carefully determined, and the value of each machine or equipment purchased to be purchased must be taken from the invoice or pro forma invoices. If three invoices are requested for the machines to be taken, this will give an idea to both investors and inspectors about whether the prices are appropriate or not.

Furnishing Expenses

This section is particularly important in tourism and service sector investments and is calculated by considering the procurement of domestic and foreign procurement materials.

Installation Expenses

In this section, it is determined how and who is to assembled of equipment, the start and end date of the assembly activities, and in which phases the assembly process will be carried out jointly after the construction activities. Also, it is determined whether or not help and responsibility of assembling of the and where the machinery and equipment is purchased. This is determined by the contracts. In addition, the duration, quantity and cost of supply of labor, materials and equipment required for installation are calculated.

Freight and Insurance Expenses

The project can be provided with the necessary equipment for the facility, parts of all kinds of vehicles, equipment from abroad, and part of them from foreign countries. Expenditures related to transport and insurance to be made from the places where the domestic equipment are provided including equipment imported from abroad. Turkey would constitute "domestic freight and insurance" expenses with domestic currency. Then, all transportation and insurance expenses to be made for importing the machinery and equipment from the country of origin, where the seller is located, to a port in Turkey would be included. Delivery methods of imported machine-equipment include free on board (FOB), cif price (CIF), cost and freight (C + F) etc.

Import and Customs Expenses

Imports and customs clearance costs consist of taxes, funds and other customs duties that must be paid for machinery and equipment supplied from abroad.

General expenses

General costs are not related to any of the components of the project cost but arise from activities related to the realization of all core components. General expenses consist of expenses of administrative establishments and services, publication and advertisement expenses, stationary expenses, mail-phone-fax-telex-internet expenses, lighting, insurance, tax, painting and fees representation and hospitality business trips. Property purchases, building-construction, vehicle purchases, credit charges are not included in general expenses.

Vehicles and Lifting Equipment expenditure

Various transportation vehicles are used to transport raw materials and auxiliary materials to the project site as well as many stacking machines, cranes, forklifts, and mobile cranes are used for loading, unloading and transporting of raw materials and other materials. Expenditures for all these are shown in this section.

Expenses of operation

In order to maintain the production activity uninterruptedly it is necessary to operate the machine equipment as a whole and then test it. During operation the plant is initially operating at a low output. Then it slowly ramped up, increasing capacity utilization rates, while performance tests are performed until switching to full capacity. The net income to be obtained during the operation must be deducted from these costs.

Unforeseen Expenses

Project evaluation is subject to some assumptions such as inflation rate, exchange rate, growth rate, sectoral capacity utilization rate, interest rates, and technological developments. It is necessary to take into consideration the deviations that may arise from the different factors that were unforeseen in calculating the investment amount. Unexpected costs are calculated according to the main elements of project investments in practice. These factors determine the duration of the investment, the size of the project, and the price increases. The calculation of unexpected expenses is carried out in three stages.

- Physical Unexpected Expenses: It covers estimated deviations that are included in the project later on by some expenditures that are missing during the preparation of the project
- Price escalation: Price increases depend on the sector in which the project is concerned, the short or long term of the investment period, and the expected upward trend in prices. Price inflation is anticipated considering the supply period of domestic machinery as the predicted inflation rate.
- Exchange rate fluctuation: This calculation is made by foreseeing the exchange rate difference between the date on which the credit is to be used and the future date of the machines to be imported

Fınancial expenditures of investment term

The investment period financing allowance is calculated taking into account the periods between the use of credits and the date of transition to commercial operation.

A.2. PRODUCTION AND OPERATING EXPENSES

Raw Materials and Products:

Raw materials: It includes the cost and stocking methods of the main raw materials that will form the product.

Products:It includes the qualities of the products, their costs and production quantities

Byproducts: In some cases depending on the production process there is a secondary product are also produced. In this section, the characteristics, amounts, and shares of these by-products are stated.

