EPİAŞ

Annual Electricity Market Report 2018

The summary of 2018 on the Turkish electricity market has been brought to the public attention via this report

Average MCP was 231,64 TL/MWh by 41,34% in comparison to 2017,

Installed capacity of Turkey was 88.526 MW by 3.326 MW increase,

Annual electricity generation was 306,7 TWh by 3,8% increase and annual electricity consumption was 305,5 TWh by 3,46% increase,

The highest MCP was 375,79 TL/MWh at 16:00 on Monday, September 5,

Day Ahead Market volume was 149,39 TWh and Intraday Market volume was 2,93 TWh,

50,01% of electricity consumption of Turkey was traded in Day Ahead Market,

60,1% of annual market volume consists of bilateral contracts, 37,1% consists of Day Ahead Market, 2% consists of Balancing Power Market and 0,7% consists of Intraday Market transactions,

Regarding shares of electricity generation by energy source, generation from natural gas-LNG power stations was 31% by 6% decrease and generation from Import Coal power stations was 21% by 3% increase,

Regarding installed capacity by energy source, solar power installed capacity was 5.068 MW by 48% increase and wind power installed capacity was 7.005 MW by 7,5% increase,

The highest hourly demand was 45.996 MWh at 17:00 on Friday, August 3, the highest peak demand was 46.160 MW at 15:20 on Wednesday, August 1 and the lowest demand was 18.212 MW at 06:00 on Saturday, June 16,

According to the final list published by EMRA in 2017, the installed capacity of power stations utilizing from Feed-in Tariff Mechanism (YEKDEM) is increased from 17.400 MW to 19.266 MW by 1.866 MW change,

The total YEKDEM payment was 26,17 billion TL and YEKDEM unit cost per withdrawal volume was 55,41 TL/MWh

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You can download EPİAŞ mobile application via iOS and ANDROID platforms

1. Spot Market Operations

Within the scope of Market Operation activities, Day Ahead and Intraday Markets are operated by EPİAŞ.

In line with orders submitted by market participants to Day Ahead Market, supply and demand volumes are announced alongside the Market Clearing Prices while there are matches with continuous trading method in the Intraday Market.

Convenience is provided to non-Turkish users performing transactions at the market, by adding an English language option to the Day Ahead and Intraday Market software. Both market software user guides were prepared in Turkish and in English, and became available for users. In addition, call center services are provided to market participants in order to provide 7/24 efficient and fast assistance about operated markets.

Objections to transactions for both markets are evaluated and resulted accordingly.

Suggestions and requests by market participants are taken into consideration and evaluated in accordance with legislation as quick as possible.

Data Publishing Activities Related to the Markets

Regarding data publishing activities; statistics are being published on price formation and transactions for the purpose of ensuring independent, transparent and non-discriminated approach among the parties.

Besides, information and data are published for market participants as daily, weekly, monthly and annual reports. These reports can be accessed from the "Bulletins" section at the EPİAŞ website.

For market participants to submit their suggestions and requests regarding published reports, a survey was conducted and constants developments are being done consequently.

EPİAŞ Mobile Application

EPİAŞ Mobil Mobile application is available in Mobile iOS and Android platforms on October 31, 2018. EPİAŞ Transparency Platform data, instant electricity generation and consumption data, Market Notification System, maintanence and outages of power plants, announcement, bulletins and latest market reports are accessible by means of Mobile application. With the help of Mobile application, reports can be added to favorites so as to be quickly access, instant notifications can be received when Market Clearing Price, and new announcement and bulletins are published.

MCP Assessment and Market Analysis

Analysis are conducted to assess the changes on market clearing price on daily basis. To do this, orders submitted by market participants are taken into account in comparision to previous delivery day.

In addition to market assessment and analysis regarding Day Ahead Market, the activities of market participants in Balancing and Power Market are also analyzed.

For Intraday Market, bids and offers of market participants are also analyzed in order to examine possible effects on Balancing Power Market.

Apart from daily analysis, the reasons of price changes in the long run, effects of legislation changes and effects of optimization algorithm are also analyzed.

Detailed reports are sent to the management and regulatory bodies regarding above-mentioned topics.

Day Ahead Market

2. Day Ahead Market (DAM)

2.1. DAM Web Application Improvements

Second Phase of Day Ahead Market Web Application Project

Market clearing price has been calculated by optimization algorithm which was created as an in-house source by EPİAŞ since June 2016.

Within the scope of market coupling and market splitting, all necessary business analysis processes in order submission, order display, result notification, web service documents, other notification sections, developments in optimization algorithm have been determined to make Day Ahead Market Web Application compatible with these changes accordingly.

In-House Developed Day Ahead Market software with a user-friendly interface is designed and developed with our own resources, and developments on new order types were started under the name of second phase process in first half of 2019 as soon as updated version of Balancing and Settlement Regulation is published in official gazette.

Upon publishing Balancing and Settlement Regulation in 2019, matching price calculation methodoly of linked block orders will be changed.

Day Ahead Market Non-Exchange Traded Market Transactions

Non-exchange market transactions are big risk factors on determining market clearing price which might bring about wrong price signals in the market.

In order to prevent non-exchange traded market transactions, EPİAŞ collaborates with market participants to establish required rules in submitting day ahead market orders and bilateral contracts, detect non-exchange traded market transactions, designate sanctions for relevant breaches in market transactions and procedures for market participants to be conducted by EPİAŞ.

Determination of Order Limits

To prevent market participant from fat-finger and thereafter being liable for huge financial risks, “Limit Determination Section”, allowing participants to determine user and organization limits to avoid fat-finger was developed for Day Ahead and Intraday Market in 2016. However, limit determination more than needed and disregarding necessary updates in limits to minimize risks brought about order submission by participants above their available portfolio and big financial risks for them.

To determine reference price without any error and protect market participants from fat finger, sell and buy order limits will be determined by EPİAŞ and this improvement in the system will be put into use by the first quarter of 2019.

2.2. Annual Average Market Clearing Price (MCP)

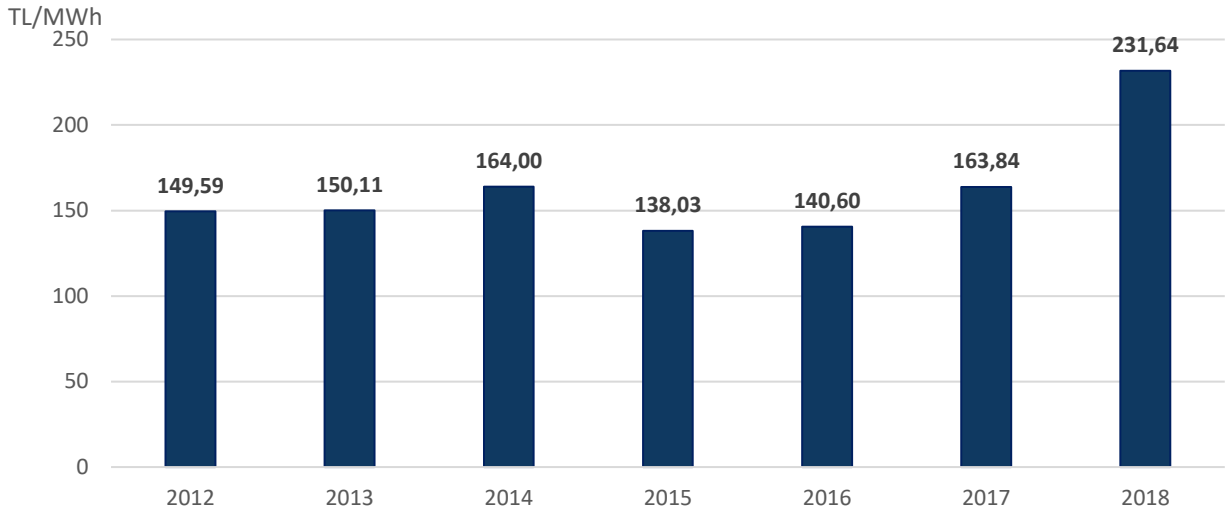
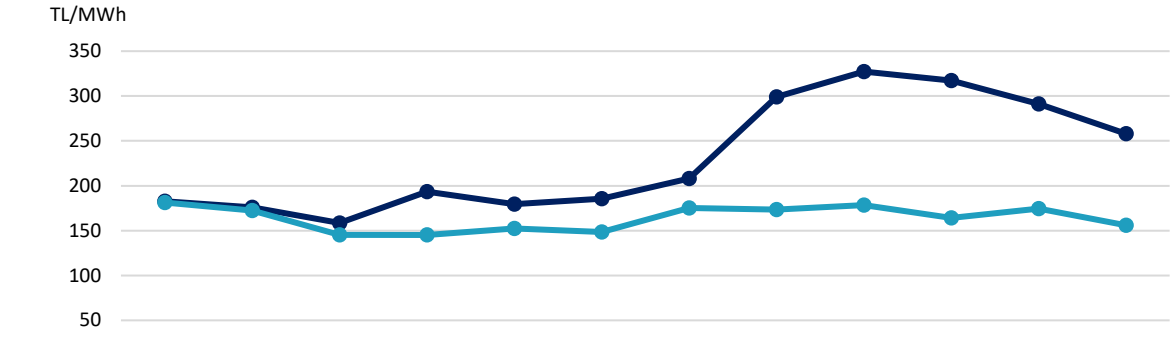


Figure 1: Annual Average Market Clearing Price

Average market clearing price was 231,64 TL/MWh in 2018 by 41,34% increase in comparison to 2017.

2.3. Monthly Average Market Clearing Price, 2017-2018



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018	182,86	175,77	158,56	193,57	179,44	185,62	208,13	298,91	327,27	317,28	291,22	257,89
2017	181,32	172,55	145,29	145,13	152,36	148,54	175,06	173,33	178,51	164,13	174,65	155,82

Figure 2: Monthly Average Market Clearing Price, 2017 - 2018

As average MCPs are analyzed on a monthly basis for 2018, it is observed that the lowest price was 158,56 TL/MWh in March and the highest price was 327,27 TL/MWh in September. In first seven months of 2018 MCP was 23,28 TL/MWh higher than previous year and from the August to the end of year MCP was 129,23 TL/MWh higher than previous year because of fluctuation in currency and price increases natural gas prices for natural gas fired power plants to generate electricity. For monthly comparison of these consecutive years, the highest increase took place as October 2018 monthly average reached to 317,28 TL/MWh with an increase of 153,15 TL/MWh compared to same month in 2017.

2.4. Daily Average Market Clearing Price

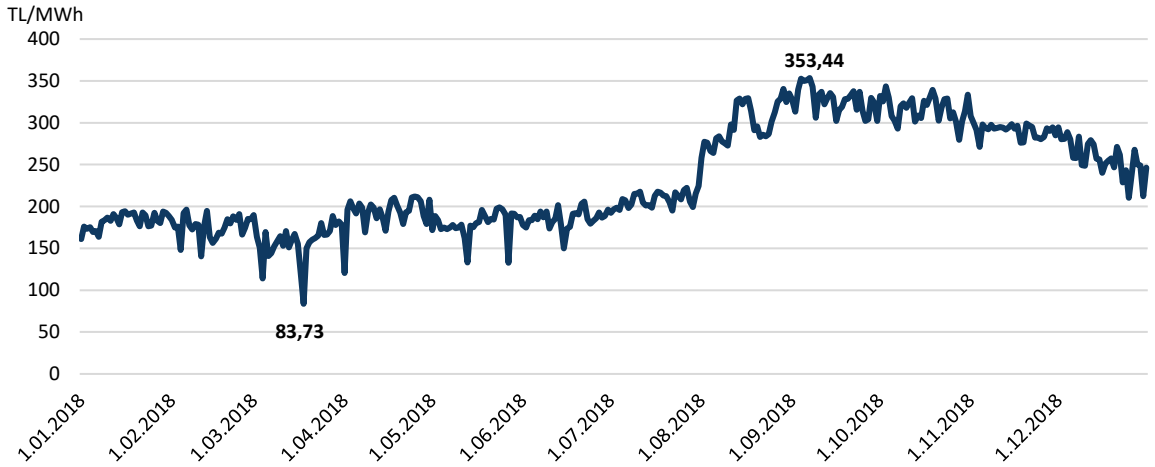


Figure 3: Daily Average Market Clearing Price in 2018

While average MCP was less than 200 TL/MWh between January-July, it was higher than 300 TL/MWh next three months after July, 2018. In the last days of 2018, average MCP was less than 250 TL/MWh. In 2018, daily average MCP was less than 100 TL / MWh for the once, between 100-150 TL / MWh for nine times, between 150-200TL / MWh for one hundred sixty five times, between 200-250 TL/MWh for fourty eight times, between 250-300 TL/MWh for sixty nine times, and over 300 TL / MWh for seventy three and above.

On Sunday, March 18, daily average MCP was 83,73 TL / MWh, which was the lowest value of the year due to the low demand especially at night hours. On Friday, September 7 daily average MCP was 353,44 TL/MWh, which was the highest value of the year due to the price inreases in natural gas for natural gas fired power plants to generate electricity and currency fluctuations.

2.5. Hourly Market Clearing Price

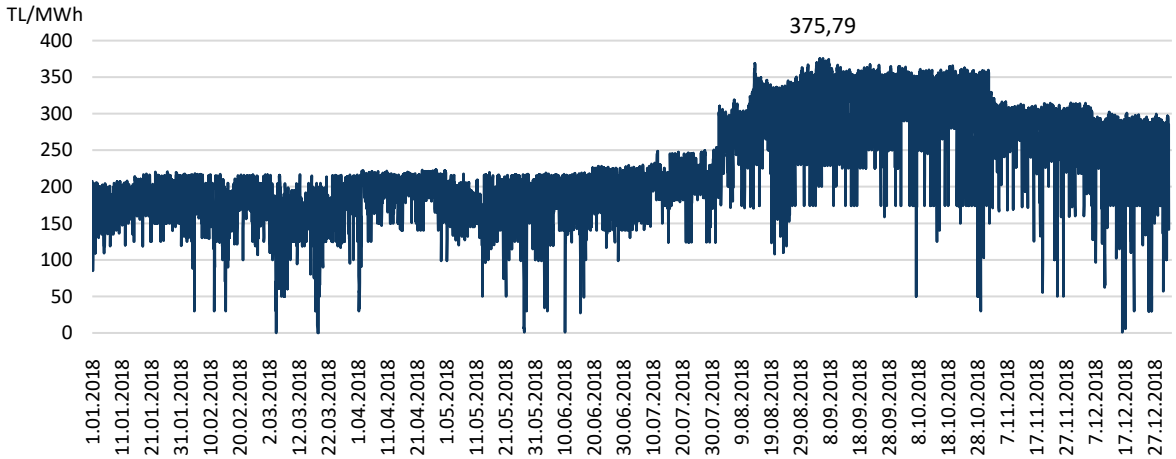


Figure 4: Hourly Market Clearing Price in 2018

Hourly MCP in 2018 is realized,

- Between 0-5 TL/MWh for 18 hours,
- Between 5-100 TL/MWh for 130 hours,
- Between 100-150 TL/MWh for 652 hours,
- Between 150-200 TL/MWh for 2.764 hours,
- Between 200-250 TL/MWh for 2.000 hours,
- Between 250-300 TL/MWh for 1.090 hours,
- Between 300-350 TL/MWh for 1.330 hours,
- Between 350-2000 TL/MWh for 776 hours.

