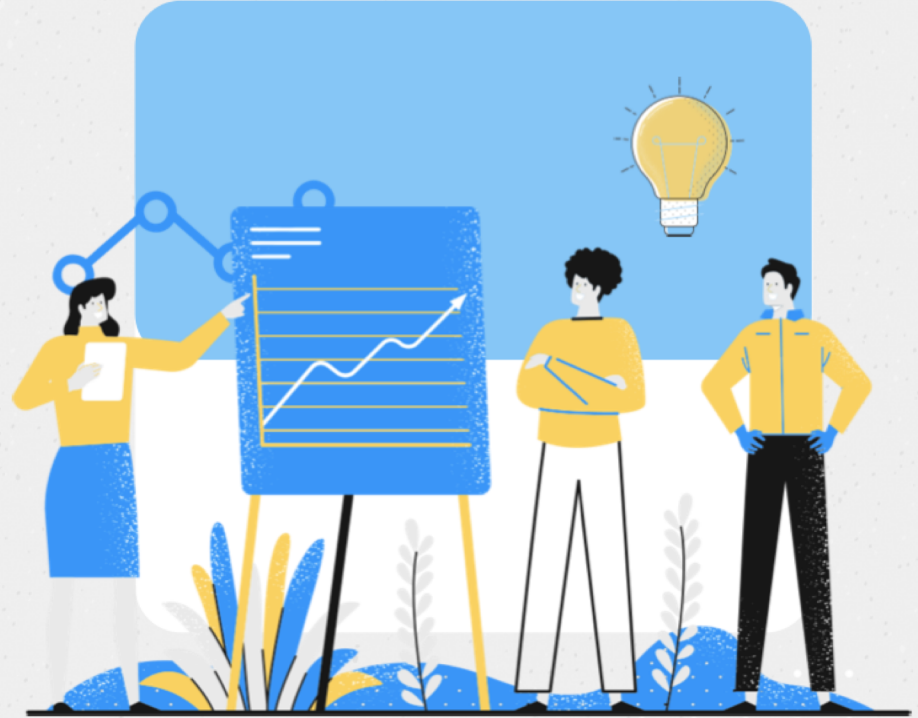


Analysis of Energy Planning, Production & Consumption in Turkey

Kar-R-sızlar



Team Members & Abstract

Mehtap Çolak

Tuğçe Uncu

Bülent Büyük

Oğuz Çolak

In this term project we aim to analyze Turkey's energy planning, production and consumption data in detail. Our objectives are to analyze

- Comparison between energy production and consumption in Turkey to understand the external dependence of Turkey in the energy sector
- Comparison between 4 year of planning data and actual production data to examine unusual factors in energy demand.
- The development of the renewable energy sources in Turkey.

Data Source

We gathered the data from [Energy Exchange Istanbul \(EXIST\)](#) website.

Energy Exchange Istanbul (EXIST) was officially established on March 12, 2015. Its main objective and principal business activity is to “Plan, establish, develop and manage energy market within the market operation license in an effective, transparent, reliable manner that fulfills the requirements of energy market and to be an energy market management that procures reliable reference price without discriminating equivalent parties and maximizes the liquidity with increasing number of market participants, product range and trading volume as well as allowing to merchandise by means of market merger.”

Analysis Structure

- 4 Year Planning Analysis: January 2016 - October 2019 (01.01.2016-31.10.2019) General Graphics Distribution by Source
- 4 Year Production Analysis: January 2016 - October 2019 (01.01.2016-31.10.2019) General Graphics Distribution by Source
- 4 Year Consumption Analysis: January 2016 - October 2019 (01.01.2016-31.10.2019) General Graphic
- Comparison of Planning and Actual Production
- Comparison of Production and Consumption
- Ratio of Renewable Energy Resources within 4 Years of Production
- Ratio of Fossil Fuel and Natural Gas in 4 Years of Production

Explanation of Raw Data and Preparation

- Energy planning, production and consumption data are taken from [Energy Exchange Istanbul \(EXIST\)](#) as 3 separate tables.
- Preparations include headline settings, format adjustments and creating organized RDS files & uploading them into Github page.

Here is the glimpse of planning data after preparation:

	tarih <chr>	saat <chr>	toplam_mwh <dbl>	dogal_gaz <dbl>	ruzgar <dbl>
1	01.01.2016	01:00	18735.09	5471.14	168.48
2	01.01.2016	02:00	17662.05	5182.14	168.44
3	01.01.2016	03:00	17059.91	5146.13	159.71
4	01.01.2016	04:00	16903.33	4990.13	149.83
5	01.01.2016	05:00	16845.48	4941.13	138.38

liniyit <dbl>	tas_komur <dbl>	ithal_komur <dbl>	fuel_oil <dbl>	jeotermal <dbl>	barajli <dbl>	nafta <dbl>	biyokutle <dbl>	akarsu <dbl>	diger <dbl>
4139.53	736	4587	115	104.1	3166	5	0	122.84	120
4139.53	736	4470	115	104.1	2499	5	0	122.84	120
4139.53	736	4470	115	104.1	1943	5	0	121.44	120
4139.53	736	4470	115	104.1	1943	5	0	130.74	120
4139.53	736	4470	115	104.1	1943	5	0	133.34	120

Explanation of Raw Data and Preparation

- 4 Year Planning Data:

This data includes 33599 rows and 15 variables for the planned production between January 1st, 2016 and October 31st, 2019

- 4 Year Production Data:

This data includes 33597 rows and 18 variables for the actual production between January 1st, 2016 and October 31st, 2019

- 4 Year Consumption Data:

This data includes 33575 rows and 3 variables for actual consumption between January 1st, 2016 and October 31st, 2019

Sources
toplam_mwh
dogal_gaz
ruzgar
linyit
tas_komur
ithal_komur
fuel_oil
jeotermal
barajli
nafta
biyokutle
akarsu
diger