Technology Selection and Production Process

The validity of the selected production technique can differ from regions compared with other production systems. In addition that renewable energy technologies hold a significant amount of value that cannot be detected by using traditional valuation techniques(Lythcke-Jørgensen, 2016).The reasons for specific preference are specified as the number of technical personnel, production plan and work flow charts, which are required by the selected production technology, are regulated. A more sophisticated valuation perspective should be adopted to deal with real options

analysis in order to be able to benefit from these technologies and to benefit from research and development expenditures (Davis G., 2003).

Full Capacity Production / Operation Expenses

The expenditure to be made in order for manufacturing, selling, and operating the project's subject matter goods or services constitutes expenses of the operating period. In other words, operating period expenses consist of expenses such as raw materials, auxiliary materials, operating materials, electricity, water, fuel, labor, maintenance and repair expenses, transportation, license expenses, general expenses, unexpected expenses, sales, and packaging. Operating costs should be examine and calculate carefully. In order to calculate the expenses for the operating period, it is necessary to know the input amount, the unit cost price, and the annual expenditure amount for each expenditure unit production. The full capacity production cost table is at below, and new expense items can be added and removed according to the production specifications of the enterprises. By using the parameters from Table production and operation costs can be calculated.

A.3. EXAMINATION OF INVESTMENT IN COST AND PRODUCTION EXPENDITURES

Process Costing:

Itis a term used in cost accounting to explain a method for assigning manufacturing costs to per unit produced. When calculating the process cost of production should be divided by the number of goods.

Industrial Cost:

Anything having to do with the business of manufacturing products; excludes utility, transportation, sales-marketing, financing, R & D, general administrative expenses. The items that make up the production / service expenses of the enterprises are explained below.

Raw Materials:

Raw materials are substances used in the primary production of goods. If the raw materials are supplied from the internal market, their transportation, insurance, loading-unloading costs should be taken into account. In case of import from outside

the country, as well as import and customs expenses should be add to the above factors.

Auxiliary Items:

All kinds of substances will be used to help production. These items will be handled in this section. Also the qualifications, description, cost and stocking status of the subsidiary substances are specified in this part.

Operating equipment:

Materials that are required during the production of the products, but, not included in the composition of the product are referred to as operating materials. The cost of these materials, their purpose, and where they are to be used are specified in this section.

Electricity-Fuel-Water (Energy Expenditures):

Energy is required for the procureof steam and boiled water for the generation of products and services for direct heating processes. Moreover, water is used in production plant such as raw water, process water, drinking water, demineralized water, cooling water and so on. Therefore, water and energy are used in the production process is determined by type, quantity, price, and these costs are accounted in this section.

Labor Costs:

It has an important place in operating expenses. In the calculation of labor and personnel expenses, salaries of workers and other employees, other compensations, bonuses and social benefits must be taken into account.

Maintenance-Repair Expenses:

The costs of maintenance-repair of the project may be calculated based on the method of production and experience which is gained in previous similar plants.

Packaging Expenses:

The calculation of packaging costs is based on the quality of the products, and reflected values in the balance sheet.

Sales-Marketing Expenses:

Sales-marketing expenses consist of marketing, distribution, advertising, insurance, and storage expenses. The figures reflected in the balance sheet are taken as basis when calculating sales and marketing returns.

Transportation Expenses:

It is the cost of transporting the product from the production site to the buyer. The distances between the producer and consumer and then the characteristics of the vehicles to be used are important in the calculation of transportation costs. The transportation costs are calculated on the basis of the balance sheet.

Financing Cost:

Expenses incurred by a business due to its financing activities. “Financing expenses consist of the outflow cash to investors through dividends, interest from loans, costs from repurchasing stock, and other expenses from financing activities”(The Mortgage Group, 2017). The projected credits expense is calculated taking into account the terms and conditions of the loans.

Overhead:

Overhead includes all ongoing business expenses such as rents, insurance, taxes, duties and fees, other administrative and operating expenses. It excludes direct labor, direct materials or third-party expenses that are billed directly to customers (Sheldon, 1998).

Royalty:

If the license agreement is to be paid at one time before being transferred to the facility, this amount is included in the investment expenditures. If the license agreement is paid in annual installments after the facility has been taken into operation, each installment is included in the yearly expenses.