The highest MCP was 375,79 TL/MWh at 16:00 on Monday, September 5, whereas the lowest MCP was 0,00 TL/MWh for the hours of 12:00-15.00 on Sunday, March 18.

2.6. Average Market Clearing Price on Hourly Basis

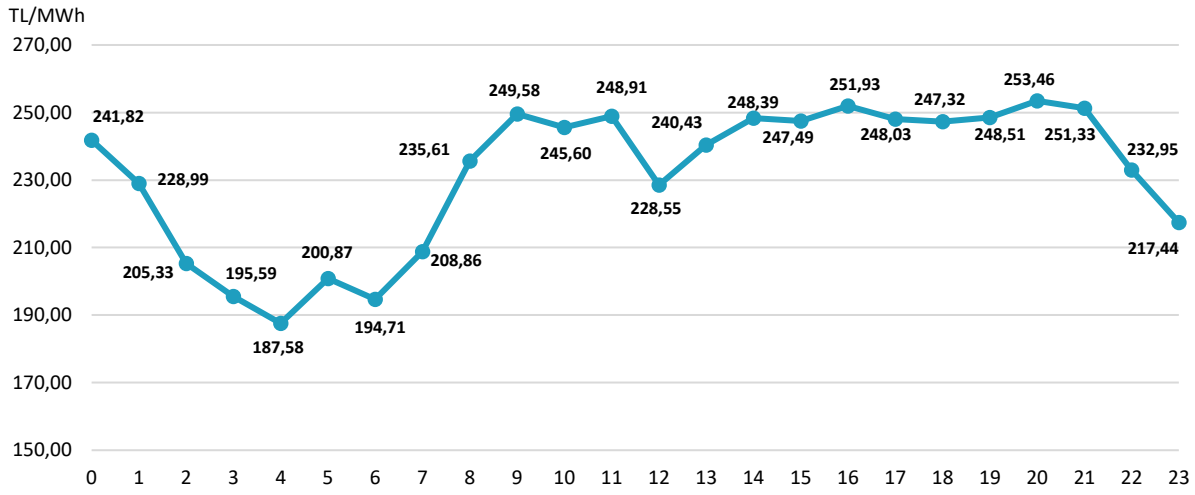


Figure 5: Average Market Clearing Prices on Hourly Basis in 2018

As average MCPs are examined on hourly basis, the lowest MCP was 187,58 TL/MWh at 04:00 and the highest MCP was 253,46 TL/MWh at 20:00 throughout the year.

Hourly average MCP was above the annual average MCP between the hours of 08:00-22:00, between hours of 00:00-07:00 and 23:00 average MCP was below the annual average MCP.

2.7. Yearly Cleared Volumes, 2012-2018

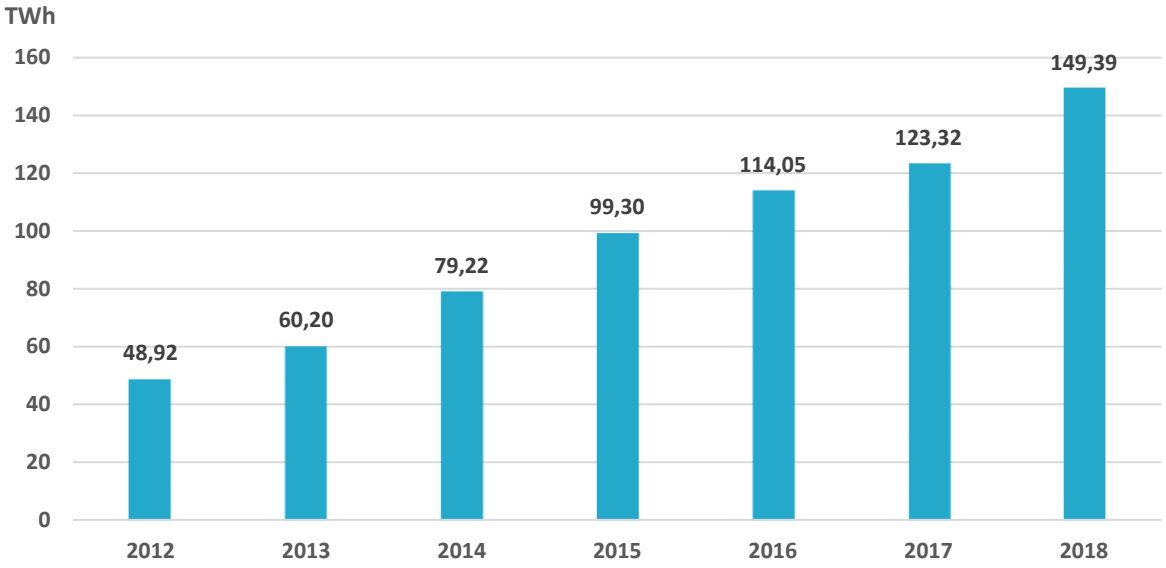
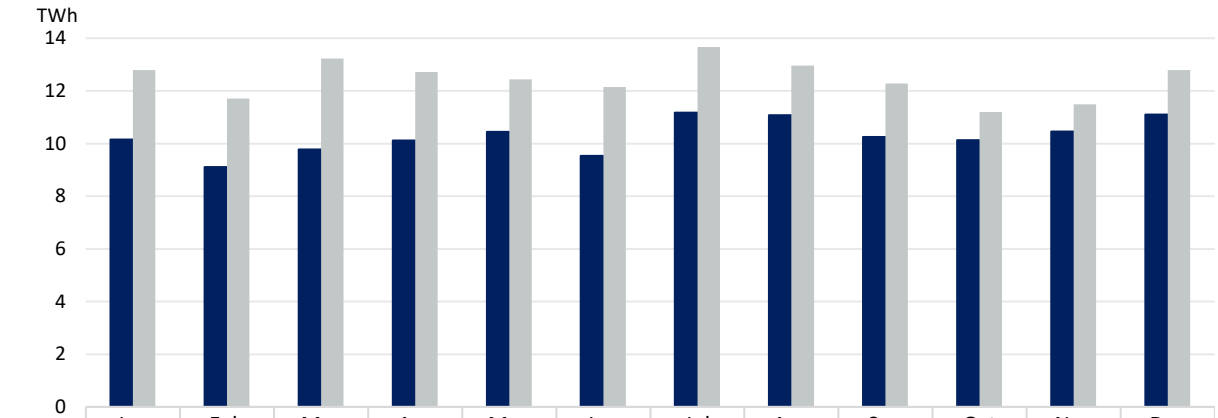


Figure 6: Day Ahead Market Yearly Cleared Volumes

Cleared volume of Day Ahead Market is increasing every year. Annual market clearing volume was 149,39 TWh by 21,14% increase in comparison to previous year.

2.8. Monthly Cleared Volume, 2017-2018



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	10,16	9,11	9,78	10,11	10,45	9,53	11,17	11,08	10,25	10,13	10,46	11,10
2018	12,79	11,71	13,23	12,71	12,43	12,14	13,66	12,96	12,28	11,20	11,49	12,79

Figure 7: Cleared volume on a monthly basis, 2017-2018

When monthly distribution of the total number of cleared columns in Day Ahead Market is examined, the highest cleared volume was 13,66 TWh in July, the lowest cleared volume was 11,20 TWh in October. In all months of 2018, monthly cleared volume increased compared to previous year.

2.9. Daily Cleared Volume

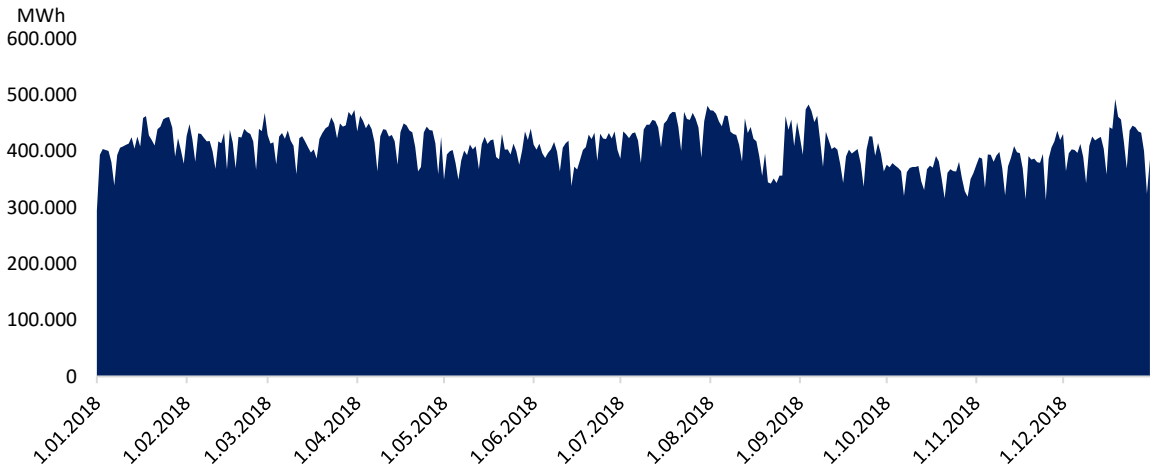


Figure 8: Cleared Volume on daily basis in 2018

While daily average cleared volume was 409.301 MWh in Day Ahead Market, the highest daily cleared volume was 492.972 MWh on Wednesday, December 19 and the lowest daily cleared volume was 294.225 MWh on Monday, January 1.

Daily cleared volume in 2018;

- Between 0-300.000 MWh for 1 day (8%),
- Between 300.000-350.000 MWh for 21 days (55%),
- Between 350.000-400.000 MWh for 111 days (37%),
- Between 400.000-450.000 MWh for 189 days (37%),
- Between 450.000-500.000 MWh for 43 days (37%).

2.10. Hourly Cleared Price

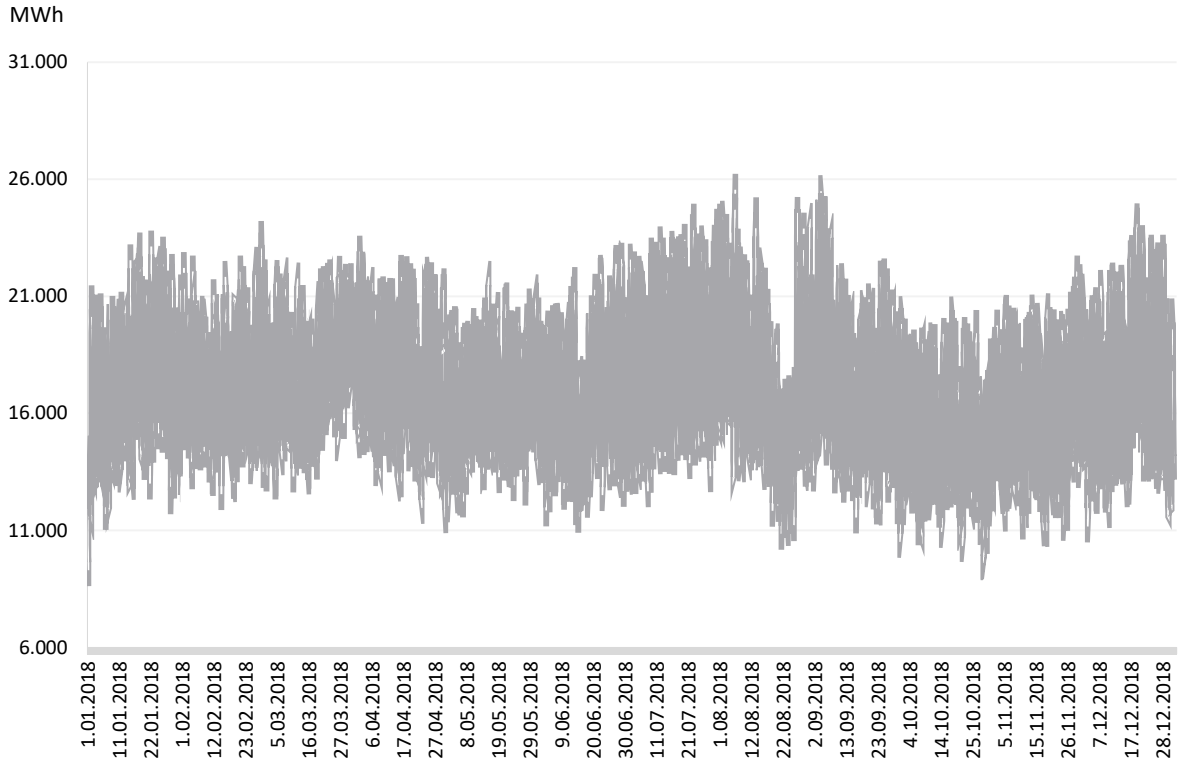


Figure 9: Hourly Cleared Volume in 2018

In Day Ahead Market, the hourly average cleared volume was 17.054 MWh, and thus when the hourly cleared volume are examined specifically it can be seen below that;

- Between 0-10.000 MWh for 5 hours (0,1%),
- 10.000-12.000 MWh for 113 hours (1,3%),
- 12.000-15.000 MWh for 2.195 hours (25,1%),
- 15.000-20.000 MWh for 5.052 hours (57,7%),
- 20.000 MWh and over for 1.395 hours (15,9%),

The lowest cleared volume in 2018 was 9.640 MWh at 05:00 on Monday 1, and the highest cleared volume was 25.214 MWh at 14:00 on Monday, August 6.

2.11. Cleared Hourly – Block Order Statistics

68% of the cleared volume in the sales side in 2018 were hourly orders and 32% were block orders. 95% of the cleared volume in the purchase side in 2018 were hourly orders and 5% were block orders.

The highest cleared block order volume in purchase side was 47% in March and the highest cleared block order volume in sales side was 66% in July. The highest cleared block volume was 48% in January.

When the cleared block order volume is examined on daily basis, it is observed that in sales side highest cleared block order volume accounted for 88,29% of total cleared volume on July 27 and the lowest cleared block order volume was 9,88% on May 13, whereas in purchase side the highest cleared block order volume was 99,85% on December 23 and the lowest cleared block order volume was 0,71% on January 16, 2018.