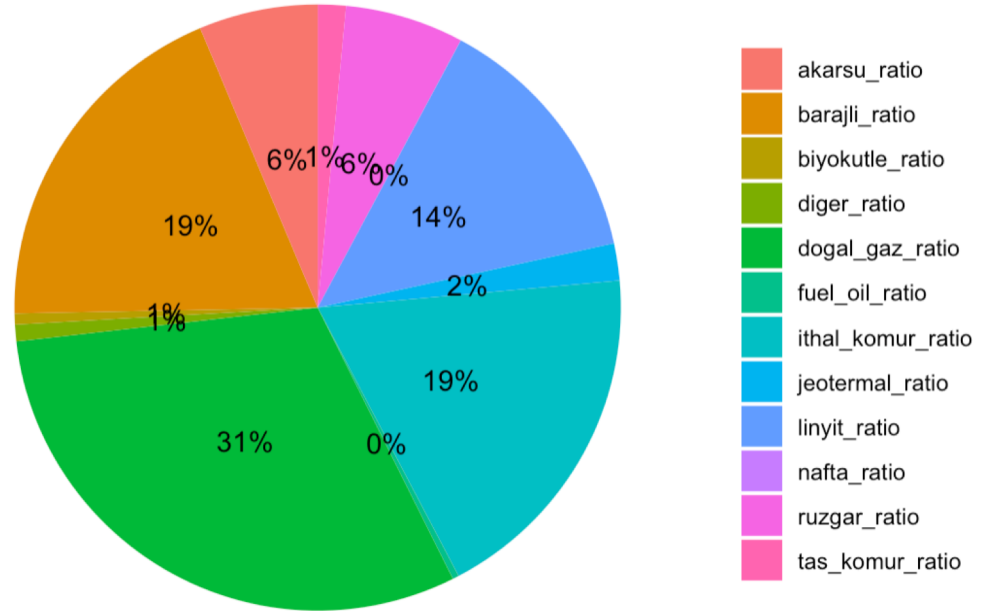
Sources
toplam_mwh
dogal_gaz
barajli
linyit
akarsu
ithal_komur
ruzgar
gunes
fuel_oil
jeotermal
asfaltit_komur
tas_komur
biyokutle
nafta
Ing
uluslararasi

Sources
tuketim_miktari_mwh

Analysis | Ratio of Planning

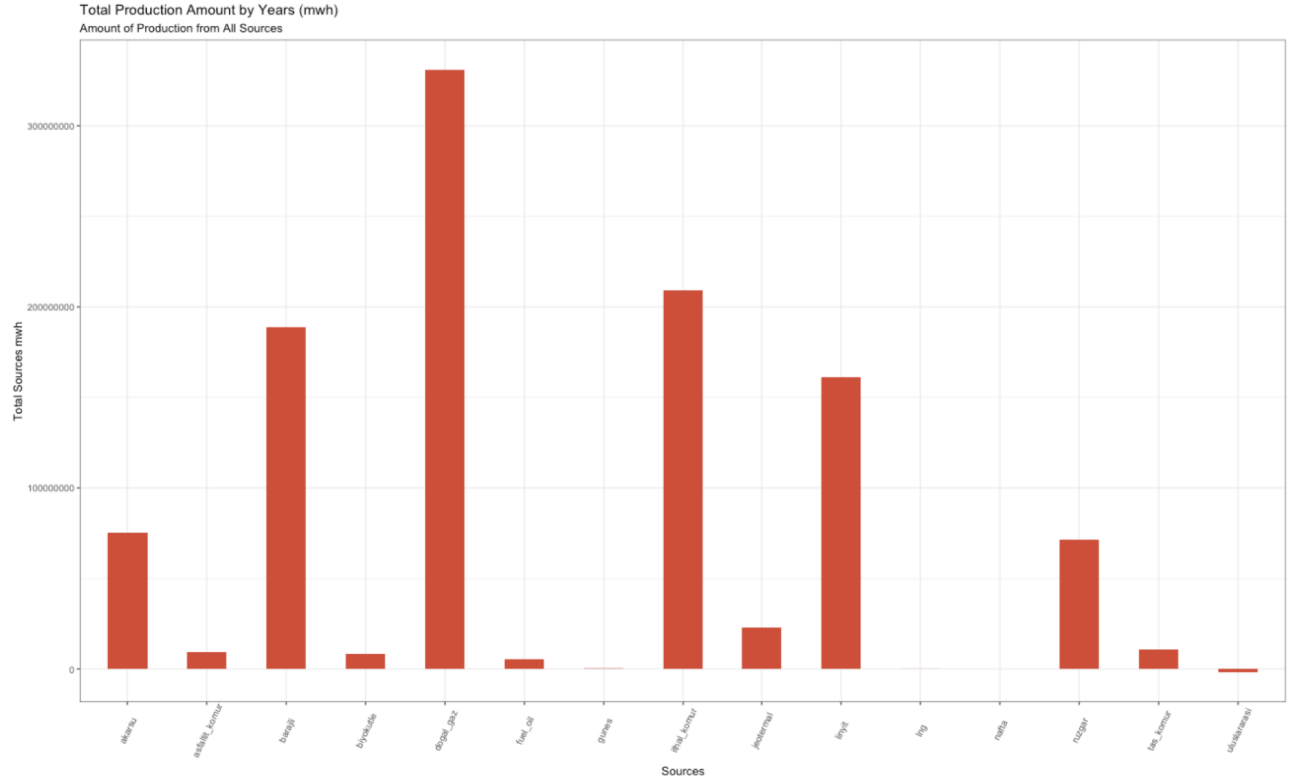
Dogalgaz, Baraj, ithal komur and linyit are the largest sources in energy planning, whereas, biyokutle, fuel oil and nafta are the smallest.

Ratio of Planning Sources



Analysis | Total Production Amount

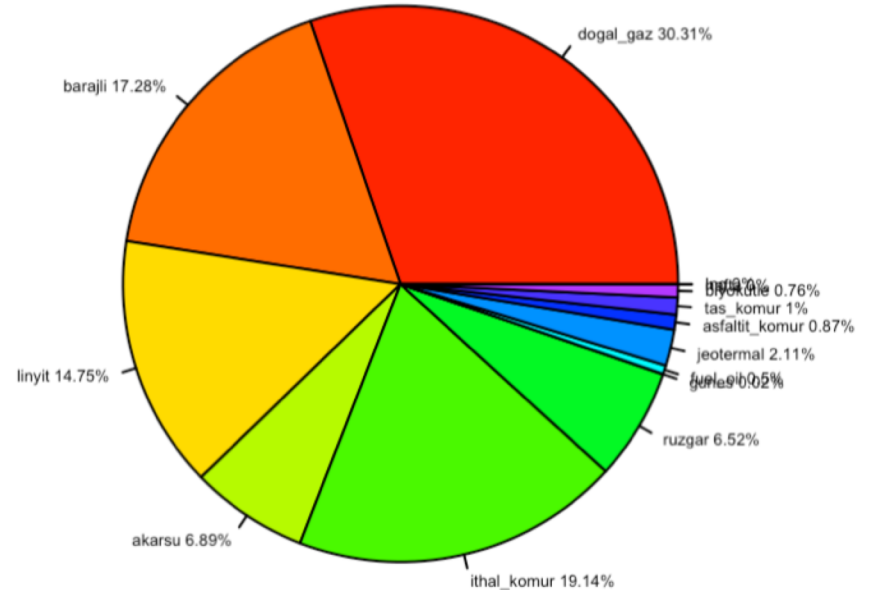
In the last 4 years, the most production was obtained from natural gas (dogal_gaz), imported coal (ithal_komur) and dammed hydro (barajli). Only the negative value (about -1.6 million mwh) was obtained from the importExport (uluslararası) source.



