

# Needs Analysis for Biogas Investments in Turkey

PROMOTION OF GRID-CONNECTED  
RENEWABLE ENERGY IN TURKEY



T.C.  
ENERJİ VE  
TABİİ KAYNAKLAR  
BAKANLIĞI



On behalf of:



Federal Ministry  
for the Environment, Nature Conservation,  
Building and Nuclear Safety

of the Federal Republic of Germany

**giz** Deutsche Gesellschaft  
für Internationale  
Zusammenarbeit (GIZ) GmbH

This project is part of the International Climate Initiative (IKI), The German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) supports this initiative on the basis of a decision adopted by the German Bundestag



**Impressum:**

giz – Alman Uluslararası İşbirliđi Kurumu  
Aziziye Mah. Pak Sokak No: 1/103, 06690 Ankara, Turkey  
T +90 312 466 70 80  
E [giz-tuerkei@giz.de](mailto:giz-tuerkei@giz.de)  
E [info@gizyep.de](mailto:info@gizyep.de)  
I [www.giz.de](http://www.giz.de)  
I [www.gizyep.de](http://www.gizyep.de)

T.C. Enerji ve Tabii Kaynaklar Bakanlıđı  
Türk Ocađı Caddesi  
No:2 Çankaya/Ankara/Türkiye  
T +90 312 212 64 20  
E [bilgi@enerji.gov.tr](mailto:bilgi@enerji.gov.tr)

**Date:**

02.2017

**Author:**

Dr. Farız Taşdan, Altan Denizsel Elif Özdemir and Burçak Sel Tüfekçi (Life iklim ve Enerji Ltd., 2017

**Content**

- 1. Introduction ..... 1
- 2. Current State of Biogas Sector ..... 2
- 3. Regulatory Framework ..... 3
- 4. Needs Analysis for Biogas Sector ..... 6
- 5. Conclusion and Further Recommendation to coverr the Needs..... 8
- 6. References.....11

## 1. Introduction

Renewable energy investments receive increasing attention from all over the world, because of reducing economic externalities, dependency on fossil and initial investment cost. Renewable energy investments have been evaluated as the most appropriate way to reduce greenhouses gases causing climate change.

In Turkey, like other types of renewable energy investments, biogas investments started in the early 2000s with the liberalization of the energy market. With the “Law on Utilization of Renewable Energy Sources for the Purpose of Generating Electrical Energy” in May 2005, the investments in renewable energy were accelerated in Turkey, especially in the wind and geothermal energy sector (Official Gazette, 2005). However, the investments for biogas took more attention with the revision of law in 2011 introducing a feed-in tariff for biogas with 0,133 USD/kWh (Official Gazette, 2011). Compared to other renewable energy investments, biogas investments have been lacking behind with 46.9 MW of current installed capacity (EPDK, 2017). Biogas only represents 0.067% of the total installed capacity, although electricity generation from biogas is more reliable compared to other renewable energy sources. Feedbacks from various stakeholders indicate that the sectors’ problems are bureaucratic, financial and structural, indeed.

The report aims to provide the reader with a Needs Analysis of the biogas sector in Turkey by giving background information as well as outlining its current state. The Needs Analysis section is based on the feedbacks from the “Seminar on Evaluation of Biogas Investments in Turkey” taking place on 20-21<sup>st</sup> of January 2017 in İzmir. Further sources are feedbacks from bilateral meetings with biogas investors in Turkey and the 10-year consulting and project development experiences of Life Energy.

This report identifies the main barriers and their solutions to biogas investments in Turkey. For this reason, there is also a short background information on the current state and regulatory framework of the biogas sector in Turkey in the second and third section. The fourth section of the report provides a Needs Analysis table which is based on the feedbacks from investors, NGOs and participants of the seminar. Finally, the last section provides further recommendation to satisfy the needs of the biogas sector. The report also provides a short descriptive section about the 2-day “Seminar on Evaluation of Biogas Investments in Turkey” in İzmir. Its aim is to inform potential biogas investors about recent developments and opportunities in the biogas sector.