2.11.1. Shares of Cleared Hourly-Block Orders in Sales Side

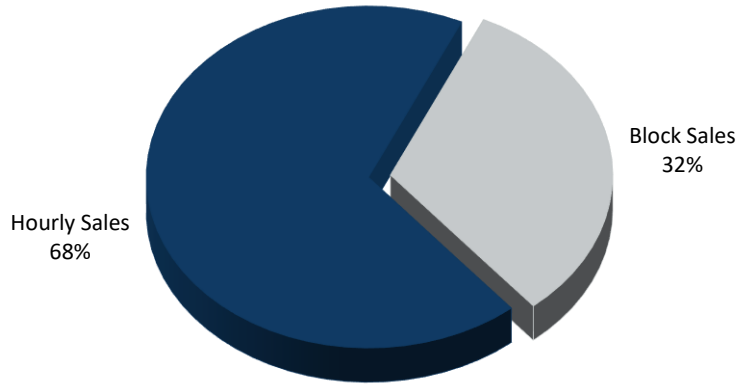


Figure 10: Shares of Hourly-Block Orders in Sales Side in 2018

2.11.2. Shares of Cleared Hourly-Block Orders in Purchase Side

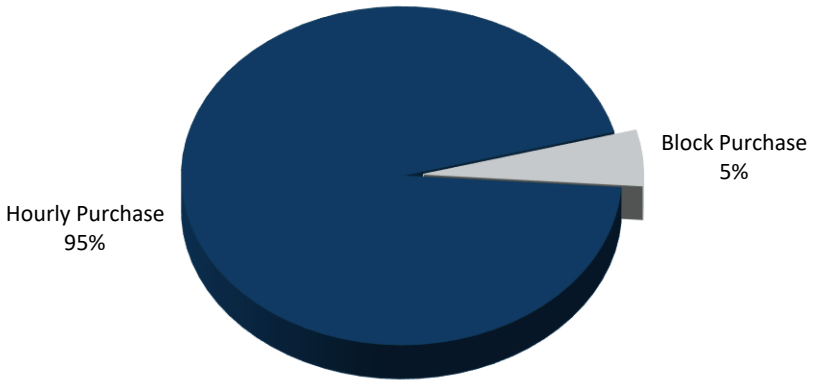


Figure 11: Shares of Hourly-Block Orders in Purchase Side in 2018

2.11.3. Cleared Hourly-Block Orders Sales Volume on Monthly Basis

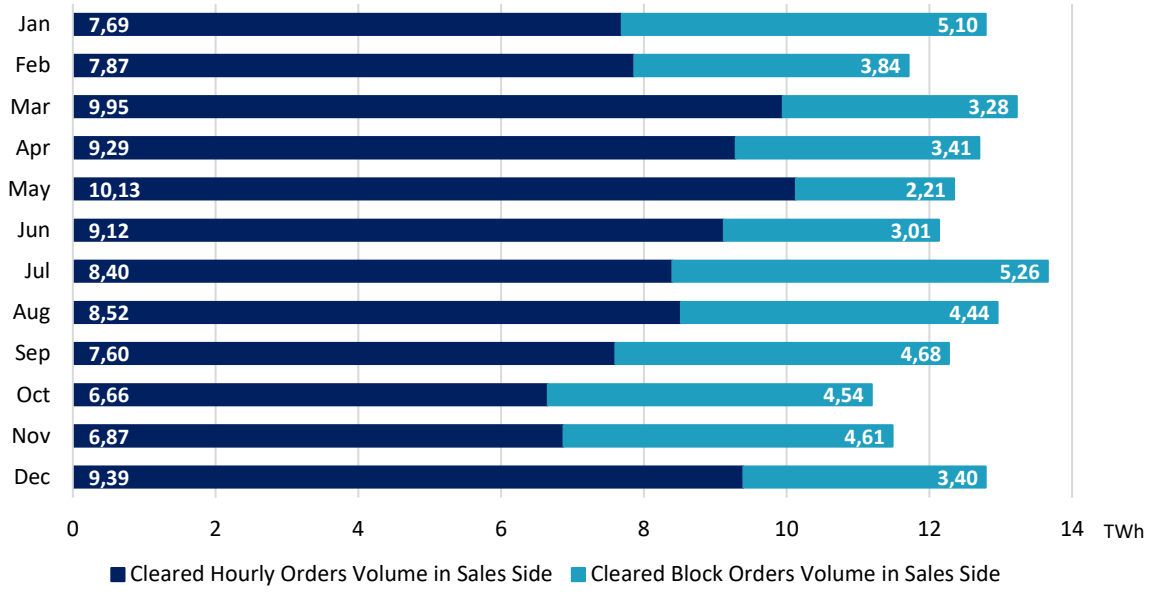


Figure 12: Cleared Hourly-Block Order Sales Volume in 2018

2.11.4. Cleared Hourly-Block Orders Purchase Volume on Monthly Basis

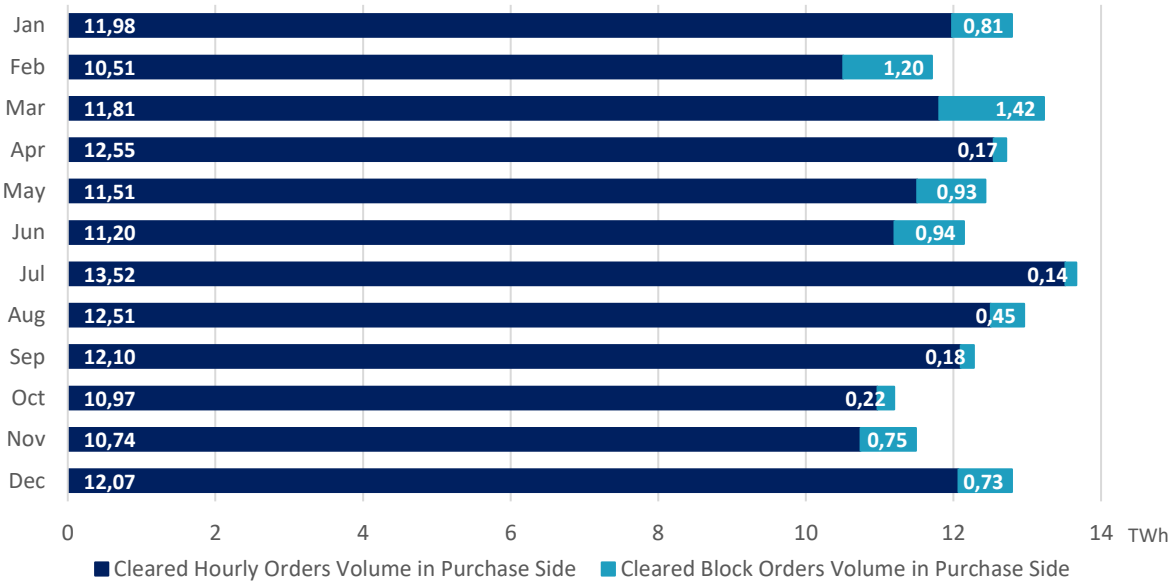


Figure 13: Hourly-Block Order Purchase Volume in 2018

2.11.5. Submitted-Cleared Block Orders Sales Volume on Monthly Basis

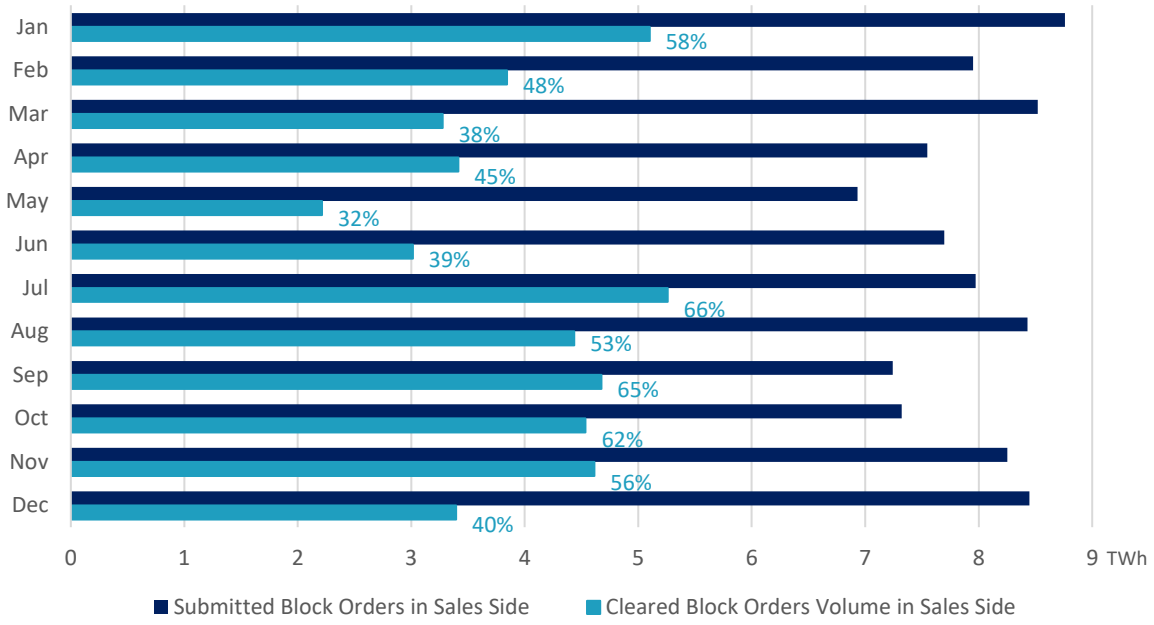


Figure 14: Submitted-Cleared Block Orders Sales Volume in 2018

2.11.6. Submitted-Cleared Block Orders Purchase Volume on Monthly Basis

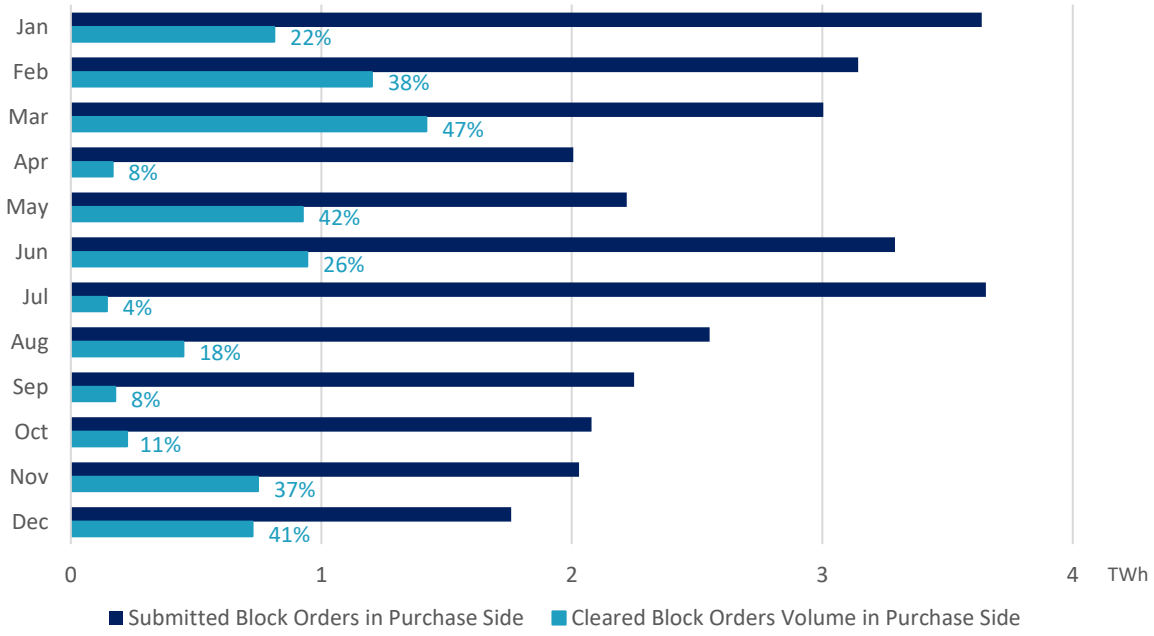


Figure 15: Submitted-Cleared Block Orders Purchase Volume in 2018

2.12. Price Independent Sales-Purchase and Cleared Volume on Monthly Basis

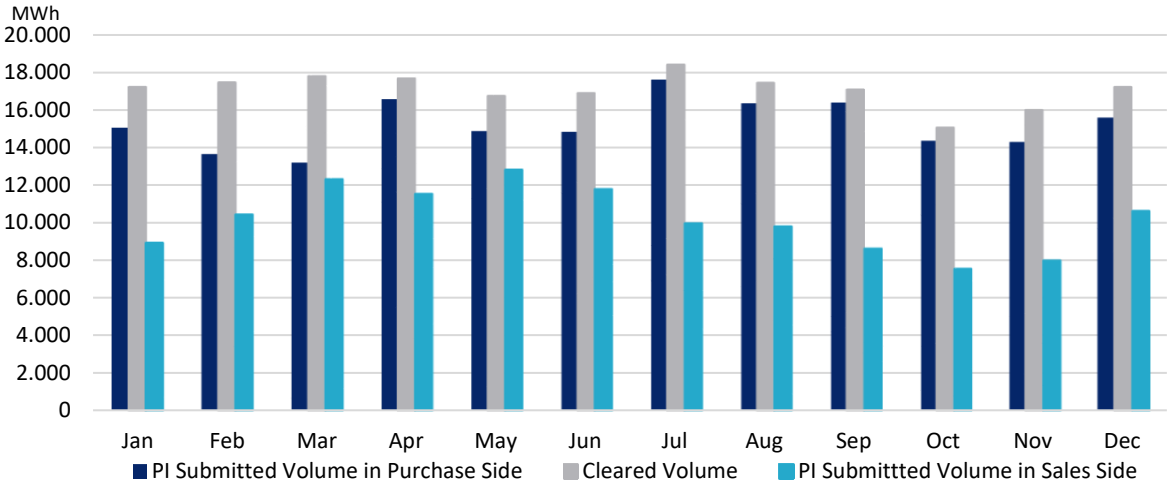


Figure 16: Price Independent Orders & Average Cleared Volume on Monthly Basis in 2018

Average hourly price independent purchase volume was 15.221 MWh, average hourly price independent sales volume was 10.116 MWh, and average hourly cleared volume was 17.055 MWh in 2018. The average hourly price independent purchase volume accounted for 89% of the total cleared volume and the price independent sale volume accounted for 60% of total the cleared volume.

In July, the price independent purchase volume reached year's maximum value of 17.594 MWh (96% of the cleared volume), in May price independent sale volume reached its maximum value with 12.780 MWh (76% of the cleared volume).

The highest value of hourly average cleared volume took place in July with 18.363 MWh. In July average hourly cleared volume was 1.308 MWh (8%), which was more than yearly average. In this month, 96% of the total cleared volume consisted of the independent purchase volume and 54% of the total cleared volume was independent sales volume.

2.13. Day Ahead Market Annual Transaction Volume

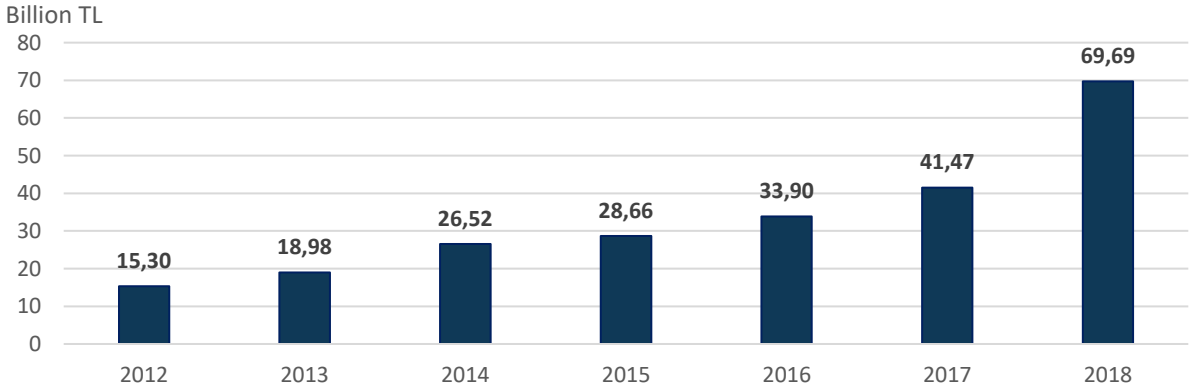


Figure 17: Day Ahead Market Annual Transaction Market Volume

Annual transaction volume was 69,69 billion TL with an increase of 83,22% in comparison to previous year in Day Ahead Market in 2018.

2.14. Average Number of Submitted Orders

Yearly average number of submitted orders and uplift payment amount made, since deployment of in-house developed DAM Web Application and are given below;

Years	Average Number of Hourly Orders	Average Number of Block Orders in Sales Side	Average Number of Block Orders in Purchase	Average Number of Flexible Orders	Average Number of Cleared Orders with Uplift Payment Made	Average Uplift Payment Amount (TL)
2016*	15.028,5	128,0	20,1	2,7	4,2	34.012,6
2017	15.590,0	113,0	27,0	2,5	4,1	35.261,1
2018	16.358,0	124,0	32,0	23,0	7,0	1.431,57

*Encompassing the period of June 1 – December 31 2016.