Analysis | Ratio of Production

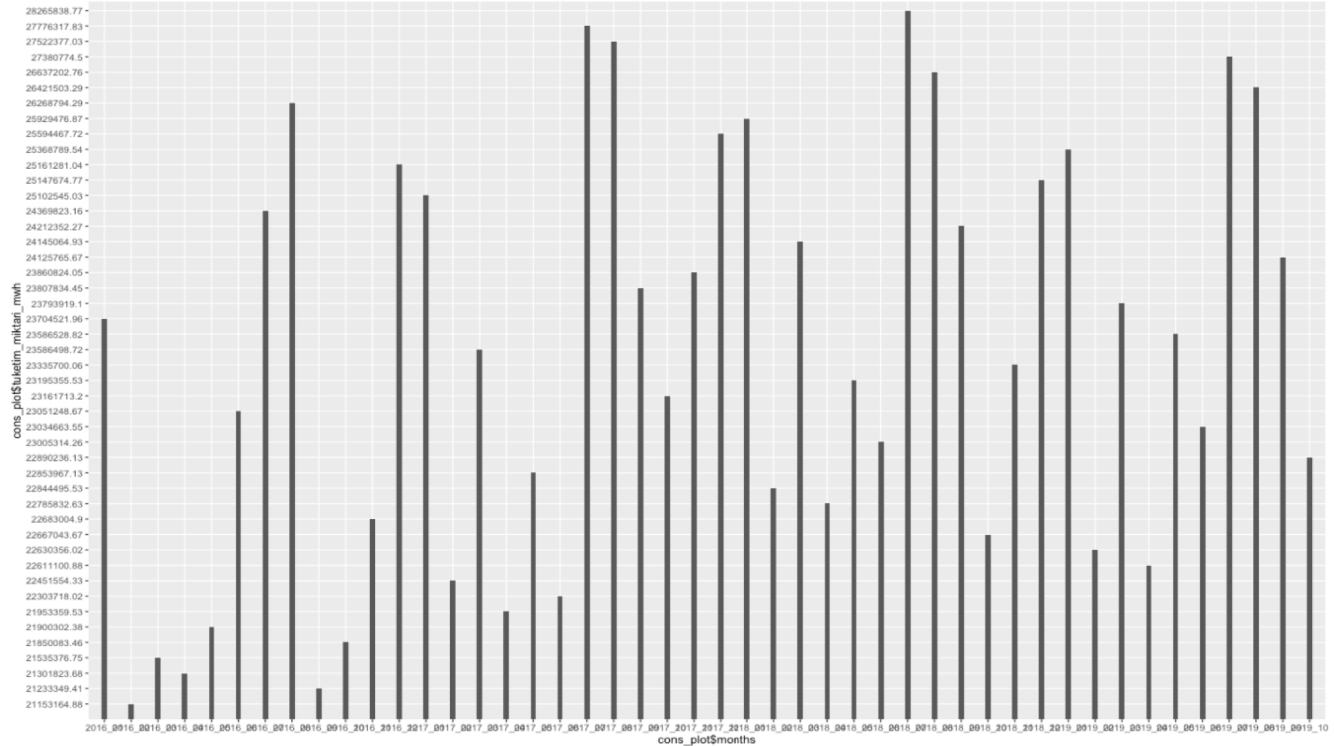
Distribution of the percentage of production of energy sources is shown on the pie chart.