7.6 FINANCIAL INDICATORS OF PROJECT PROFITABILITY

In the analysis of the profitability of the project, the financial ratios calculated prospective for the ability to repay the loan can select the project financing model. The main goal is to determine the cash income from the project, the repayment of the loan, profitability of the project, and the need for financing (Yescombe, 2002)

Making these measurements requires expertise to construct and interpret the models. For this reason, it should be emphasized that the income / cost analysis is compatible with the market analysis before the financial ratios are calculated.

Net Cash Flow:

The project costs and the income from the project that are deducted from the income obtained from project loan payments to the bank are not included in the project costs.

Debt service coverage ratio calculation (DSCR):

It provides information about the debt payment capacity of the project. The credit given to the project financing to be allocated to the Special Purpose Company for the revenues from the project, the higher this ratio can be interpreted as the less the risk of non-payment of the loan.

Debt service coverage ratio = Net Operating Income / Total Debt Service(Energy Renewal, 2014).

Debt Service: Interest + Principal Payments.

Loan life Coverage Ratio (LLCR):

While the debt service cover ratio (DSCR)measures period-on-period, the Loan life Coverage Ratio provides the lenders with a measurement of the number of times the project cash flow, over the scheduled life of the loan, can repay the outstanding debt balance(Guvemli, 2001).

The high level of Loan life Coverage Ratio shows that the level of the loan's repayment capacity for future income from the project and the loan's "principal + interest" payments can and will be made comfortably.

Net Present Value (NPV):

There is difference between the present value of cash inflows and the present value of cash outflows (Investopedia, 2017). It is one of the most frequently used methods in project valuations. Also it is very important thet the project takes time value into account. “One of the most controversial issues in calculating the present value of the cash flow is to estimate the appropriate discount rates”(Davis G., 2003).

“*Net present value is measured in monetary terms and shows the absolute effectiveness of the project at a given discount rate. An investment project is approved or disapproved depending on its NPV*” (Mackevicius, 2013).Whether an investment projects affectivebased on NPVcalculation can be explained in the following statements.

• If NPV is greater than 0, the renewable energy investment will generate cash surplus unles the project implements;

• If NPV is equal 0, the renewable energy investmentwill not generate cash surplus but will not be loss-making (Mackevicius, 2013).

• If NPV is lower than 0, the renewable energy investment is not feasible and the investor is going to suffer from being in the loss.

Internal rate of return (IRR):

The added value to be obtained from the project is, in other words, the income that measures the profitability of the Project. When an executive needs to compare projects to determine which ones to fund, there are generally three options available to help in the decision process: internal rate of return, payback method, and net present value. (Harvard Business Review, 2016). If the internal rate of return is higher than the projected rate of profit, it is decided to move forward on the project. Otherwise, if the expected profitability is higher than the internal rate of return, the operation of the projectunprofitablemaking it meaningless to invest. This value is the reason why it is prefer projects that have a high internal rate of return be funded. The project will represent the minimum return that the sponsor can provide.

Modified Internal Rate Of Return - MIRR:

"*It assumes that positive cash flows are reinvested at the companies' cost of capital, and the initial outlays are financed at the firm's financing cost "*(Mackevicius, 2013).

The most important feature toensure that the modified internal rate of return is superior to a normal internal rate of return method is a traditional internal rate of return (IRR).However, considers the cash flows from a project bring reinvested with the internal rate of return, the Modified Internal Rate of Returnwill have a more completely picture of the cost and profitability of a project (Sariaslan, 2003).

Break Even Point:

It is the method by which the capacity utilization rate, in which the total incomes to be obtained, from the project and the total expenditures (fixed and variable) are calculated. In other words, the breakeven point is equal to the total fixed costs then divided by units contribution margin (The Balance, 2017).

Fixed Costs ÷ (Price - Variable Costs) = Breakeven Point in Units

It is the point at where its sales exactly contain its expenses. As long as the sales are low then break-even point the producer make a profit. In addition, if the break-even point of a facility increases, consequently, the risk of the project also increases. If the break-even point is low, then the prospect is more likely to profit. Moreover, with breakeven point analysis can be shown how changes in fixed costs, prices, and variable costs can affect the sales volume. In this analysis variable leads to more variation. The critical variable is that the most sensitive point of project. A small incorrect estimate of the value of the critical variable may cause big loss in the Project.