Table 1: Average Number of Submitted Orders

2.15. Number of Submitted Orders Basis to Order Type

Year	Hourly Order	Block Sales Order	Block Purchase Order	Flexible Order
2012	7.323	87	46	0,3
2013	8.800	107	42	0,3
2014	10.064	99	38	0,8
2015	9.815	117	15	0,5
2016	12.458	130	17	1,6
2017	15.590	113	27	2,5
2018	16.358	124	32	23

Table 2: Yearly Average Number of Submitted Orders

2.16. Number of Day Ahead Market Participant Active in Trade

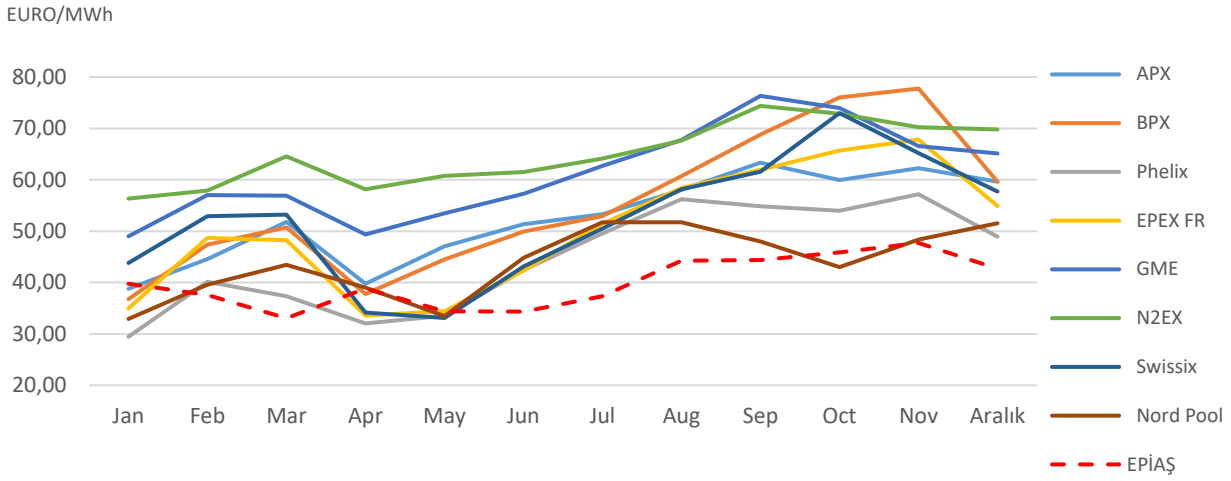
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
735	733	745	759	768	763	751	744	728	728	735	750

Table 3: Number of Day Ahead Market Participant Active in Trade

The average number of participants placed orders at the Day Ahead Market were 747 in 2018.

2.17. European Energy Exchanges and EXIST DAM Prices

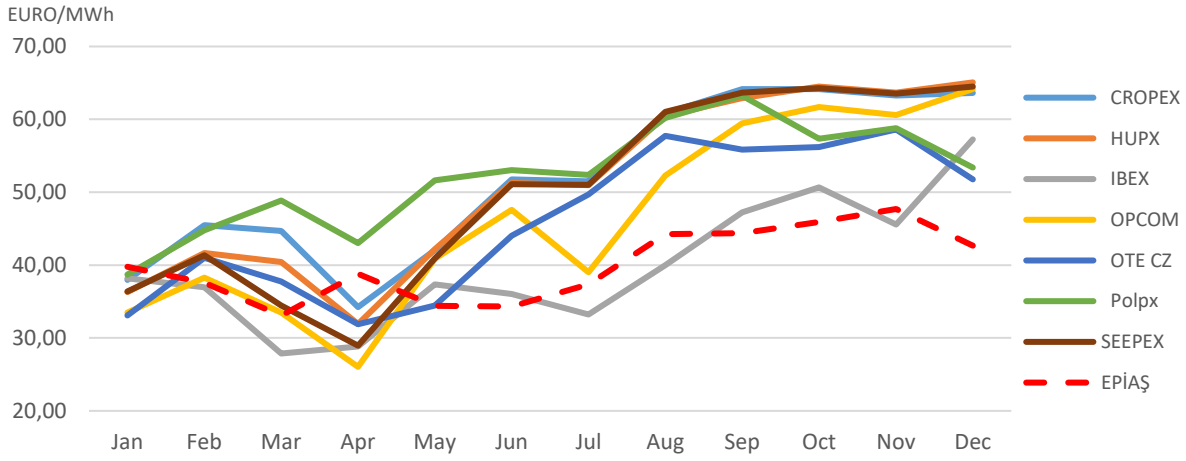
2.17.1. Central and Western Europe and EXIST Day Ahead Market Prices



*Source: Montel-Foreks * Exchange rate data: Central Bank of the Republic of Turkey.

Figure 18: Central and Western Europe and EXIST Day Ahead Market Prices

2.17.2. Eastern Europe and EXIST Day Ahead Market Prices

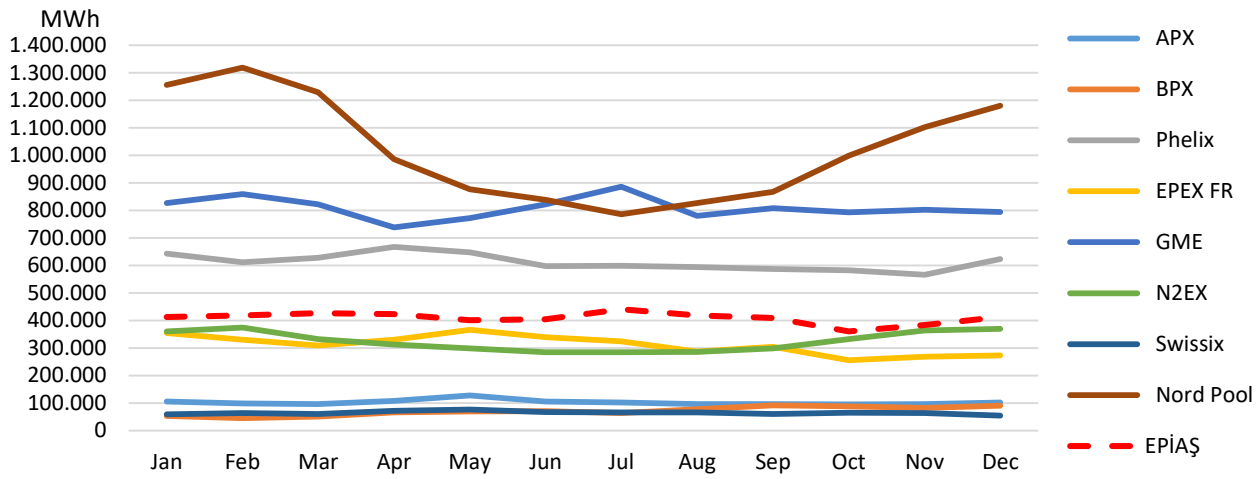


*Source: Montel-Foreks * Exchange rate data: Central Bank of the Republic of Turkey.

Figure 19: Eastern Europe and EXIST Day Ahead Market Prices

2.18. European Energy Exchanges and EXIST DAM Clearing Volumes

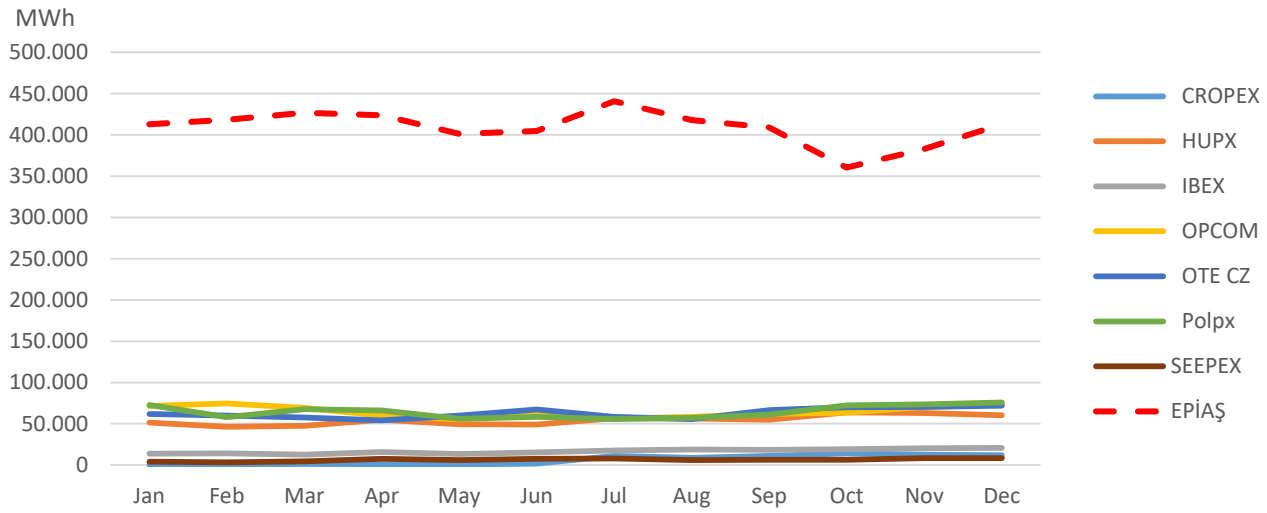
2.18.1. Central and Western Europe and EXIST Day Ahead Market Clearing Volumes



*Source: Montel-Foreks

Figure 20: Central and Western Europe and EXIST Day Ahead Market Clearing Volumes

2.18.2. Eastern Europe and EXIST Day Ahead Market Clearing Volumes



*Source: Montel-Foreks

Figure 21: Eastern Europe and EXIST Day Ahead Market Clearing Volumes

Intraday Market

3. Intraday Market

3.1. Updates in Intraday Market in 2018

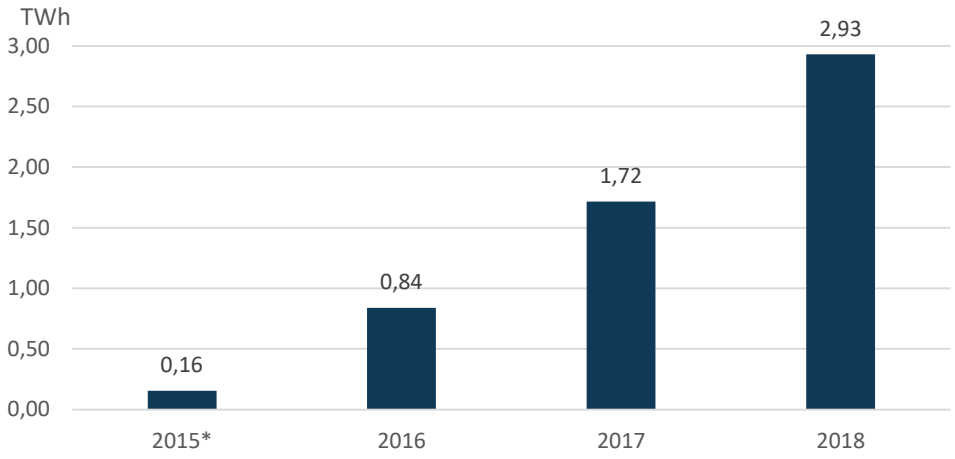
It was aimed to improve Intraday Market Web Application in 2018 in accordance with feedbacks received from participants for more efficient utilization of Intraday Market.

Intraday Market helps market participants to minimize imbalances and contributes to system balance by leaving a more balanced system to system operator.

Intraday Market Web Application, deployed on July 1, 2015 and funded by in-house sources, updates in 2017 are listed below. Updates in Intraday Market will continue in 2019 as well.

- As of February 1, 2018 correctly submission of Daily Generation Program became more important as wrong submission is punished. Those power stations generating electricity in renewable energy sources in particular became more sensitive to better forecast their generation and submit their generation program more correctly as their Intraday Market activities enable them to trade more closely to real time.
- After many requests by market participants to reduce transaction time slot and as a result of joint work with system operator contract closure time in Intraday Market before physical delivery is reduced by 30 minutes from 90 minutes to 60 minutes. Updates in Daily Generation Program resulting from Intraday Market trading activities must be completed in 30 minutes after contract closure time.
- To minimize order submission errors of users, some filtering features were added to Intraday Market web application as “Price deviation with respect to MCP” in admin section of Intraday Market Web Application. Moreover, for participants to be able to analyze their past trading activities more easily, “Explanation” section in order submission was also added to Web Application.

3.2. Annual Traded Volume of Intraday Market

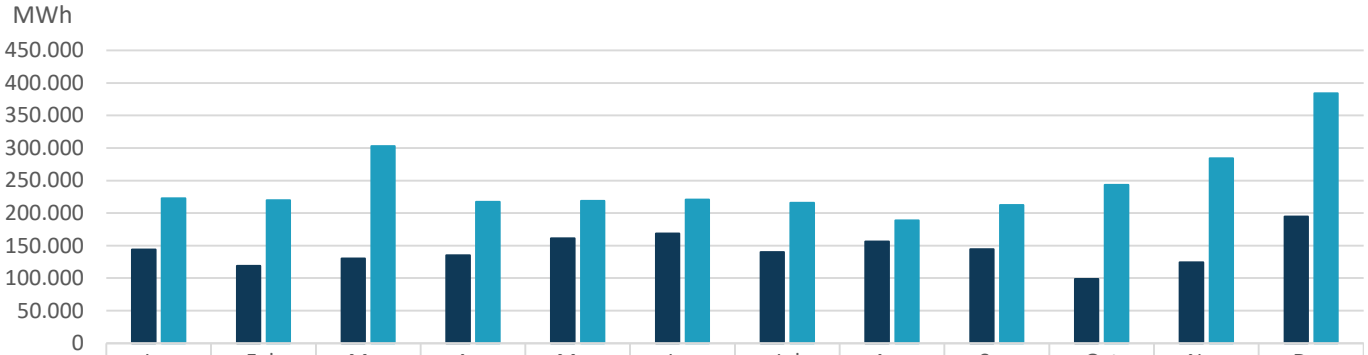


*Encompassing the period of July 1 – December 31, 2015.

Figure 22: Annual Traded Volume of Intraday Market (TWh)

Traded volume of Intraday Market increased by 71% in 2018 in comparison to 2017.

3.3. Monthly Traded Volume of Intraday Market, 2017 - 2018



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	143.985	118.915	130.381	134.927	161.349	168.403	139.932	156.482	144.239	98.920	124.068	194.867
2018	222.881	219.873	303.030	217.205	219.006	220.502	215.599	188.565	212.577	243.496	284.080	384.275

Figure 23: Intraday Market Monthly Traded Volume, 2017 - 2018

Total traded volume of Intraday Market was 2,93 TWh in 2018. The maximum traded volume was 384.275 MWh in December.

The maximum daily traded volume was 58.901 MWh on February 15, 2018, and maximum hourly traded volume was 3.869 MWh at 20:00 on Thursday, February 15.