## 2. Current State of Biogas Sector

Under current consumption rates, fossil energy sources such as natural gas, coal and oil will deplete in no more than 100-150 years' time. Moreover, it is clear that the usage of fossil fuels emits greenhouse gases which are a cause of climate change. There is a need to reduce GHG emissions and limit the temperature increase of the earth under 2 °C to save the world from severe effects of climate change (UNFCCC, 2016). From this point of view and supported by decreasing cost of renewable energy technologies, the tendency to use more renewable energy sources is on the rise and spreading all over the world. This tendency is also applicable in Turkey. Therefore the country aims to increase its renewable electricity production in various commitments for 2023 and 2030 (MoENR, 2016), (MoFA, 2015).

In the context of this energy transition also biogas is becoming a more important factor. With 8,928 plants and 4,177 MW installed capacity in 2015, Germany is the country with the highest electricity production from biogas (Biogas Association, 2015). Although Turkey has vast agricultural and husbandry resources, biogas investments have been lacking behind with 20 facilities as listed in the table below (EPDK, 2017). According to the information obtained from EPDK and General Directorate of Renewable Energy, total current installed capacity of biogas power plants is 46.9 MWe which is excluding landfill gas to electricity projects (EPDK, 2017). This is 0.067 % of the total installed capacity in Turkey. However, according to the estimation of the Ministry of Energy and Natural Resources of Turkey, there is a biogas potential of 17,500 MWh in the country. The table below provides plant-specific information on present biogas projects in Turkey.

**Table 1: Biogas Power Plants in Turkey**

No.	Name of Project	City of Project	Installed Capacity (MWe)
1	AkinciEnerjiSandıklıBiyogazTesis	Afyonkarahisar	1,4
2	Afyon-1 BiyogazSantrali	Afyonkarahisar	1,2
3	PakmilBiyokütleSantrali	Adana	1,763
4	PamukovaBiyogazSantrali	Sakarya	1,4
5	OvacıkBiyogazEnerjiSantrali	Kırklareli	4,8
6	Modern BiyokütleEnerjiSantrali (MOBES)	Tekirdağ	6
7	Cargill BioenerjiTesis	Bursa	0,12
8	Tatlar Köyü-Sincan-Ankara	Ankara	3,2
9	ES ESBiyogaz	Eskişehir	2,042

## Needs Analysis for Biogas Investments in Turkey

10	Polatlı BES	Ankara	1,471
11	Aksaray OSB Biyogaz Tesisi	Aksaray	6,402
12	Albe-I Biyogaz Santrali	Ankara	1,813
13	Gönen Biyogaz Tesisi	Balıkesir	3,621
14	Hayat Biyokütle Projesi	Kocaeli	0,955
15	EDİNCİK BES	Balıkesir	2,134
16	Afyon Biyogaz Santrali	Afyonkarahisar	4,017
17	Karma 1 BES	Sakarya	1,487
18	Karaman Biyogaz Tesisi	Karaman	1,414
19	Sezer Bio Enerji Biyogaz Tesisi Biyokütle Projesi	Antalya	0,5
20	Ekim Grup Biyogaz Tesisi	Konya	1,2
	<b>Total</b>		<b>46.9 MWe</b>

As it can be seen in **Table 1**, there are currently only 20 projects in Turkey, a relatively low number compared to the size of the country and its agricultural industry. Regarding the vast biogas potential as well as the relatively high feed-in tariffs, a higher number of projects should be expected. In reality however, investors are facing numerous barriers blocking investment.

The level of human capacity, consulting services, type of farms, bureaucratic approaches, technological existence and financial services in the sector of biogas are the parameters of the investments. These parameters will be implicitly analyzed to state the barriers for biogas investments. Thus, the form and level of the support needed to overcome the barriers in the biogas sector will be covered under Section 4 and 5 where the Needs Analysis and recommendation are covered.

### 3. Regulatory Framework

Biogas investments have been regulated by several legislations published by the “Ministry of Food, Agriculture and Livestock”, the “Ministry of Environment and Urbanization” and the Energy Market Regulatory Authority of Turkey. There are also strategic documents that produce policy on biogas investments. These regulations and strategy documents are explained briefly in the table below to give some background information.