Payback Period:

This ratio is calculated on net cash flow, used to calculate the return period of the project. The payback period is the number of years it needs to payback the initial investment of a capital project from the cash flows that the project generates. The payback period measures the firm's liquidity (Finance Train, 2017)

The conclusion of the thesis has been demonstrated in the next chapter.

CHAPTER 8

8.1. GENERAL ANALYSIS AND RESULTS

The private sector is an important actor in promoting renewable energy investments. Accordingly, governments and investors have agreed on common standards for scaling up green bonds as an instrument to enhance liquidity in financial markets. This scale up has unlocked capital for investment for the renewable energy sector (NCE, 2016).

The project financing includes only a project-based financing. This is called full non-recourse funding. In this financing method an issuer can take possession of the collateral but cannot search out the borrower for any further compensation. Even in the case of the collateral it is not covering the full value if the borrower defaults.

Due to the inability to transfer project costs through a third party, banks take guaranties so the implemented financing method will not rest entirely on the project financing model. In Turkey, the guarantees for the project are secured by collateral, usually property, and a pledge based on the income of the project, a pledge over a commercial enterprise and/or a pledge of shares. This is where the borrower does have a personal liability for the loan.

According to this thesis, provision of long-term senior debt financing, syndication loans and project financing for the construction of solar photovoltaic plant, wind, geothermal and other renewable energy investments are the suitable financing methods in Turkey.

Project development processes are needed to obtain pre investment financing for significant hydro and geothermal projects as opposed to solar and wind projects.

Even though the renewable energy investments cost look equal with any European country, because of currency and exchange difference renewable energy investments are still relatively expensive, while also, being more vulnerable for local investors in Turkey.

Affordability is a key factor for competition capacity. There needs to be significant acquisition of renewable technology to compete against combustible technologies and equipment is likely to be more dependent on import technology. The renewable

energy technologies in particular solar and wind are a long way from accomplishing cost competitiveness because this market has just begun flourish in Turkey.

Generally 40 percent of the investment costs come from the fieldwork, 50 percent from the plant installation or construction, and 9 percent from the operation. The cost of licensing and project development are out of project financing frame. When an investor offers a project proposal, as a bank answer to these two questions need to be requested.

Is the power plant reserve sufficient for a certain period of time as the plant to be installed?

Will the other investor be affected when the capacity of the investment is increased in the side-by-side investments, especially, at a geothermal plant?

Therefore, another key factor is resource adequacy. Resource uncertainties are vital to take into account when considering project financing. In geothermal projects, the supreme risk comes from resource appraisal when drilling of exploratory wells is done. The investors need a three dimensional reserve analysis for this, which can be expensive. In case of low flow, it is necessary for additional expenditure to keep the source at the same level. Banks cannot continue support the over cost of a project. In the future, a project will need an extra unforeseen financial source if the allocated loan does not cover extra expenses.

The risks and barriers facing off-grid projects can be different from those encountered by on-grid projects. Such projects are generally based on individual utilization and developed by a small supplier. Thus, these projects can face more financing and legislation problems compared to other large or medium scale projects in reaching for the necessary capital to make initial investments. Though technical challenges may be limited, credibility can be hard. Smaller projects, generally, rely on corporate finance or micro financing such as a personal loan or home equity line of credit instead of project financing. Also off-grid projects can get financing from the scope of an energy efficiency investments (Kramer, 2014).

The barriers and risks to different renewable energy investments are previously illustrated in table 10. It is extremely difficult to conduct an exact statistical analysis

because each project has its own different circumstances. Even though the result of this inquiry is inevitably subjective, it ensure an symptom of which barriers and risks are likely to exposure the major challenges to developing renewable energy investments in Turkey. Lack of market funding is out of the thesis scope since it is a common challenge for any investment.

8.2.CONCLUSION

Reliable electricity supply can be provided by renewable energy in a world which fossil fuels are continuing to being depleted from day to day. In addition, if renewable technologies and renewable energy investments are supported by effective economic incentives and financing methods, it is possible to generate electricity at a lower cost than traditional methods.