3.4. Average Hourly Traded Volume of Intraday Market in Total

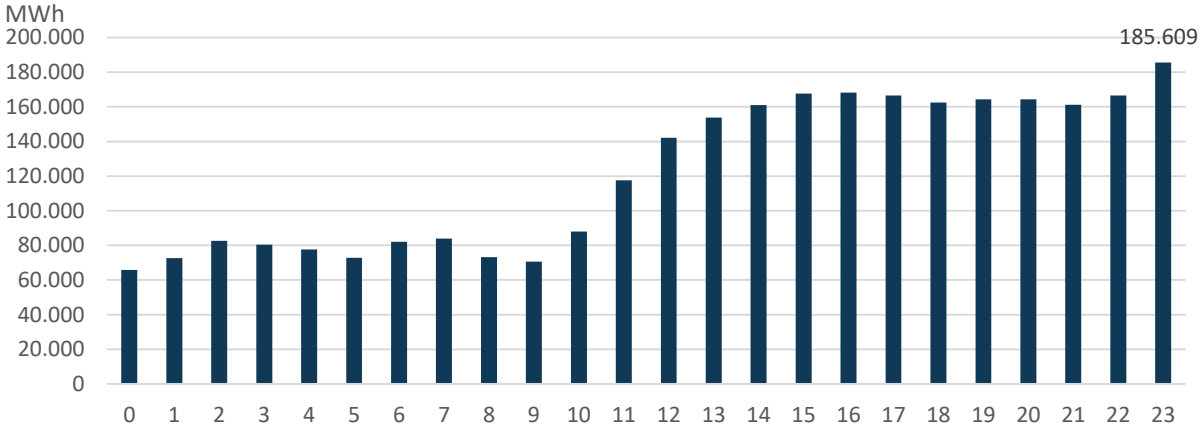


Figure 24: Total Average Intraday Market Traded Volume on hourly basis in 2018

The maximum average traded volume on hourly basis was 185.609 MWh at 23:00 of each trading day in 2018 and minimum average traded volume on hourly basis was 65.878 MWh at 00:00 of each trading day in 2018.

3.5. Number of Intraday Market Participants Active in Trade

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
283	311	339	325	355	355	329	340	330	378	368	408

Table 4: Number of Intraday Market Participants Active in Trade in 2018

343 participants in average were active in Intraday Market trade in 2018.

3.6. Intraday Market Total Purchase Volume per Participant

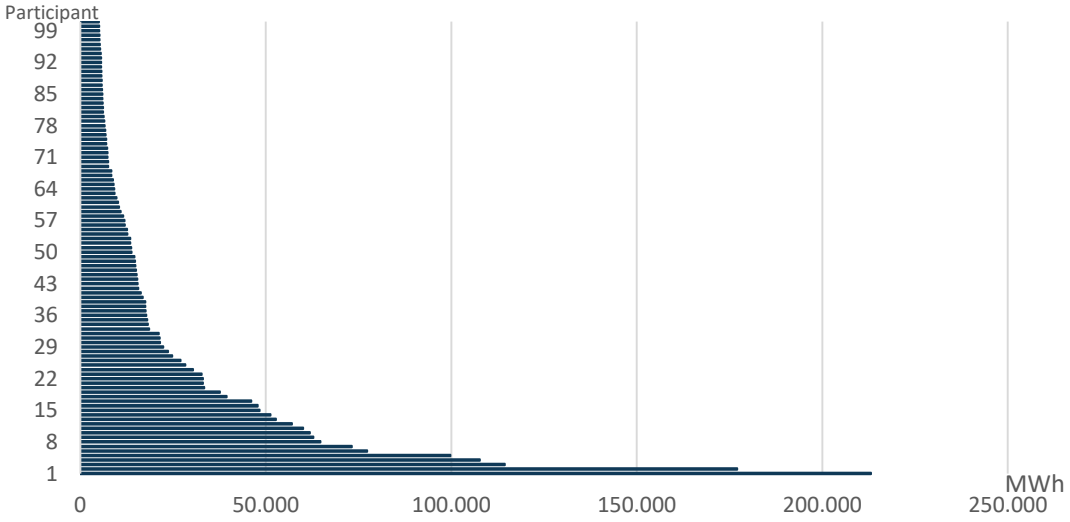


Figure 25: Intraday Market Total Purchase Volume per Participant in 2018

There were 101 market participants whose transactions in purchase side were minimum 5.000 MWh and thus maximum purchase volume was 213.175 MWh by a single participant.

3.7. Intraday Market Total Sales Volume per Participant

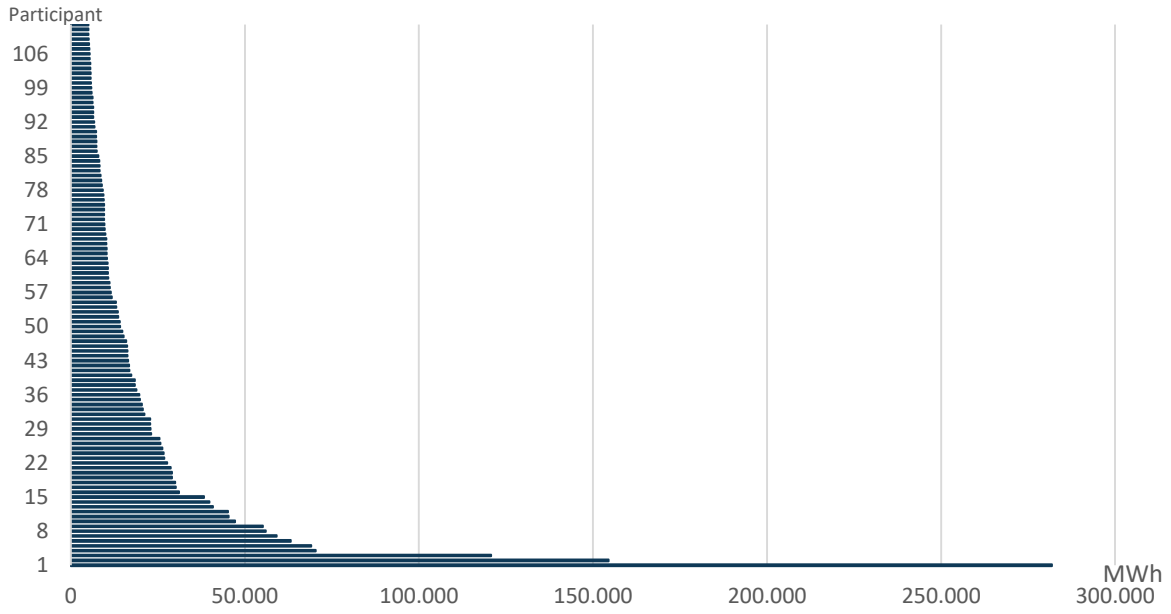


Figure 26: Intraday Market Total Sales Volume per Participant in 2018

There were 112 market participants whose transactions in sales side were minimum 5.000 MWh and thus maximum sales volume was 281.892 MWh by a single participant.

3.8. Monthly Intraday Market Weighted Average Price, MCP and SMP

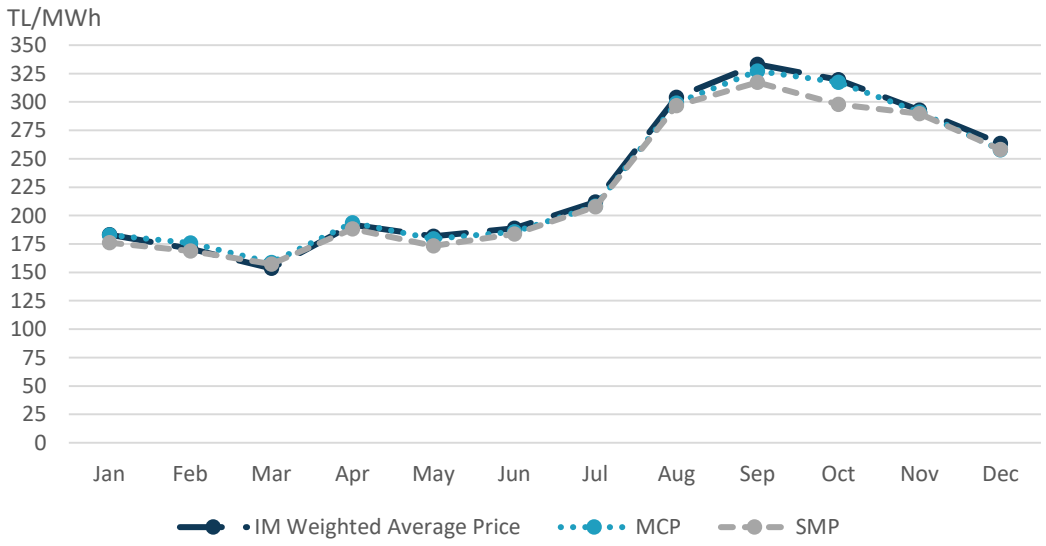


Figure 27: IM Weighted Average Price, MCP and SMP on a monthly basis in 2018

Monthly weighted average price of Intraday Market was higher than average MCP and SMP for almost every month of 2018 except for February, March and April. The biggest difference between weighted average price of Intraday Market and MCP took place in September.

3.9. Total Number of Orders in Intraday Market

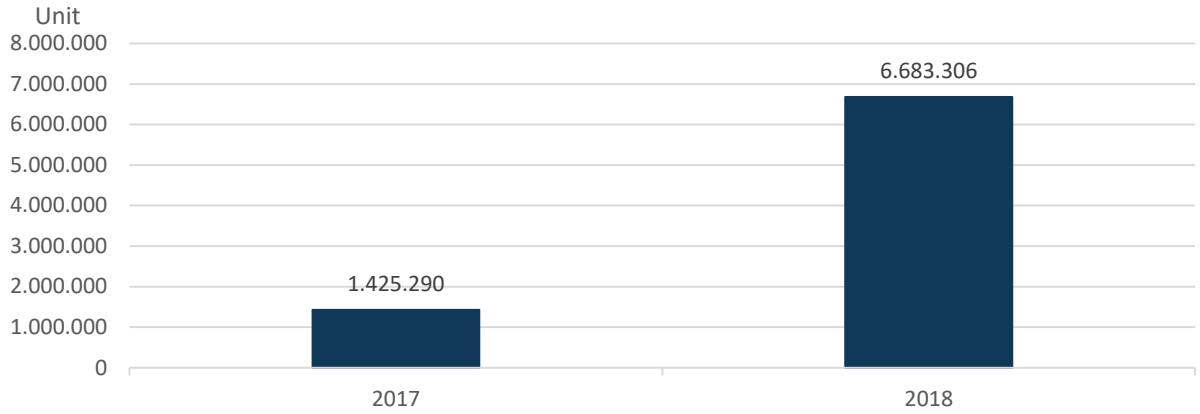


Figure 28: Total Number of Orders in Intraday Market for 2017-2018

Number of orders increased by 369% in 2018 in comparison to previous year.

3.10. Annual Total Number of Bids-Offers in Intraday Market

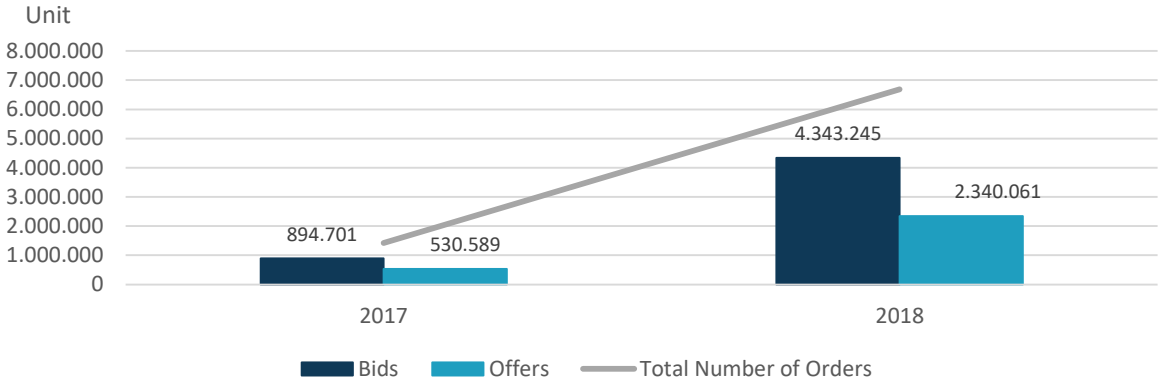


Figure 29: Annual Total Number of Bids-Offers in Intraday Market

65% of 6.683.306 orders were in purchase side and 35% of orders were in sale side in 2018.

Option	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
IoC	19	2	78	52	55	76	37	20	38	30	32	88
FoK	1	2	4	3	6	0	2	1	6	2	2	4
Total	20	4	82	55	61	76	39	21	44	32	34	92

Tablo 5: Monthly Numbers of IoC-FoK

IoC option was used for 0,01 % of 6.683.306 orders, whereas FoK option was used for 0,01% of orders in 2018.

Y/M	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	46.524	43.139	66.187	62.971	69.821	77.328	114.221	213.476	116.536	154.061	128.573	332.453
2018	255.414	222.666	352.640	584.354	578.966	830.439	1.066.118	711.763	787.946	636.566	239.226	417.208

Table 6: Monthly Number of Orders, 2017-2018

3.11. Number of Submitted and Matched Orders in Intraday Market

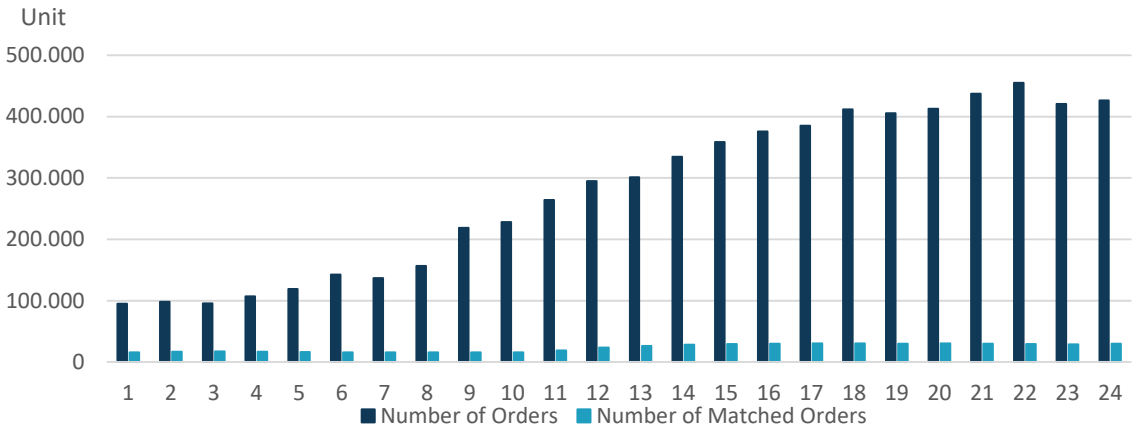
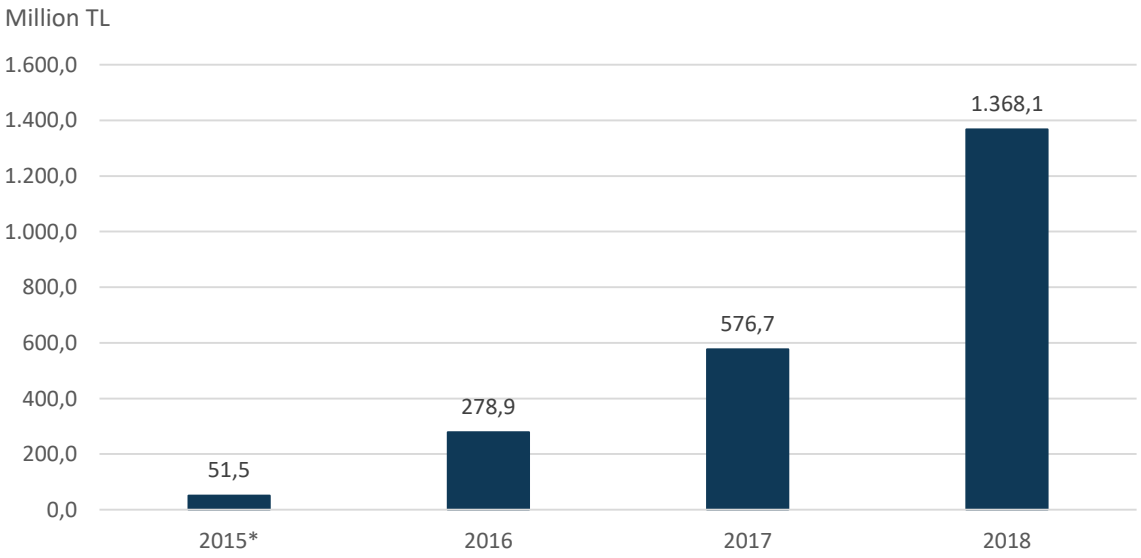


Figure 30: Number of Submitted and Matched Orders in 2017

8,35% of orders matched in 2018.