**Table2: Laws, Regulation and Strategy Documents for Biogas Investments**

<b>Regulatory Framework for Biogas Investments</b>	<b>Content of the Regulation</b>
Environmental Law (Official Gazette No: 18132 Date of Issue: 11/08/1983)	The general principles for the protection, improvement and pollution prevention are explained in the Environmental Law. This law comprises of all environmental values that make up the environment of today's generation as well as the environment of future generations. Biogas is described as a renewable resource, which will improve the environmental quality for today's and future generations by the recovery of former waste.
Regulation on Animal Products Not Used for Human Consumption (Official Gazette No: 28152 Date of Issue: 24/11/2011)	Procedures and principles of animal by-products which are not designated for human consumption are specified in order to prevent or minimize risks to public and animal health, food and feed safety. Raw materials used in the production of animal origin products and products manufactured but not used for human consumption have been enucleated. Approval procedures for biogas establishments and installations have been clarified according to this regulation.
Mechanical Separation, Biochemical and Biomonitoring Facilities and Fermented Product Management Communiqué (Official Gazette No: 29498 Date of Issue: 10/10/2015)	Management of biodegradable waste can be ensured by this communiqué without exposing risk to the environment and human health. The amount of waste disposed to sanitary landfill can be reduced. Mechanical separation, bioreactor and biogas production facilities and also biomonitoring facilities which are material and energy recovery facilities are described. Furthermore, the quality of the fermented product obtained in biogas facilities is designated by this communiqué.
Compost Communiqué (Official Gazette No: 29286 Date of Issue: 05/03/2015)	Biodegradable waste is described by this communiqué to ensure that the waste management is provided by separate collecting at the source without harming the environment and human health. Technical criteria of composting plants are determined as well. Moreover, the quality criteria of the products obtained from compost and biogas facilities can be determined by this communiqué.

## Needs Analysis for Biogas Investments in Turkey

<p>Law on Use of Renewable Energy Sources for Production Purposes Electricity Energy (Number of the Law: 5346 Date of Issue: 10/05/2015)</p>	<p>The law describes the expansion of the use of renewable energy sources for electricity production while increasing the security of supply. Furthermore the reduction of greenhouse gas emissions is quantified. Waste evaluation procedures as well as environmental protection regulations have been adjusted according to this law. Investment application and coordination of the biogas facilities have been specified accordingly, too.</p>
<p>Supply Security Strategy Document (Date of Issue: 21/05/2009)</p>	<p>Production plans will be prepared taking into consideration the technological developments and other renewable energy use potentials such as biogas depending on the regulatory regimes. The increase in the use of these resources will reduce the share of fossil fuels, especially imported resources. This strategy document promotes the establishment of biogas production facilities.</p>
<p>Regulation on Electricity Generation in Electricity Market (Official Gazette No: 29865 Date of Issue: 22/10/2016)</p>	<p>The main purpose of this regulation is the expansion of the use of renewable energies to reduce greenhouse gas emissions and to diversify the energy supply. Most importantly, a feed-in tariff for biogas has been determined as 0,133 USD/kWh by this regulation which encourages the installation and operation of biogas facilities in Turkey.</p>
<p>Compost Directive (Number of the Directive: 56468)</p>	<p>This Directive provides a legal framework for the use of animal by-products in biogas production. It clearly explains biogas and compost transformation parameters, biogas and compost facilities. The minimum requirements, the approval of the installations and the procedures and principles for the inspection are specified in the Compost Directive.</p>
<p>Biogas Potential Report of Turkey (Date of Issue: December 2011)</p>	<p>Turkey's biogas potential has been evaluated for each county. Here the presence of untapped agricultural land and its biogas potential has been examined. Additionally an overview of the existing industries (cattle, poultry, sugar etc.) is given and its potential evaluated.</p>

With the laws, regulations and strategy documents listed above, it can be clearly seen that there is a framework created for biogas investments in Turkey. However, some aspects of this framework could be hindering real investments which are pointed out in the next section of the report.