"The key elements in financial decision making are the risk, return and timing of chash flows" (Whaley, 2006). The climate change, fluctuation in expected resourse or any unexpected facts that adversely affect renewable energy investments are the risks that undertaken by all parties of a renewable energy project.Sometimes unexpected facts may occure thus planned investment may not be reached desired level and cannot provide estimated return. Derivatives can use in renewable energy investment projects as an efficient hedging method in Turkey. Using derivative contract would be most sophisticated financial method in order to mitigate the risks. For example, if an investor assumes that the following year the weather will be dry and the wind will not flow as much as previous year, the investor may use a hedging product to manage this risk. As the investor estimated, because of the lack of renewable energy sourse hydro powers and wind farms cannot work at base loat operation. As a result,they cannot generate expected electricity and whileall the things are constant,the electricity prices will spike. In this case, having along call option contract would be a good asset management strategy for this investor.

In Turkey fossil fuels are mainly utilized instead of renewable energy sources since government has given priority to combustible technologies. This is mainly due to the

increasing energy need of the country as mentioned in the previous section, the lack of renewable energy technology, the low level awareness of the environment and renewable energy. Therefore, the country is suitable for investment in environment for renewable energy financing that has not been fully carried out yet.

Currentcarbonemissionvalue is 400Mton CO2 and it is predictedtoaccess 1540 Mton CO2 bytheyear 2052 in Turkey. Inaddition, potentialemissionreduction isprojected as 22.47%, 24.04% and 27.4% under $10, $20 and $30 emission tax scenarios respectively (Kumbaroğlu, 2017)

Financial institutions have appetite for financing renewable energy projects; however, getting financing is still difficult for investors, because of the volatile market conditions and the fresh memory of the financial crisis. Financiers have demand more collateral and price guarantees from sponsors. Although some improvement have had, the finance sector has not improved much since the global financial crisis.

As mentioned before, renewable energy sponsors in Turkey are not able to obtain non-recourse loans which are secured by the project assets to be paid back by the project's cash flow return. Instead of non-recourse financing, banks still provide limited recourse project finance loans, all the guaranty requirements made these loans very similar to full recourse corporate finance loans.

Development and national banks are other financiers of renewable energy projects. They have been engaged with renewable energy sector in Turkey or work together with Turkish banks in order to support renewable energy investments in Turkey.

This thesis brings to light thataccession to finance maintains a core barrier especially for small or medium sized entrepreneur (SMEs) in Turkey. Moreover, uncertainty about regulation such as the feed in tariff mechanism, exchange rate fluctuation and economic turbulence in Turkey sours the appetite of local and international investors. In reference to Debora Revoltella, The European Investment Bank's (EIB) Chief Economist, "There is a very strong differentiation between countries, but in almost

all of them uncertainty about the future was the top barrier to investment ” (EBRD, 2017).

The questions which have been prepared for the inquiry of this thesis is as follows;

1.Could you please introduce yourself?
2. Do you have a role in the renewable energy policy of Turkey? If yes, can you please briefly describe it?
3. Do you have a role in the finance sector or any connection with the financial sector?
4. What are the challenges faced by the financing of renewable energy projects, and how can these problems be overcome?
5. What are the most significant current and emerging risks faced by the renewable energy industry and how can renewable energy investments reduce risky and thus attract necessary capital?

6. Do you have a strategy paper (document) in regard to manage renewable energy investment risks (and uncertainty) and political risk?

7. What is the potential role and future contribution of banks in renewable energy finance in Turkey?
8. What is your opinion regarding how to engage the financial sector with the renewable energy investments in Turkey?
9. Are there necessary incentives supporting renewable investments? In another words, are supporting procedures for renewable investments attractive enough?