3.12. Annual Traded Volume of Intraday Market



* Encompassing period of June 1– December 31, 2015.

Figure 31: Annual Traded Volume, 2015-2018

3.13. Monthly Traded Volume of Intraday Market

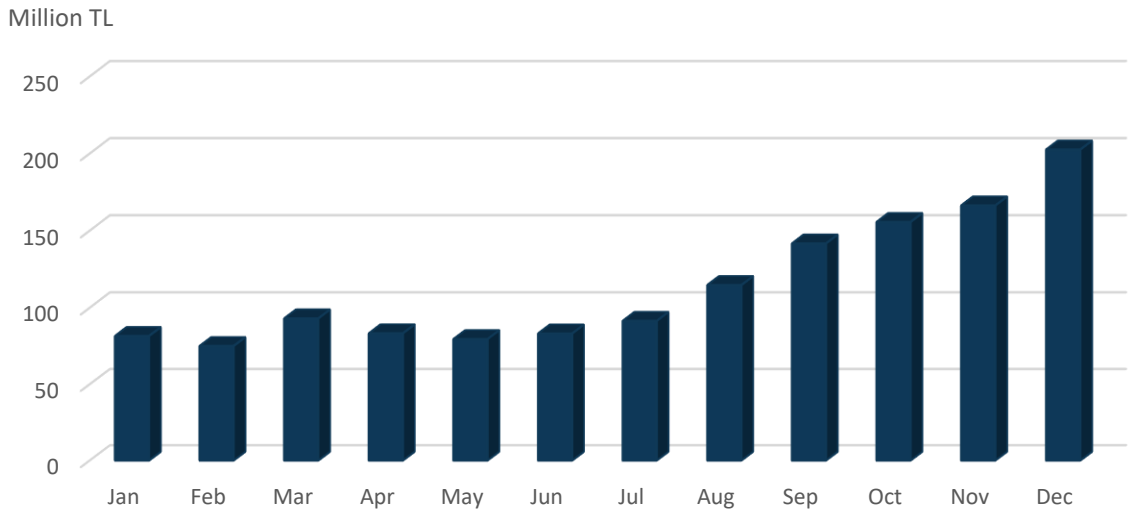


Figure 32: Monthly Traded Volume in 2018

Total traded volume of Intraday Market was 1,4 billion TL in 2018.

3.14. Intraday Market Matching Closeness to Contract Closure Time

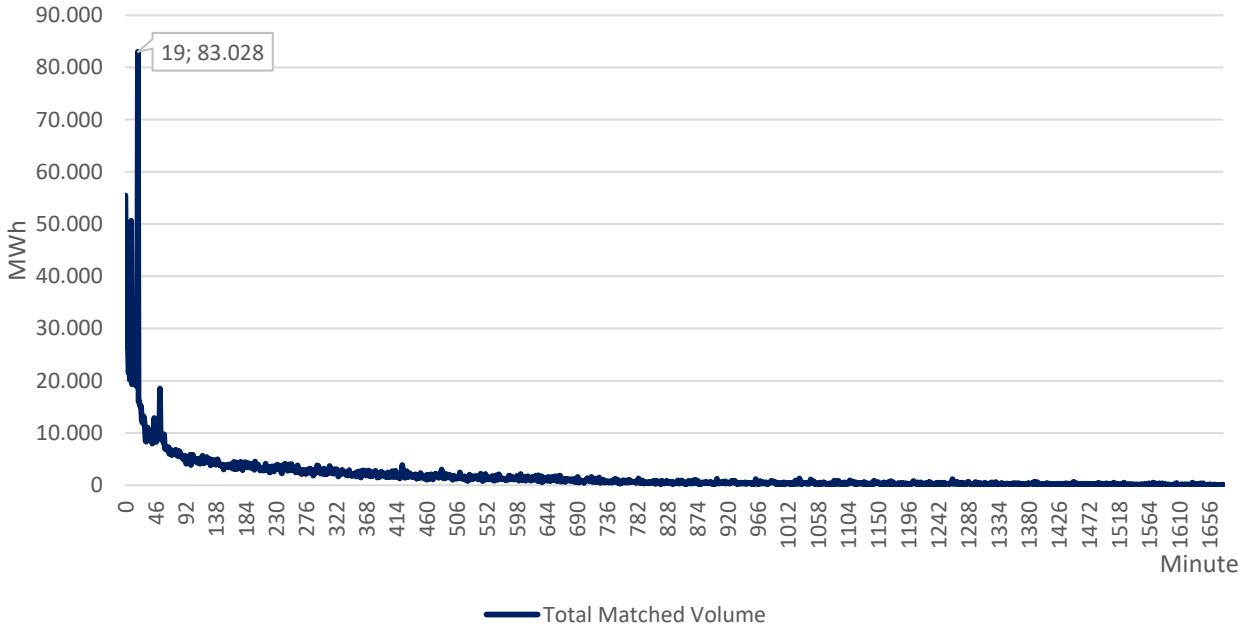


Figure 33: Intraday Market Matching Closeness to Contract Closure Time in 2018

Within the notion of closeness to contract closure time*, the 83.028 MWh volume in Intraday Market is matched before 19 minutes of contract closure time in 2018.

* Closeness to contract closure time means the difference between each matching time and its relevant contract closure time.

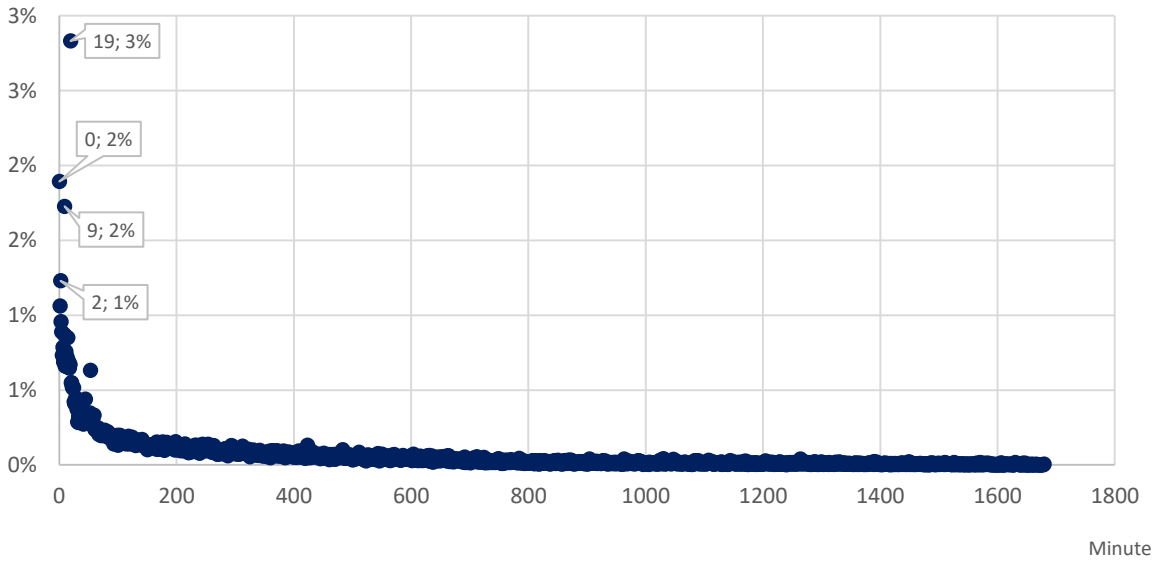


Figure 34: Closeness to Contract Closure Time to Rate of Intraday Market Matches to All Matches in 2018

Market Volume

4. Market Volume

4.1. Monthly Volume of Electricity Market in 2018

Month	Total BC	BCs between Private Entities	EÜAŞ BC Sales	TETAŞ BC Slaes	Other Public BCs	DAM Cleared Volume	IM Traded Volume	BPM Volume	Total Market Volume
Jan	23.099.293	7.907.722	3.841.407	9.611.656	1.738.508	12.792.088	222.881	1.602.407	37.716.668
Feb	20.898.788	6.982.388	3.189.953	9.156.181	1.570.265	11.709.981	219.873	457.044	33.285.685
Mar	24.265.124	8.675.937	3.473.266	10.384.638	1.731.283	13.225.872	303.030	544.937	38.338.962
Apr	19.429.984	7.391.108	2.647.733	7.723.682	1.667.461	12.714.178	217.205	421.903	32.783.270
May	20.674.738	7.551.124	2.738.558	8.663.571	1.721.485	12.433.297	219.006	599.718	33.926.759
Jun	20.056.082	7.318.428	2.433.983	8.621.746	1.681.925	12.143.327	220.502	657.869	33.077.779
Jul	24.473.958	8.090.551	3.975.752	10.736.521	1.671.134	13.662.402	215.599	699.239	39.051.198
Aug	20.138.184	8.307.722	10.177.735	0	1.652.727	12.957.929	188.565	832.494	34.117.172
Sep	16.799.935	6.885.007	8.232.501	0	1.682.427	12.277.014	212.577	792.294	30.081.820
Oct	16.524.068	6.947.416	7.901.494	0	1.675.158	11.195.287	243.496	414.992	28.377.843
Nov	16.784.952	6.987.605	8.402.817	0	1.394.530	11.490.910	284.080	515.927	29.075.868
Dec	18.904.099	8.595.209	9.238.483	0	1.070.407	12.792.426	384.275	692.891	32.773.691
Total	**242.049.205**	**91.640.216**	**66.253.681**	**64.897.995**	**19.257.313**	**149.394.710**	**2.931.088**	**8.231.713**	**402.606.715**

Table 7: Electricity Market Volume on a monthly basis in 2018

The highest market volume of bilateral contracts took place as 24.473.958 MWh in July and the highest bilateral sales contract volume of EÜAŞ was 10.177.735 MWh in August.

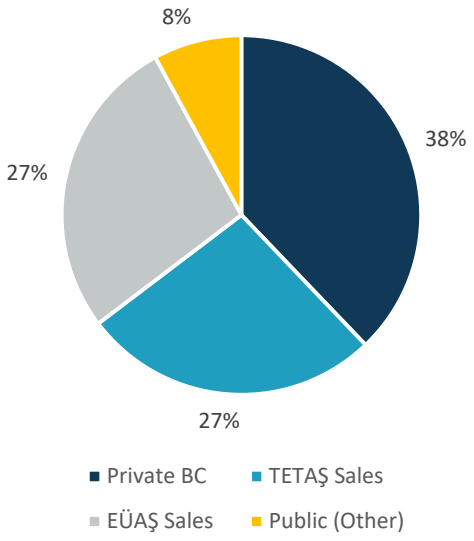


Figure 36: Volumes of Bilateral Contracts on annual basis

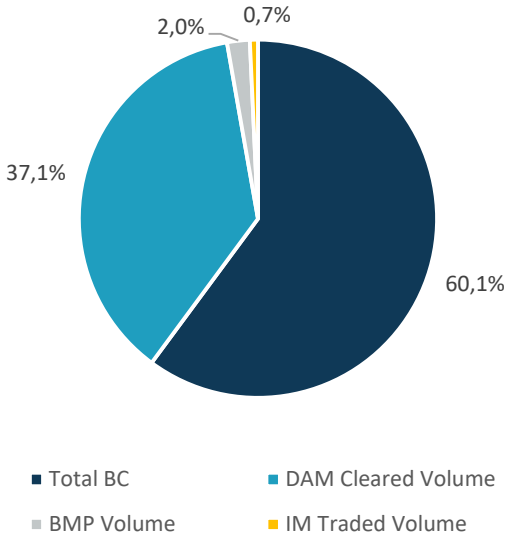


Figure 35: Market Volume on annual basis

- Total BC: Sum of bilateral contract volume in purchase or sales side,
- Private BC: Sum of bilateral contract volume between private entities,
- Public (Other): Difference between TETAŞ BC purchase volume and EÜAŞ BC sales volume,
- DAM Cleared Volume: Cleared sales volume of DAM,
- IM Traded Volume: Traded sales volume of IM,
- BPM Volume: Sum of executed up and down regulation volume.

Balancing Power Market

5. Balancing Power Market

5.1. Monthly Average MCP-SMP

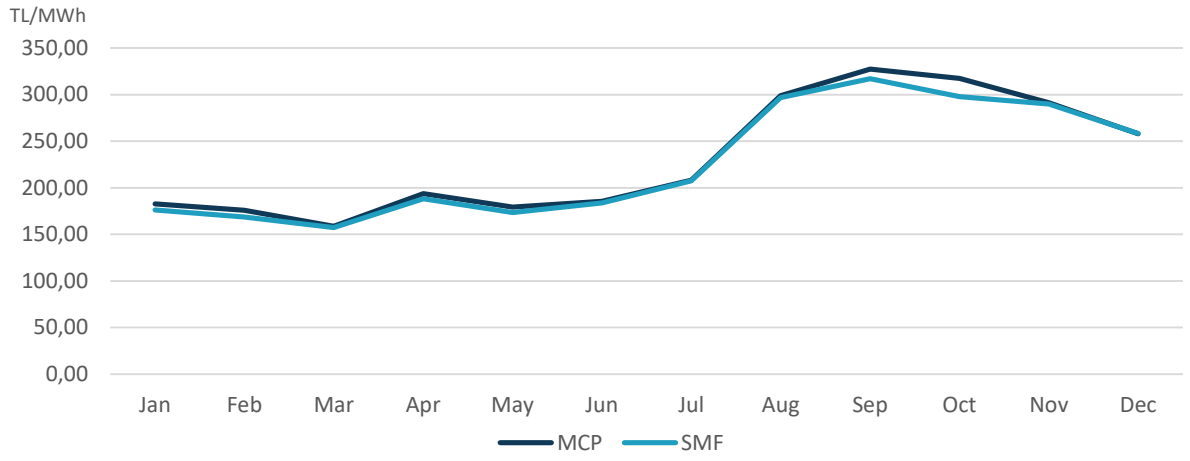


Figure 37: Average MCP-SMP on a monthly basis

Average System Marginal Price was lower than Average Market Clearing Price on a monthly basis in 2018.

The highest System Marginal Price was 317,20 TL/MWh and the highest Market Clearing Price was 327,27 TL/MWh in September, 2018. The lowest System Marginal Price was 157,30 TL/MWh in March, 2018.