Ratio of Production Resources



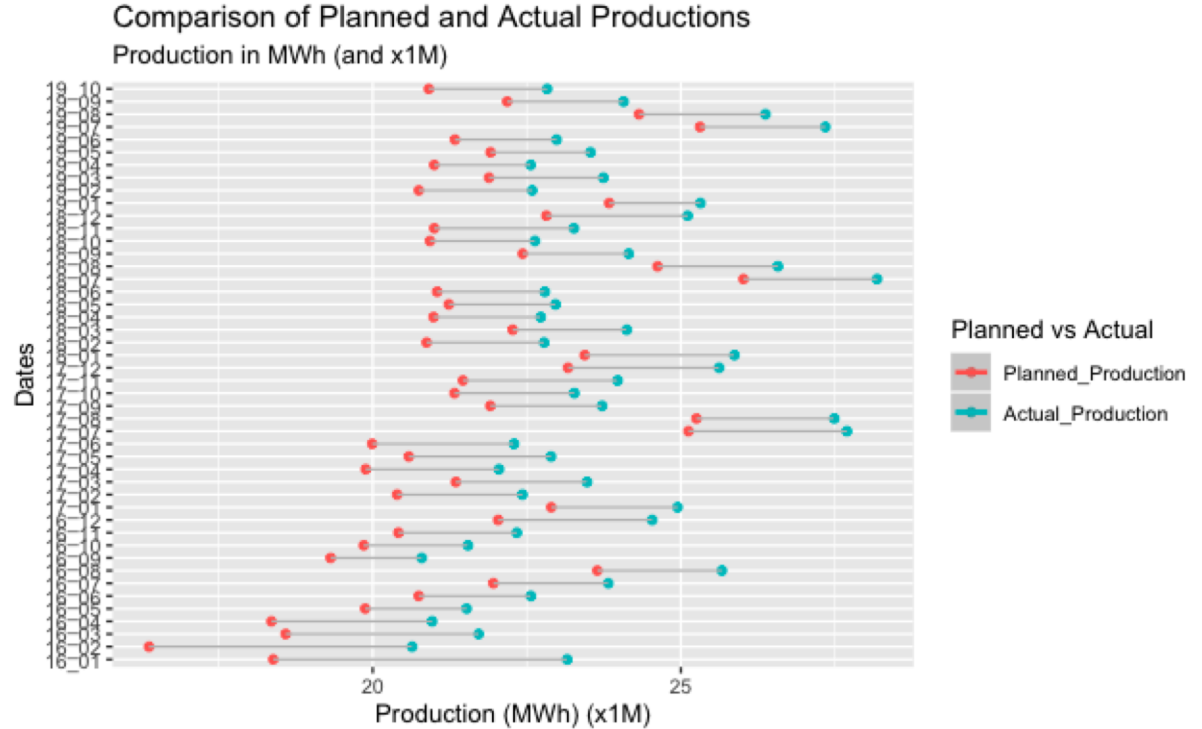
Analysis | 4 Year Consumption Analysis

Hourly consumption data was previously edited on a monthly basis, now we will first change the column headings to follow the consumption from the first month to the last month and then visualize.



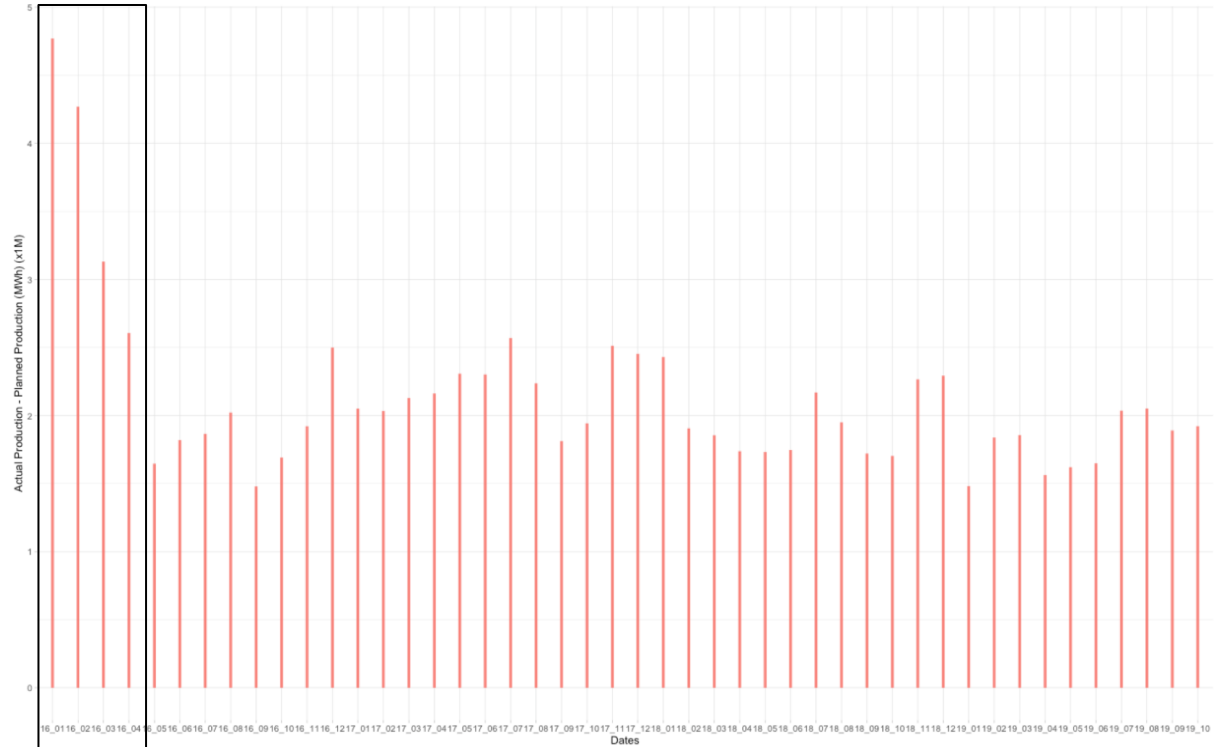
Analysis | Planned vs Actual Production (Total)

When the data obtained since 2016 are analyzed, it is seen that the actual production is above the planned production in the whole process.



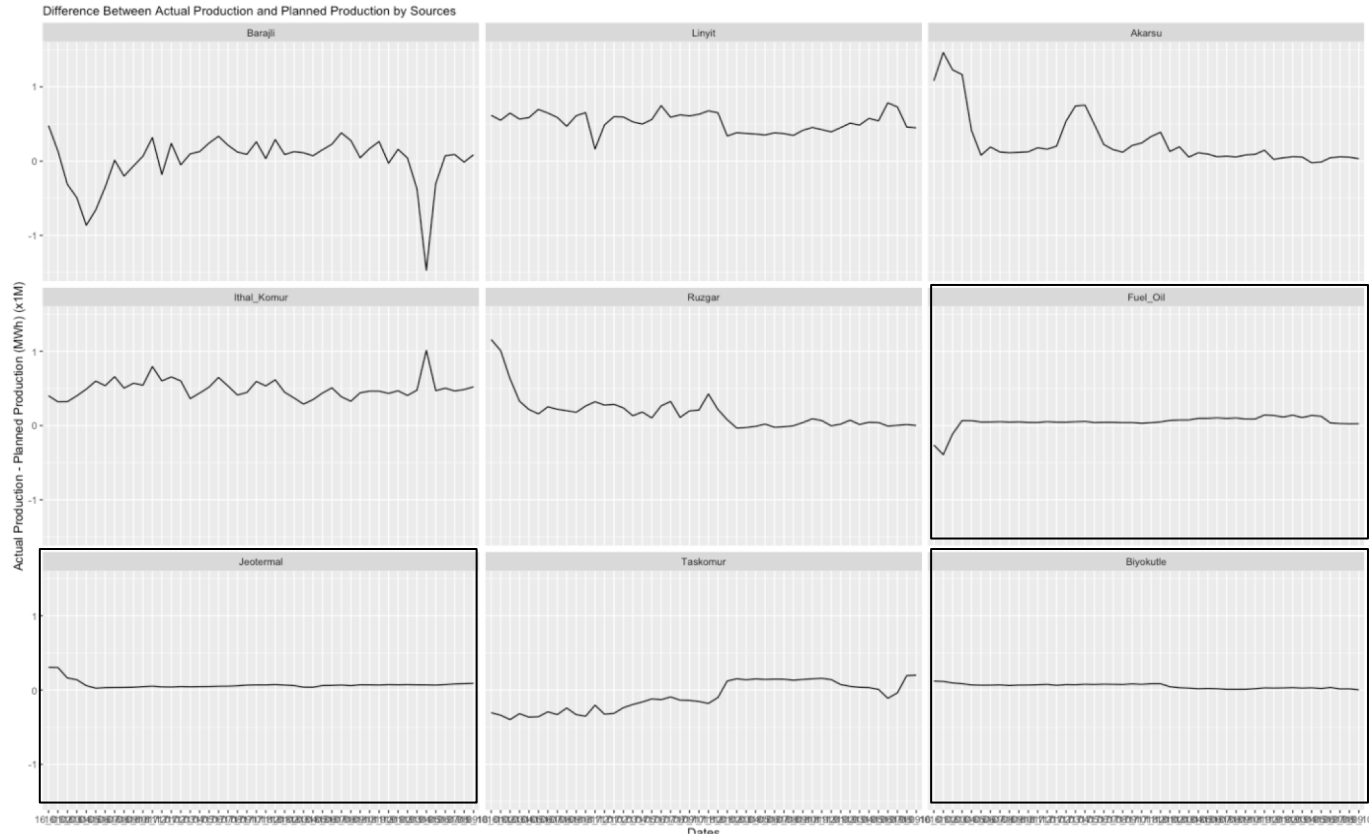
Analysis | Planned vs Actual Production (Total)