10. Do you think the renewable energy development could be the tool to minimize foreign energy dependency of Turkey?

11. Do you think the carbon tax implementation can be used as a tool to expand renewable energy investments?

The unique responds which have been given for the inquiry of this thesis takes places at following table;

Table 9:Key Inquiry Respond Data	
Prof. Dr. Gurkan Kumbaroğlu Director of the Energy policy Research Center, professor of Industrial Engineering at Bogazici University and Immediate Past Present, Member of The Executive Committee of International Association for Energy Economics	• I do not have a strategy paper directly related to managing renewable energy investment risks or political risks. However, I do have a paper evaluating the diffusion prospects of renewable energy Technologies. This is a model-based study. With this study I do elaborate a bit on the investment risks and the political risks. • There are supporting procedures protective enough. So I do think yes. The incentives in terms of the long-term agreement the 15 year under the Feed in tariffs currently when compared to the current market prices. This obviously provides a good incentive. We also see back in the applications for generating renewable energyso that the incentives are there supporting procedures. Maybe there are some barriers in terms of the procedures of the legalities of the bureaucracy required to able make use of the incentives schemes. • Definitely, renewable energy allotment is a major tool to minimize import dependence. Actually, we have noticed this with two large scale renewable investments one for solar and one for wind. This comes together with the old manufacturing plan to generate photovoltaic modules to generate wind turbines. This is seen as a tool not only to minimize energy import dependence but also technology transfer and know how and with this there is an export potential in the future. . Therefore, I can see Turkey becoming a renewable energy country where it is manufactured domestically. So it is a win-win thing in that sense to counteract the current account deficit. • Do you think that the carbon tax implementation can be

used in Turkey as a tool to expand renewable energy investments? Yes. Definitely, actually that is what we are now studying with our policy model applications. In effect, it is of a carbon tax. So on one hand you have cap and trade mechanism and on the other hand you have carbon tax. This is a big discussion, which one is more effective in terms of reducing carbon emissions.

- I think carbon tax implementation. It is because you give price on the carbon it is like a market-based mechanism, and as long as you do not distort the market too much then a carbon tax implementation. It should lead the direct way and this would definitely expand renewable energy investments. So you have to be careful because there are on the one hand the feed in tariffs and then a carbon tax implementation. How do these to interact? Another question but I think now in Turkey the current policy is to reduce or even get rid of a Feed in tariff system. Granted 15-year agreements but then what will be next? So then, carbon text appears to be the most promising option. The other thing cap and trade is like what they have in Europe, the European commission training scheme. So that the first phase in my opinion has not been that successful this is partlythe reason prices turned out to be too low by not providing any incentive. Therefore, carbon tax on the other hand you have direct control on the price on the tax amount and thus it may be a more effective tool. Then how much emission reduction and renewable energy development will be fostered by say $10 per ton $20, $30 per ton Carbon dioxide. This is another questionthat we also do analyze with our modeling studies.
- Do you think that long-term financing is a barrier for renewable energy investments? Well sure, long-term

renewable is all the based on the technological risks. The investment coming back and the financing institutions would like to see this as a guarantee. So based on the risk premium and this may be technology specific differences. As we have identified in the previous sheet. Therefore, I think this is an important issue and an important barrier for renewable energy investments long-term financing. Still particularly for renewable energy investments, typically the investment cost is the large chunk. The major part of the investment and then compare to other thermal generation operation and maintenance costs are rather low. So, long-term investment costs are a barrier or less of a barrier for renewable energy investments than non-renewable energy investment. But it is still a Barrier

- Do you think that being short of equity is an obstacle to the financing of renewable energy? Short of equity capital results in projects sponsors are often unable to manage the costs of ongoing activities without external financial sources. This is less of an obstacle I would say. Being short of equity because of renewable energy investments can have very small size investments so the capital requirements are typically reasonable. Therefore, being short of equity and financing institution is providing 80% of the loan. I think it is currently less of an obstacle. I see more of an obstacle with the bureaucratic legislative issues here for the renewable energy investments.

Proceeding with number 13. The range of risks emerges from the political legal economic and social conditions of a country that have adverse consequences investors and creditors. If you divide the countries risk into two groups that are political and economic risks which one could be the stronger in Turkey? I see that in Turkey we have political risk as a more significant barrier for sure.