#### 4. Needs Analysis for Biogas Sector

The aim of the Needs Analysis for biogas sector is to state the barriers that are hindering development in the sector. The approach to identify these barriers is to compare the status quo with an optimal situation. . Thus, the needs are the gaps between optimum and real situation. The representing formula is as follows:

$$\text{Needs} = \text{Expected Conditions} - \text{Real Conditions}$$

The Needs Analysis in this report is based on the feedbacks from the stakeholder during the seminar in İzmir on 20<sup>th</sup> and 21<sup>st</sup> of January 2017 and feedbacks from the investors of biogas in Ankara. The feedbacks are provided in the annex of the event report, please see them for further information.

The Needs Analysis is provided as a table below.

Expected Conditions	Real Conditions	Needs
Existence of laws and regulations	There are laws and regulations for biogas sector in Turkey	
Existence of a feed-in tariff as an incentive mechanism	There is feed-in tariff system for biogas in Turkey	-
Experienced Engineers and technicians to do operation and maintenance of the biogas projects	Very low number of experienced technical staff for the sector	Technical trainings aiming to increase capacity of technicians and engineers
A harmony between institutions regulating biogas sector	Lack of coordination between institutions regulating the biogas sector, especially between the Ministry of Environment and	Capacity building activities targeting staffs working in the ministries for better and harmonized approach for

## Needs Analysis for Biogas Investments in Turkey

	Urbanization and Ministry of Food, Agriculture and Livestocks	biogas investments
Medium level of technological and regulatory knowledge of staff responsible for biogas investments	Low level of technological and regulatory knowledge of staff working in institutions responsible for biogas investments	Capacity building activities for the ministerial staff and staff working in the regional administrations
Experienced companies to do feasibility studies on biogas investments	Low number of companies to do biogas investment feasibility studies	Capacity building trainings for the consulting companies
Harmonized regulations	Conflicting regulations on biogas investments	Harmonization of the regulation on biogas investments
Smooth and clear process for investors to see the timeline of the permission process	A slow process of permission (especially regulation on bio-methanation) causing pre-investment period to be long as 2 to 3 years	Revision of regulations
Big farms to feed biogas projects lowering the cost of logistics	High cost of logistics because of many farms with small capacity	Researches on reducing costs of logistics in biogas projects. Lessons that can be learned from Germany
High demand of liquid waste / fertilizer by the agricultural land owners	The disposal problem of liquid waste / fertilizer that is generated by biogas	Awareness raising about usage and benefits of liquid fertilizer / waste. Lessons to be learned from Germany how to dispose liquid waste / fertilizer
High demand for solid organic fertilizer created by biogas digesters	Problem of sale and consumption of solid organic fertilizers created by biogas digesters	Awareness raising / marketing activities about usage and benefits of organic fertilizer Encouragement of usage of organic fertilizer by related ministries
High level of financial services to invest in biogas projects	Limited level of financial services to understand, analyse and invest in the biogas sector	Capacity building activities for finance sector on biogas investments

The Needs Analysis done in the table above shows that the needs of the sector can be grouped as:

- 1- Needs of capacity building activities for technical, ministerial and financial staff
  - The technical training has to increase the knowledge of technical staff, engineers, technicians for operation and maintenance of existing plants.
  - Capacity building activities for Ministerial and financial staff shall aim to increase knowledge on biogas investments and technology.
- 2- Needs of harmonization of the conflicting regulations for investors to estimate a timeline of investments
  - A technical proof-reading and gap analysis for the regulations on biogas investments could help to find conflicting parts in the regulations and increase harmonization within.
- 3- Marketing needs for biogas products: awareness-raising activities
  - Biogas facilities produce organic and liquid fertilizers besides gas to be used in energy production. The sale of fertilizers, which is also more beneficial for agricultural production, can help faster return on biogas investments. The usage of fertilizer from biogas plants could be increased by incentive programs or awareness raising activities among farmers.

Knowing the limited installed capacity of biogas power plants and huge potential of biogas in Turkey, it is clear that there is room for more investments. But there are things to be done to enhance the developments in the sector, such as covering some of the needs stated above.