While there are significant differences between the two values in the first 4 months of 2016, it is observed that these differences have decreased in the continuation of the process.



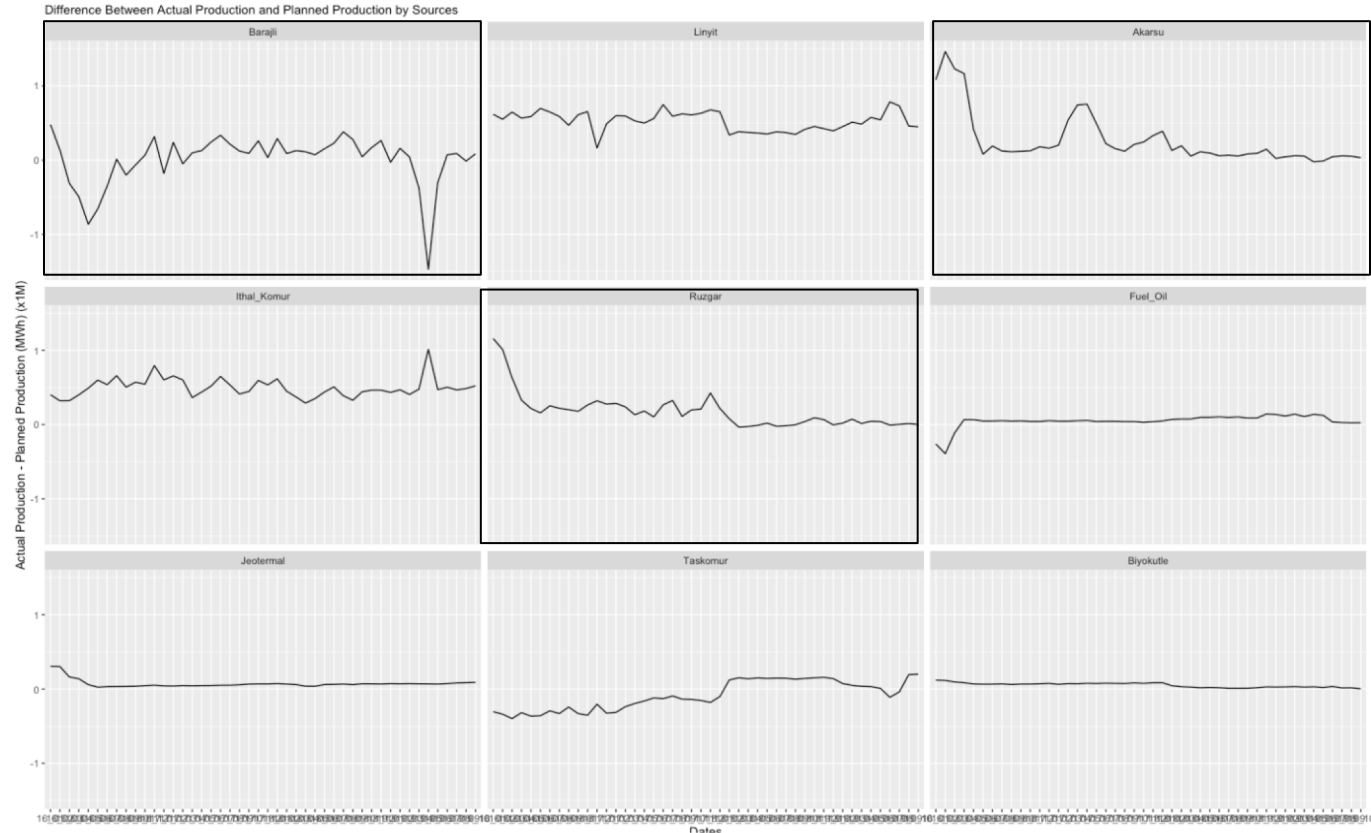
Analysis | Planned vs Actual Production (By Sources)

When the differences between actual production and planned production values are analyzed by source; It is seen that there are no significant differences between the two values in Geothermal, Biomass, Fuel Oil sources.