	Moreover, in terms of what we have seen we have Micro economy. The Turkish economy has grown very well over the past decades say but then we see the coup attacks last year. What could be a more political risk? It is a major political risk. Still the micro economy, the economy has seemed to survive this. I mean many private sector companies were just taking over, closed or being shut down just for being close to the coup attempt. Still it turned out that the economy is well and survived this. Therefore, it looks like there is a stable and solid economic ground. The risk I see there t is much less when compared to the political risk. The geopolitical is aspect in my opinion is more, which provides threats and opportunities. Opportunities for the micro economy. Iraq, Syria and in all these countries, hopefully the war will stop and there will be a rebuilding process.. This will provide a micro economy opportunity and a trade opportunity for Turkey. This will also provide an investment opportunity and for the Turkish micro economy this is surely a plus point. However, of course there are these geopolitical risks and also not geopolitical but political risks for Turkey that are quite significant, here. In addition, with the current tension with the European Union and its economic impacts all these are somewhat interrelated (Kumbaroğlu, 2017).
Adonai Herrera Martinez Senior Manager, Energy Efficiency and Climate Change at EBRD	• Martinez went on to explain why EBRD is involved in sustainable energy investment in Turkey: The EBRD has invested nearly 2 billion EURO each year since 2009 half of which relates to sustainable energy, which forms a large part of total investment. The EBRD are supporting geothermal energy, not only with the financing, through direct loans or on lending to local banks. It also part of the

	mobilized climate financing in order to tackle system challenges that may arise. Together with that, the EBRD also provides technical assistance to investors or developers in order to apply best practice model. In addition, the EBRD works with the Turkish Government to improve regulatory frame work support for renewable energy investments. Current geothermal total capacity of Turkey is 858 MW. It is outstanding and the EBRD is expecting to add additional capacity. • Challenging renewable energy investments in Turkey financing will be a major issue. When the EBRD does investment, it takes account of the value at risk (VaR). In geothermal there are two stages. The first one is the drilling stage, while the second one is the power plant development stage. . Initially we will find out the highest risk for the finance sector and by doing this the finance sector tends to lower risks and secure returns for investment. Therefore, the finance sector does not want to take the early stage risks except in the case of green technology funding, which considers early project development costs. The EBRD expects investor to keep track of the top side of the investment until exploratory drilling is done. The coordination among project operation is key to sustainable management and is essential for future success of the project. • Cost of renewable energy technology in Turkey is equivalent with any other European country. On the other hand there are some specific technology is that are cheaper. For example, the geothermal drilling cost is the lowest in Turkey when we compare globally because there is good competition between drilling companies. This is a great opportunity for Turkey to export the

	drilling services to other countries. • When we consider about the current economy of Turkey, implementing carbon tax seems not easy, however, it would be an effective solution in the long term (Martinez, 2017).
Sabahattin Oz Head of General Directorate of Renewable Energy at Republic of Turkey Ministry of Energy and Natural Resources	• There are some murky points in legislation that could cause a time delays. In order to clear these murky points and give a clear investment picture to investors, related authorities will have to remedy this situation. Severe problems for project feasibility can arise when the regulatory framework make frequest changes. If the legislation can be fixed, renewable energy investments can get enough financing. • In addition, investors' appetite is higher than anticipated so energy infrastructure has to be immediately expanded. • In terms of solar resources, there are lots of databases which assess if conditions are suitable for solar to voltaic technology with a fair level of certainty and suitable locations. He explained that Turkey has many areas that are quite feasible for solar, wind and geothermal energy. According to Oz, Turkey does not have renewable energy source problem. • The promotion of public and private dialogue with the cooperation between value chain players is essential (Oz, 2017).
Ramazan Tunc Head of Project Analysis Department at Vakifbank	• Without high quality assessments of renewable energy resources, making investment on the relevant field than finding a financial supporter or obtaining private financing is like "trying to scratch your ear with your

	elbow." The source of energy is the backbone of the investment. • Resource assessments for wind, hydro, and biomass must be assess very properly. It is general assessment that solar energy could be sufficient for project financing in Turkey. However, in hydro and wind investment projects, cash flows might be less than expected, whether because of short of rain or wind so careful investigation of resources viability will be required (Tunc, 2017).
Caner Genceli, Engineer at Vakifbank Sustainability department	• If the climate funds give the adequate support, Turkey will do major transition to low carbon economy. Especially the Marrakech Climate Conference is a milestone for funding renewable energy investments. National and international green funds can canalize trough renewable energy investments • In addition, carbon tax would be a financial method in order to cut emission and support renewable energy investments in Turkey (Genceli, 2017).
Refik Tiryaki, Head of Group the Electricity Market Department Republic of Turkey Energy Market Regulatory	• Refik Tiryaki emphasized the regulatory and technological challenges. He said that the up-front cost of renewable energy investments is expensive at the beginning because of the cost of technology. In general though, real life time costs are quite lower when compared to combustible ones because the renewable energy comes from free sources like the sun, the water or the wind. Where the barrier are at is the up-front cost. Without improving our technology, Tiryaki says, I do not think that fund providers can rely on the current condition. • Also there is no way to fulfill Turkey's energy