5.2. Hourly System Marginal Price

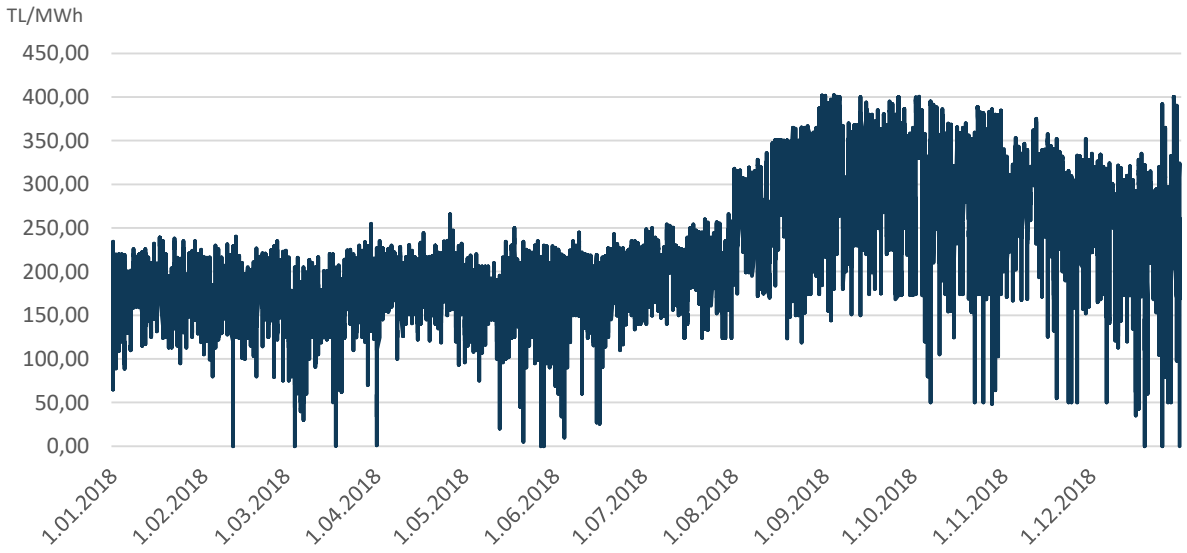


Figure 38: SMP on hourly basis

Daily average of SMP was 226,51 TL/MWh in 2018. The highest SMP was 402,20 TL/MWh at 17:00 on Tuesday, September 4, 2018.

5.3. Hourly Difference between MCP and SMP

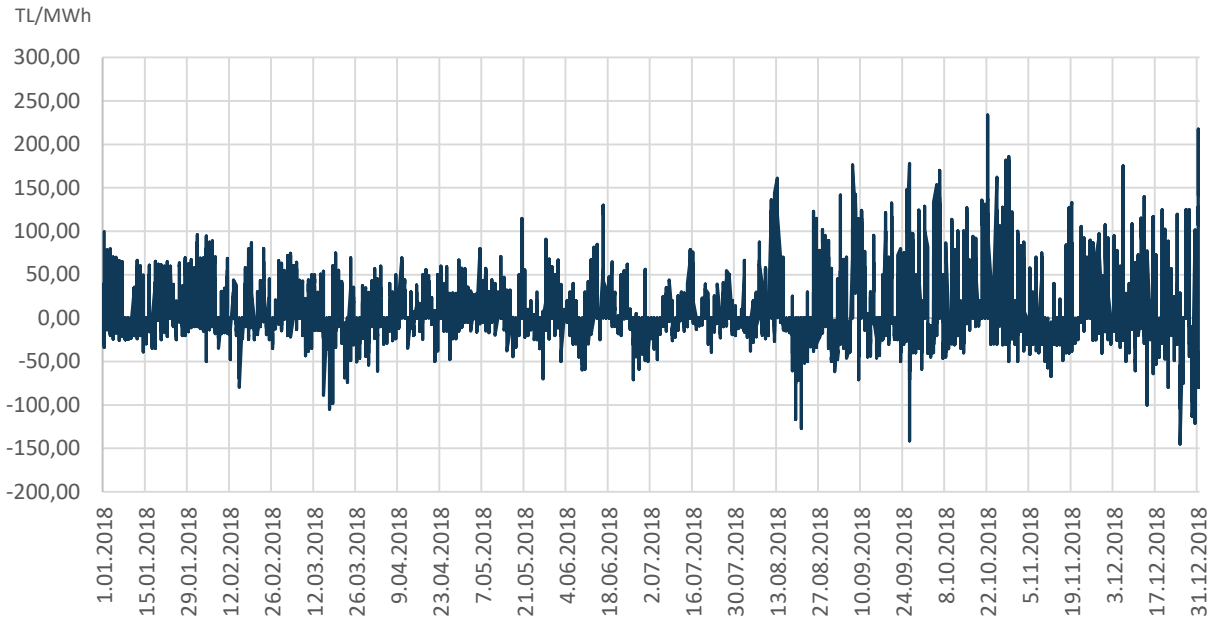


Figure 39: Difference between MCP and SMP on hourly basis

The highest difference between MCP and SMP was 233,64 TL/MWh at 05:00 on Monday, October 22, 2018. The highest difference between SMP and MCP was 145,45 TL/MWh at 23:00 on Tuesday, December 25, 2018.

5.4. Monthly Volumes of 0 - 1 - 2 Coded Regulations

System Direction	Up			Down		
Months/Reg. Code	0	1	2	0	1	2
January	1.154.887	1.110	20.792	77.527	0	637.930
February	403.321	0	0	194.882	233	0
March	546.561	0	0	202.181	73	0
April	386.777	0	0	171.815	2.682	0
May	472.959	48.393	0	245.888	58.018	0
June	782.537	6.662	0	201.663	18.333	0
July	838.513	131	0	110.107	28.253	0
August	879.260	399	0	132.127	98.243	0
September	776.210	0	0	139.081	157.557	0
October	391.836	113	0	176.643	28.140	0
November	687.078	0	0	100.895	9.369	0
December	941.740	229	0	143.170	3.012	0

Table 8: 0 - 1 - 2 Coded Regulation Volume on a monthly basis

The highest total number of up-down regulation took place in January, 2018. The lowest number of up regulation occurred in April and the lowest number of down regulation took place in November.

Ancillary Services Market

6. Ancillary Services Market

6.1. Primary Frequency Control (PFC)

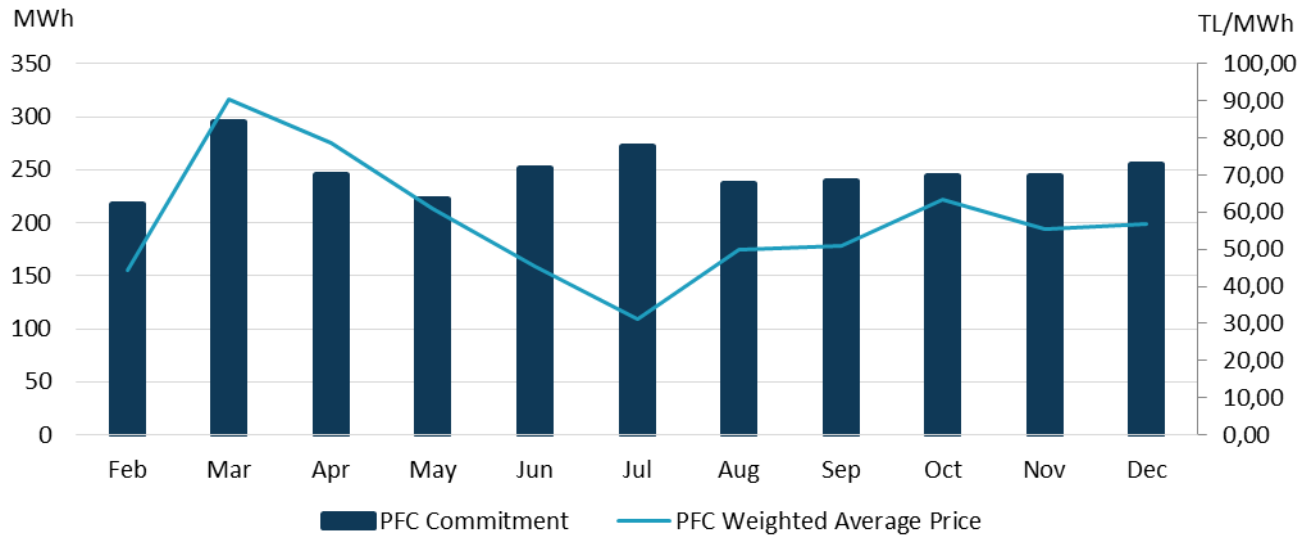


Figure 40: Monthly Average PFC Reserve Volume and Weighted Average Price

Hourly average of primary frequency reserve volume was 248 MWh in 2018. Weighted average unit price of primary frequency reserve was 57,61 TL/MWh in 2018. The highest allocated primary reserve volume was 219.527 MWh in March. The highest primary reserve unit price was 90,48 TL/MWh in March, 2018.

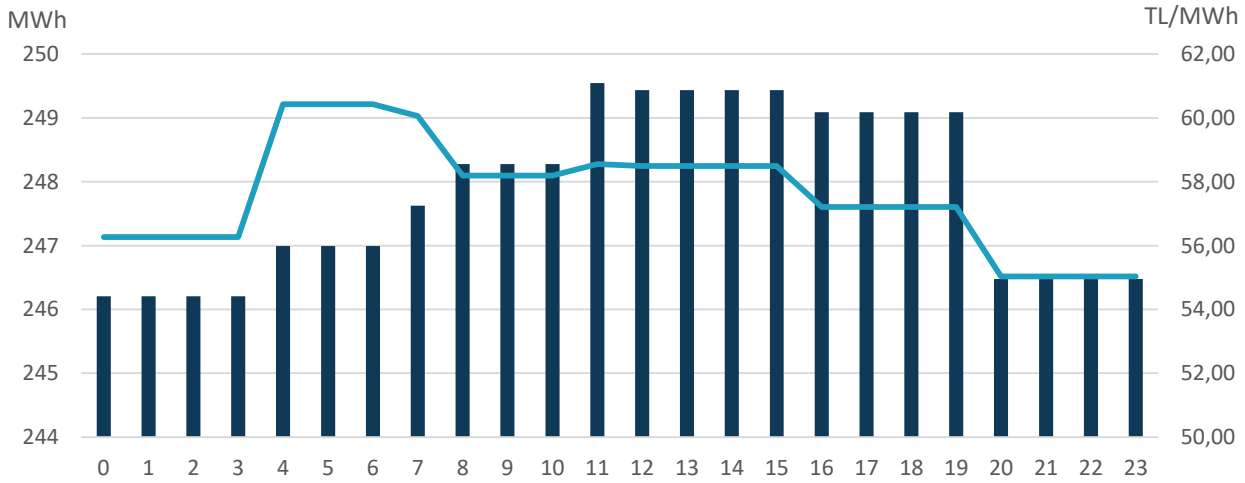


Figure 41: Hourly Average PFC Reserve Volume and Weighted Average Price

The highest allocation of primary reserve took place at 11:00 as average volume was 249,5 MWh for this hour during 2018. The highest weighted average price took place as 60,42 TL/MWh at 04:00, 05:00 and 06:00 during 2018.

6.2. Secondary Frequency Control (SFC)

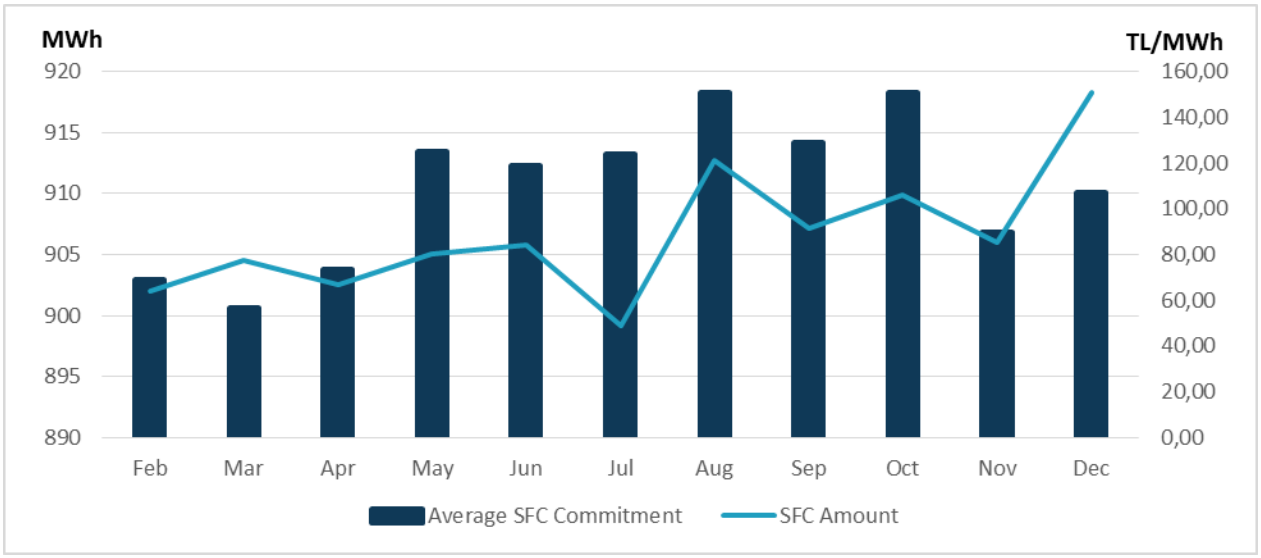


Figure 42: Monthly Average SFC Reserve Volume and Weighted Average Price

Hourly average of secondary frequency reserve volume was 910 MWh in 2018. Weighted average unit price of secondary frequency reserve was 89,13 TL/MWh in 2018. The highest allocated secondary reserve volume was 683.220 MWh in August. The highest secondary reserve unit price was 151,10 TL/MWh in December, 2018.

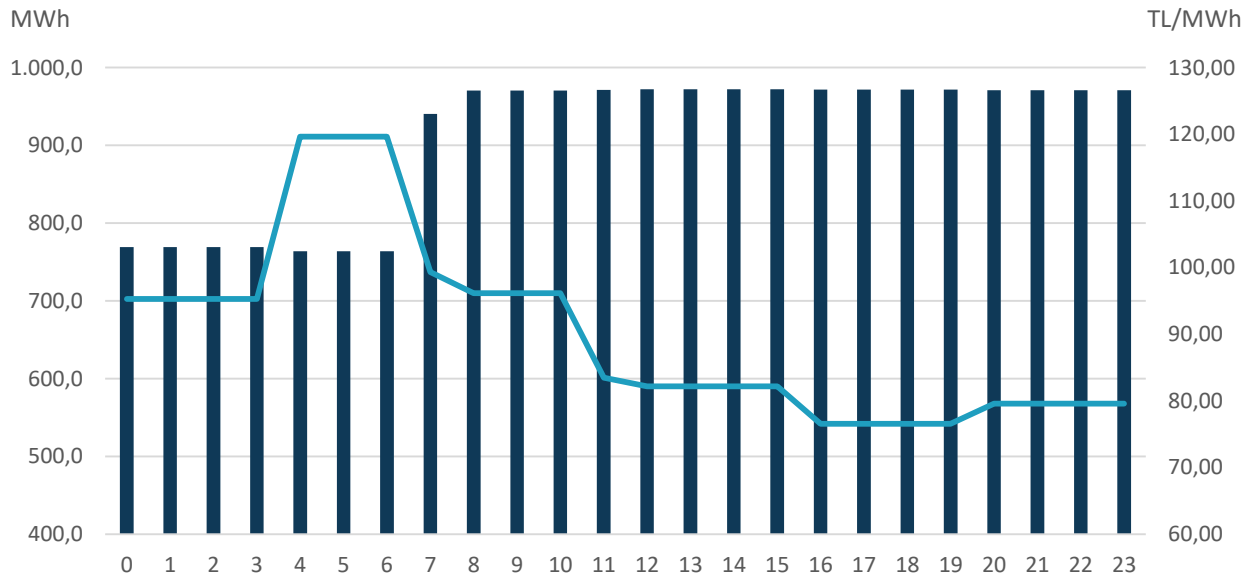


Figure 43: Hourly Average SFC Reserve Volume and Weighted Average Price

The highest allocation price of secondary reserve took place at 04:00, 05:00 and 06:00 as average price was 119,62 TL/MWh for these hours during the 2018. The lowest weighted average price took place at 16:00, 17:00, 18:00 and 19:00 as average price was 76,54 TL/MWh during 2018.