## **5. Conclusion and Further Recommendation to coverr the Needs**

Dependency on fossil fuels creates economic, social and environmental negative consequences for a country like Turkey, which has limited natural resources. Negative impacts of fossil fuels on environment and economic dependency on other countries could be avoided by investing in Turkey's vast renewable energy sources. The investments in hydro, wind, geothermal and solar power is accelerating compared to the low level of

## Needs Analysis for Biogas Investments in Turkey

investments in biogas resources. The installed capacity of biogas power plants is only 46.9 MWe with 20 plants, although, Turkey has a total biogas potential of 17,500 MWh annually. The report at hand aims to analyse barriers in the biogas sector under “Needs Analysis” with a target to provide recommendation to overcome these barriers. A short background information on current state and legal framework of the sector is also provided in the second and third section. The Needs Analysis section of the report is based on the feedbacks from the seminar which took place on 20-21<sup>st</sup> of January 2017 in İzmir, feedbacks from bilateral meetings with biogas investors in Ankara, Turkey and the 10-year consulting and project development experiences of Life Energy.

The Needs Analysis show us, although there are laws, feed-in tariff and regulating framework for the biogas investments in Turkey, there are some barriers slowing down the investments. The barriers, analysed in section four, could be listed and summarized as:

- Limited number of experienced technical staff for the sector to do operation and maintenance
- Lack of coordination between institutions regulating the biogas sector, which is a reason of the slowdown in the permission process
- Low level of technological and regulatory knowledge of staff working institutions responsible for biogas investments
- Low number of companies to do biogas investment feasibility studies
- Conflicting regulations on biogas investments
- High cost of logistics because of many farms with small capacity
- The disposal problem of liquid waste / fertilizer that is generated by biogas
- Problem of sale and consumption of solid organic fertilizer produced by biogas digester
- Limited level of financial services to understand, analyse and invest in the biogas sector

Most of the barriers listed above could be overcome by trainings on biogas power plants through capacity building projects, but some other barriers need a closer look. The recommendation to overcome barriers are listed and summarized as below:

- Technical trainings aiming to increase capacity of technicians and engineers to do operation and maintenance
- Capacity building activities targeting staffs working in the ministries for a better harmonized approach for biogas investments

#### PROMOTION OF GRID-CONNECTED RENEWABLE ENERGY IN TURKEY

- Technical proof-reading of the regulation for better harmonization of the regulations on biogas investments
- Researches on reducing cost of logistics in biogas projects. Lessons that can be learned from Germany
- Awareness raising activities about usage and benefits of liquid and organic fertilizer

It is obvious that the biogas sector in Turkey can contribute more in the struggle to reduce dependencies on fossil fuels and to avoid emission of greenhouse gases. However, there is more to do than providing feed-in tariffs and a legal framework. The list of recommendations provided above could be a first step to approach the sector for new developments.

## 6. References

EPDK, 2017, Licenses in operation. Ankara.

German Biogas Association, 2015, Biogas production in Germany: Status quo and future trends.

Official Gazette, 2005, Law on “use of renewable energy sources for production purposes electricity energy” 10 May 2005, Ankara. No. 25819.

Official Gazette, 2011, Law on “revision on law of use of renewable energy sources for production purposes electricity energy” 10 January 2011, Ankara. No. 27809.

MoENR, 2016, Budget presentation for 2017, Ankara. 2016.

<http://www.enerji.gov.tr/File/?path=ROOT%2f1%2fDocuments%2fB%C3%BCt%C3%A7e%20Konu%C5%9Fmas%C4%B1%2f2017%20B%C3%BCt%C3%A7e%20Sunu%C5%9Fu.pdf>

MoFA, 2015, INDC of Turkey. Ankara 2015.

[http://www4.unfccc.int/submissions/INDC/Published%20Documents/Turkey/1/The\\_INDC\\_of\\_TURKEY\\_v.15.19.30.pdf](http://www4.unfccc.int/submissions/INDC/Published%20Documents/Turkey/1/The_INDC_of_TURKEY_v.15.19.30.pdf)

UNFCCC, 2016, Paris Agreement, Paris. France.