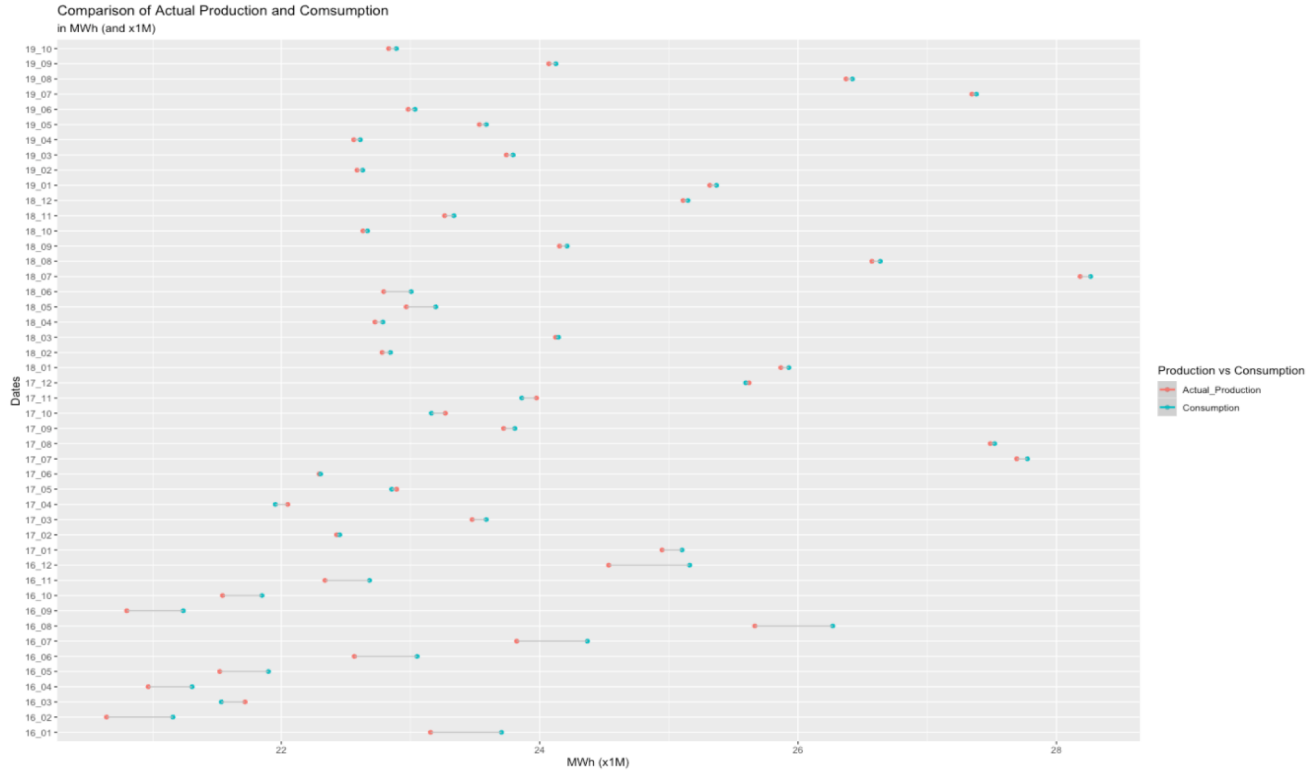


Analysis | Planned vs Actual Production (By Sources)

But there are differences between plan and production in sources such as Dams, Stream and Lignite.



Analysis | Production vs Consumption

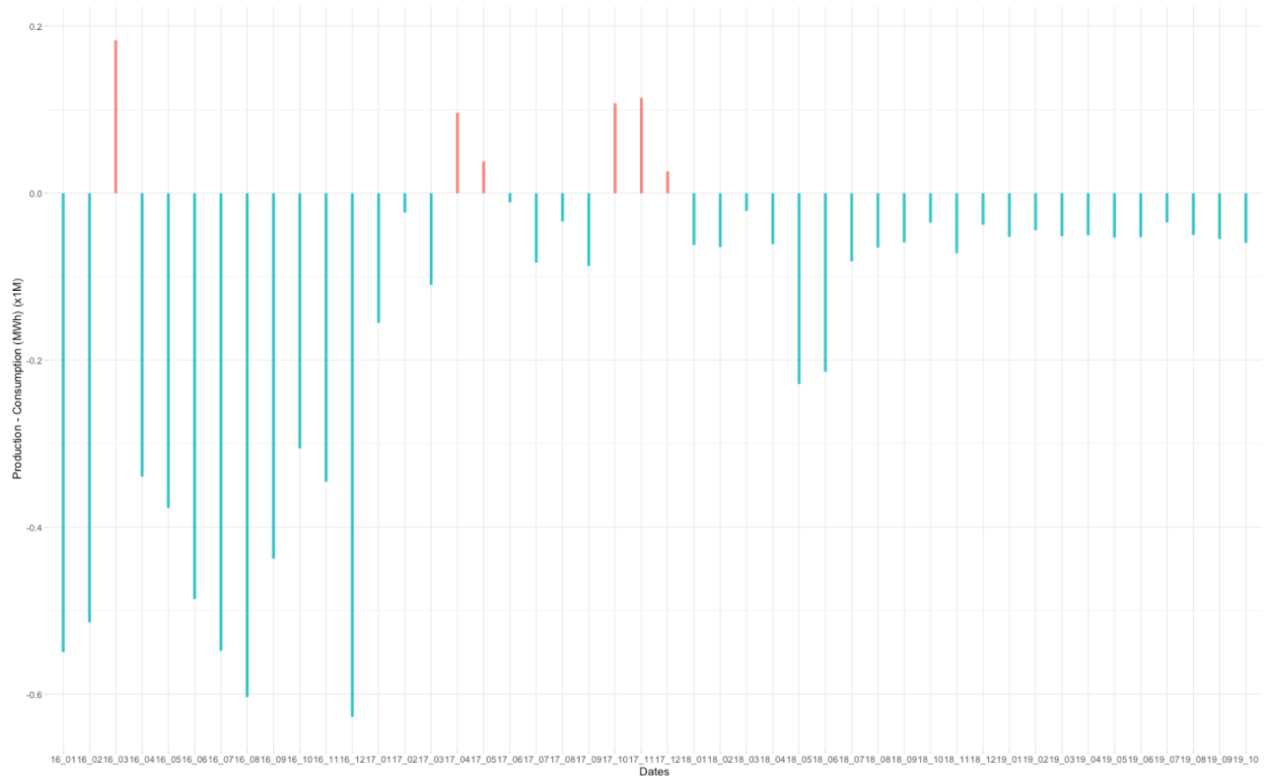


When real production and consumption values are compared, it is seen that consumption values are generally higher than production values.