Authority	dependency with renewable energy with current National and international green funds • If Turkey wants to increase renewable energy share in total energy consumption in a sustainable way, the country has to invest in renewable energy technology and create its own renewable energy technology (Tiryaki, 2017)
Metin Alımlı, SME Banking Product Manager at Vakifbank	• I think that "best Practice" model is the most implementable model for small-scale energy projects in Turkey because instead of searching or testing, Turkish investors tend to take investment decisions based on best practice models. • Banks have the opportunity to ensure that funds are successfully generated through renewable energy via new or improved financing schemes (Alimli, 2017).
Dogan Taskent Business Development Leader with Technology Transfer Accelerator (TTA) Turkey Advisory Project	• When the renewable energy projects passed the construction period and into the operation phase many banks are willing to bear the transaction cost. With the lack of project financing in Turkey, investors are abstaining on taking suitable investment action because of the fear of losing everything as a collateral. • Accession to finance maintains a core barrier especially for SMEs • The promotion of public and private dialogue with the cooperation between value chain players is essential (Taskent, 2017).
Zafer Arikan	• The awareness of the society should be increased. • Uncertainty about the future was the top barrier to

Bereket Enerji Grubu GES Koordinatoru	investment. As we investors want to know the future of feed in tariff mechanism. • Double standard should not be practiced for companies by the government. • Uncertainty about the future was the top barrier to investment. • Climate conditions would be a barrier for investors. It should be considered by both investors and creditors while projecting investment term and calculating cash flow (Arikan, 2017).

Project financing will be an investment framework for banks' financing of renewable energy projects for the electricity grid modernization. The expansion of renewable energy investments will enable renewables integration into the Turkey energy supply. In order to do that, the Turkey energy market must adopt a more market-based renewable energy support scheme, which includes a transition to an auction-based price-setting mechanism. Also, project-specific financial instruments should be used not only in the renewable energy investments, but also in the finance sector innovation. The financing instruments needed to support this growth should be flexible.

The work has been done on statistical data in Turkey but there needs to be more data collected.

A double standard should not be practiced for companies owned by the government andrules should net be changed after investors have entered the market.

According to our interviews withrenewable energy sector stakeholdersmany buildings roofs are not suitable for solar panels installation. This creates technical problems for renewable energy investments. Contracting firms can make roofs suitable for solar panels when the building is a constructed building. They should design the building's mains power infrastructure according to a structure that will connect to the solar power inverter. If the information of roof structure is shared with

the solar panel producing company, the solar panel can be produced to properly fit the roof. Additional regulation of the installation of solar panels is needed because existing laws are inadequate.

Another important finding of the thesis is the lack of investment into community energy in Turkey. The small projects cannot get loans to fund projects and thisthesis suggests that more time should be spent working with lawyers, accountants, financial planners, technical consultants to get them to investment stage. . There are risks in these projects as there are with other types of renewable energy investments. The finance sector should focus on the smaller project and as a result the economic multiplier may get a financial and environmental return.

The promotion of public and private dialogue with the cooperation between value chain players is essential for Turkey to have a robust and more productive renewable energy sector. In this case, financial and political decision makers play an essential role by promoting an amalgamated vision of the renewable energy sector's growth. Policy makers should combined all endeavors in key areas such as research, development, and technology transfer with interacting on global and local renewable energy investors. With this vision, it will ensure Turkey's energy security and carbon reduction goals for national and international green funds can canalize through renewable energy investments which will result in banks having the opportunity to ensure that funds are successfully allocated to renewable energy through new or improved financing schemes.

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