Analysis | Production vs Consumption

In the 46-month period from the beginning of 2016 to October 2019, it was found that only 6 months (listed below) Production value was higher than Consumption value;

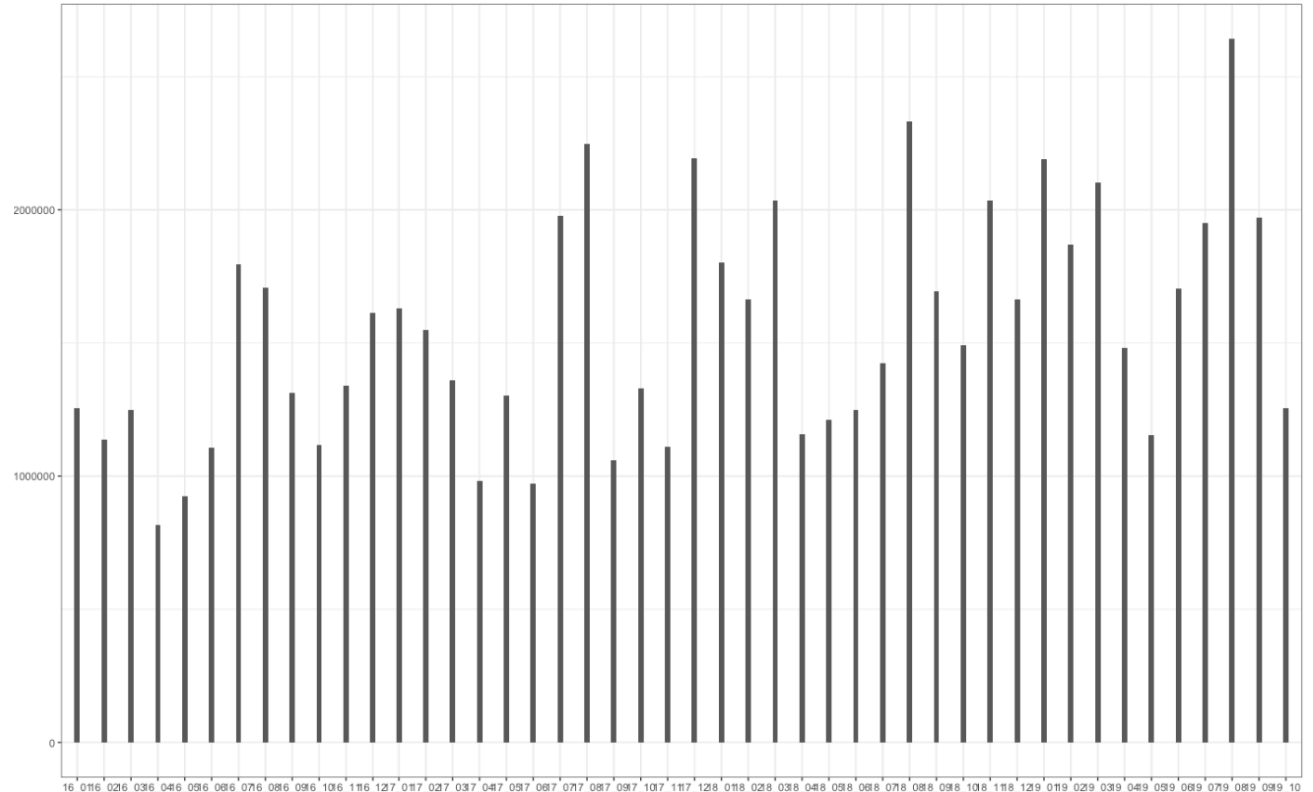
- March 2016
- April 2017
- May 2017
- October 2017
- November 2017
- December 2017



Analysis | Ratio of Renewable Energy Sources

The percentage of wind and solar energy in the total amount of energy is shown on a separate pie chart.

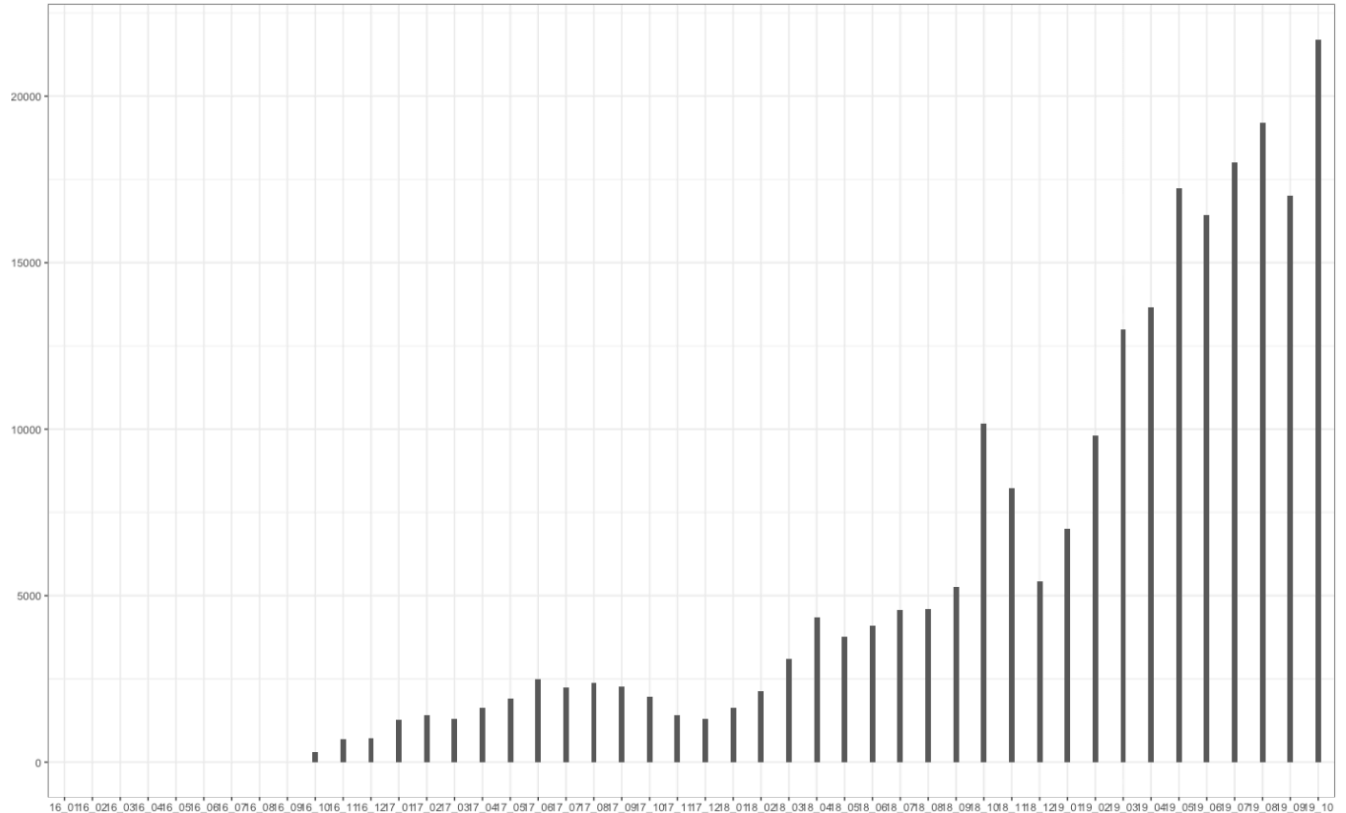
- ruzgar: 6.52%
- gunes: 0.02%



Analysis | Ratio of Renewable Energy Sources

The percentage of wind and solar energy in the total amount of energy is shown on a separate pie chart.

- ruzgar: 6.52%
- gunes: 0.02%

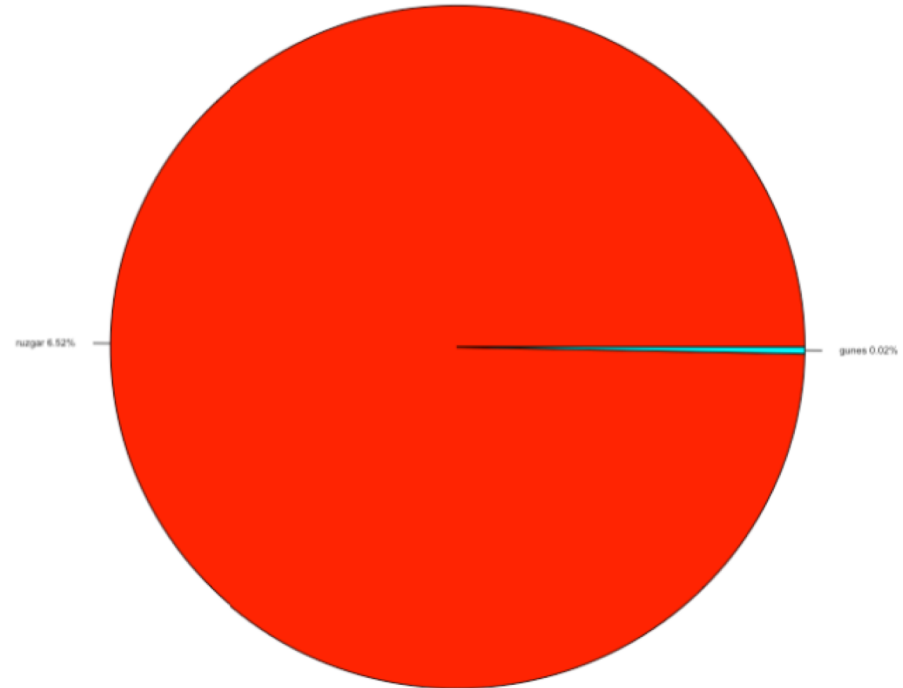


Analysis | Ratio of Renewable Energy Sources

The percentage of wind and solar energy in the total amount of energy is shown on a separate pie chart.

- ruzgar: 6.52%
- gunes: 0.02%

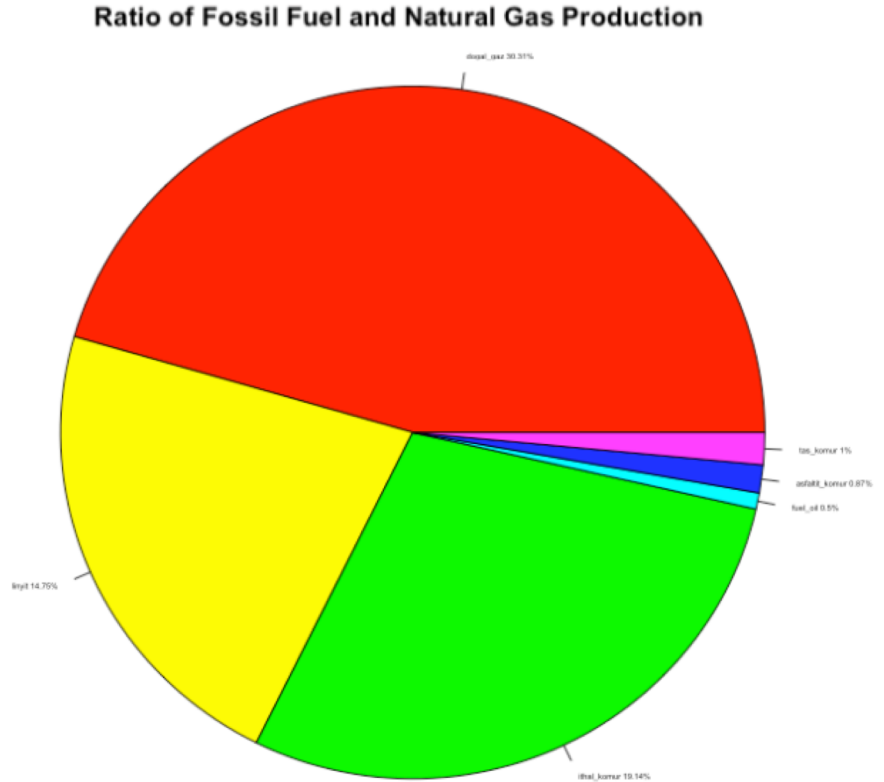
Ratio of Renewable Energy Resources Production



Analysis | Ratio of Fuel and Natural Gas Sources

The percentage of natural gas and fossil fuels in the total energy amount is shown in a separate pie chart.

- dogal_gaz: 30.31%
- ithal_komur: 19.14%
- linyit: 14.75%



Conclusion

- Comparison between energy production and consumption in Turkey to understand the external dependence of Turkey in the energy sector

Consumption, usually exceeds the value of production (42/48 months) and in this case it is seen that Turkey is dependent on foreign energy in order to close this gap.

- Comparison between 4 year of planning data and actual production data to examine unusual factors in energy demand.

Analysis show that the actual production is above the planned production in the whole process. This shows that the energy demand always exceeds the plan due to different variables.

- The development of the renewable energy sources in Turkey.

It is seen that renewable energy sources (especially solar energy) are quite low in total production and these resources have not developed sufficiently yet.