Settlement-Registration and Eligible Customers

7. Settlement, Registration and Eligible Customers

EPİAŞ operates the financial settlement of Day Ahead Market, Intraday Market, Balancing Power Market, Energy Imbalances and YEKDEM. These operations are performed in a fast, secure, transparent manner in accordance with Balancing and Settlement Regulation and EPİAŞ does not incur any profit/loss during financial settlement operations.

The settlement of Day Ahead Market and Intraday Market are performed considering purchase and sales amount on a daily basis. Here, the participants' calculation of uplift, debt and receivable advances are proceeded on a daily basis.

In addition to financial settlement, minimum collateral amount, imbalance collateral, collateral amount required for Day Ahead Market transactions, collateral amount required for Intraday Market transactions and risk collateral are calculated and announced.

At the end of each month, final up-down regulation volumes which are in scope of Balancing Power Market, are calculated. Moreover, final up-down regulation volumes for each participant in BPM are determined on a monthly basis and receivable and payable for each participant are calculated based on up-down regulation offer prices are being calculated. In case commitment of regulation are not realized, associated extra cost is being calculated and participant is being informed.

7.1. SBDT (Residual Balance Adjustment Amount)

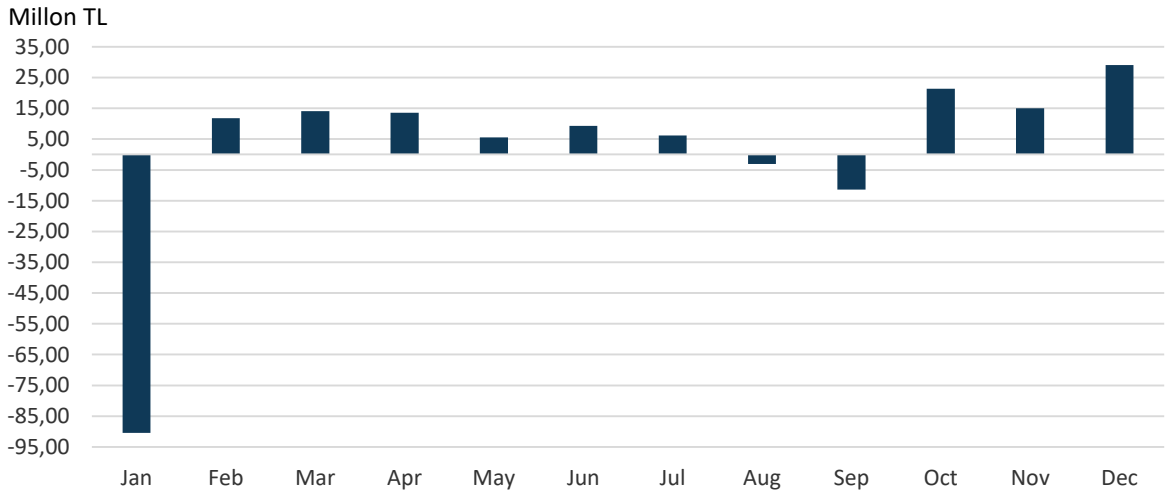


Figure 44: Residual Balance Adjustment Amount on a monthly basis

TEİAŞ is liable for SBDT resulted from transactions of BPM, Energy Imbalances and Retroactive Adjustment and monthly proportion of net consumption. Changes in SBDT are shown in Figure 44 on a monthly basis.

7.2. İSKK (Transmission System Loss Coefficient)

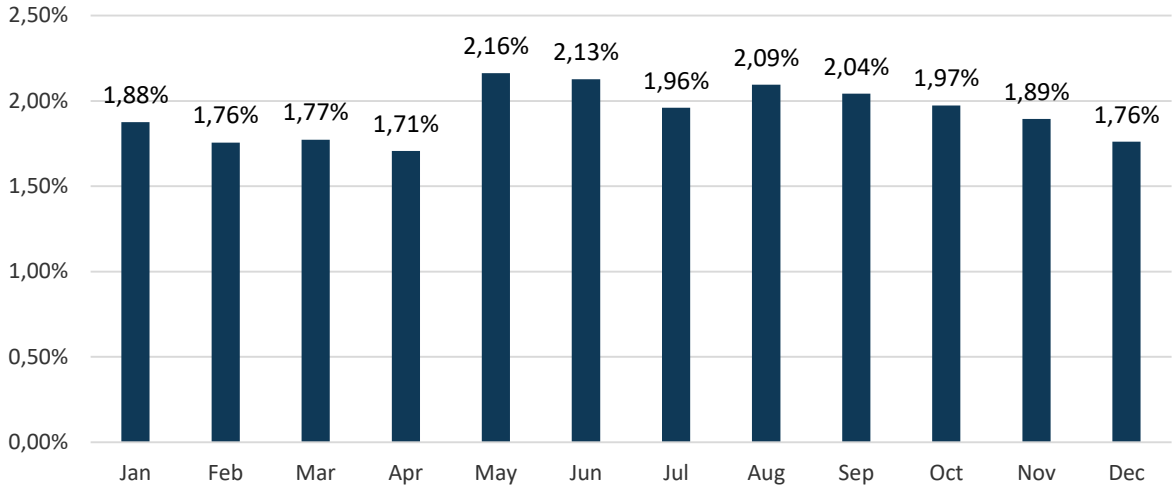


Figure 45: Transmission System Loss Coefficient on a monthly basis

Transmission System Loss Coefficient for 2018 is given in Figure 45 on a monthly basis.

7.3. YEKDEM

7.3.1. Total YEKDEM Payment

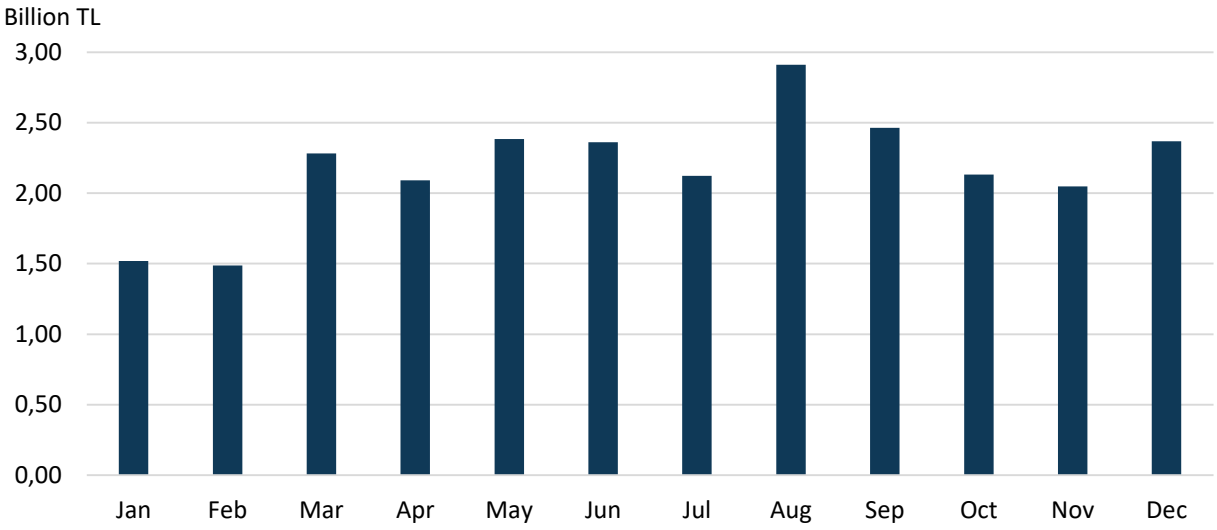


Figure 46: Total Payment to YEKDEM Participants in 2018

The changes in total payment made YEKDEM participant are shown in Figure 46 on a monthly basis.

7.3.2. Unit Cost of YEKDEM

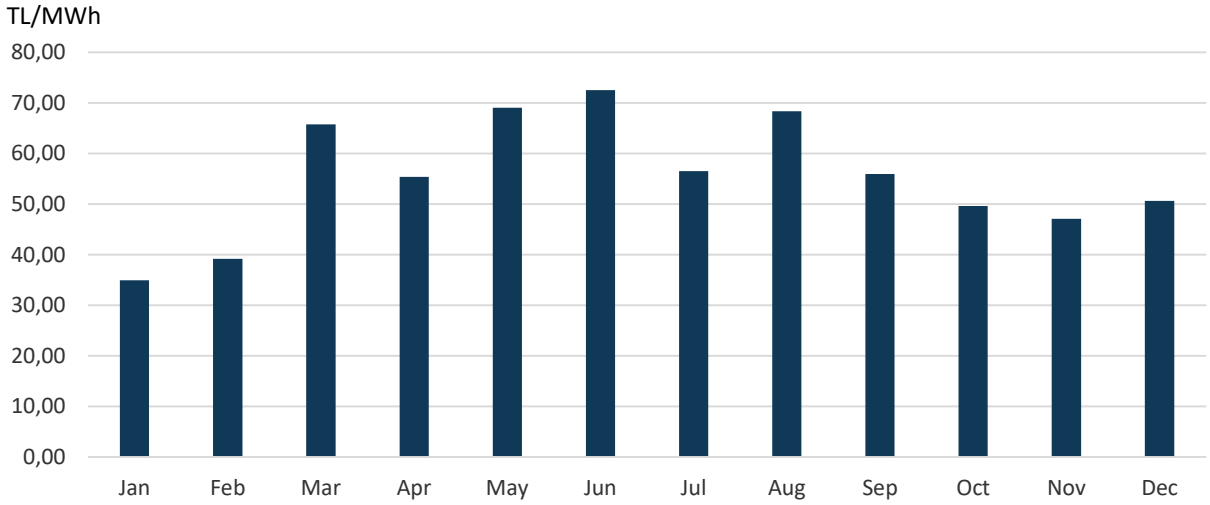


Figure 47: Unit Cost of YEKDEM

After YEKDEM settlement, monthly average unit costs per MWh that are liable for participants, are shown in Figure 47 above. The highest unit cost of YEKDEM per MWh took place in June, whereas the lowest unit cost of YEKDEM per MWh occurred in January.

7.3.3. YEK Revenue

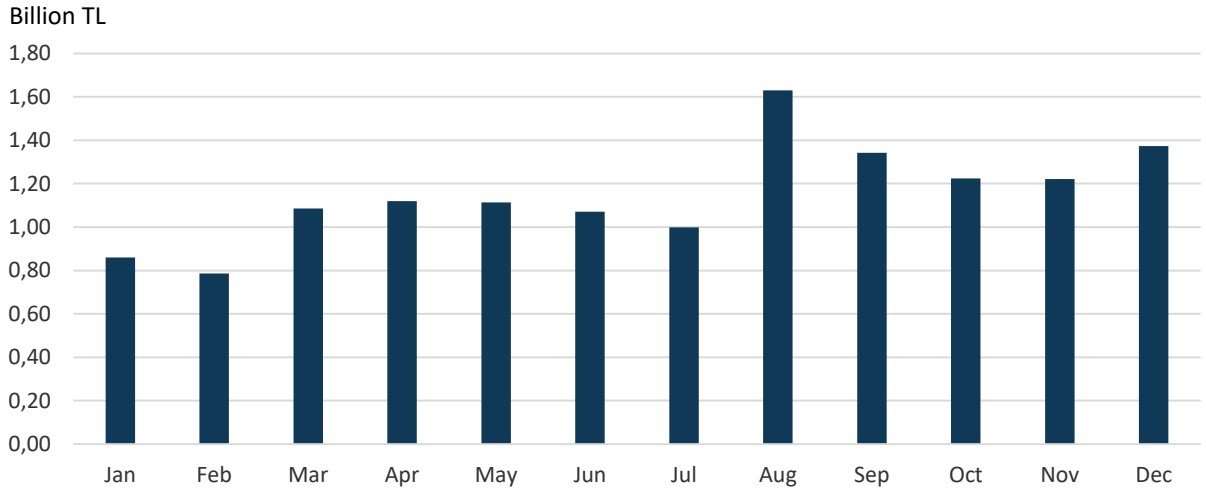


Figure 48: YEK Revenue in 2018

Total amount of YEK revenue is shown in Figure 48. The highest revenue obtained in August, whereas the lowest revenue was in February 2018.

7.4. Balancing Power Market (BPM)

7.4.1. Total BPM Transaction Amount

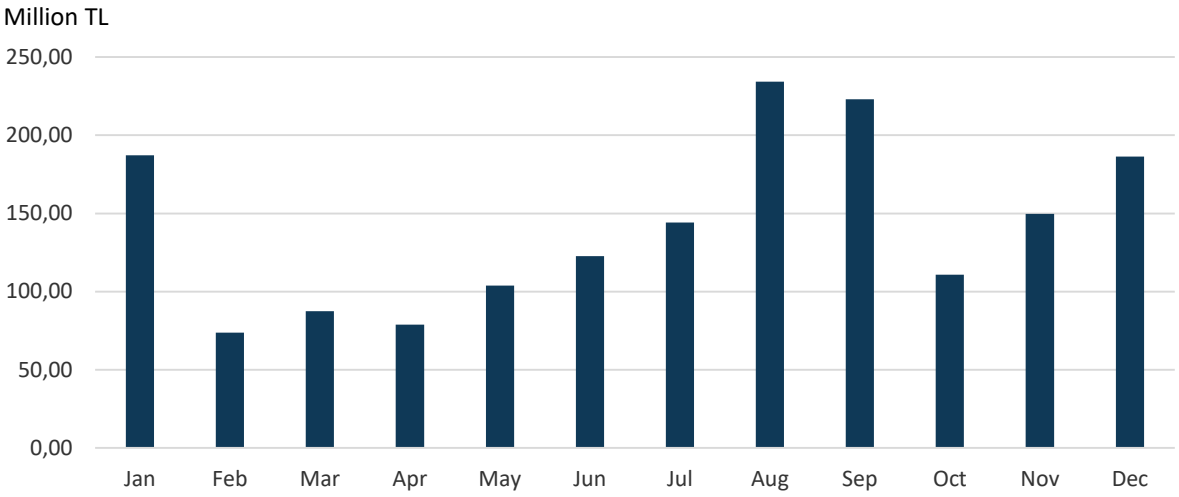


Figure 49: Total BPM Transaction Amount in 2018

Total cost of BPM in a monthly basis is shown in Figure 49.

7.4.2. Total BPM Amount in Up-Down Regulation

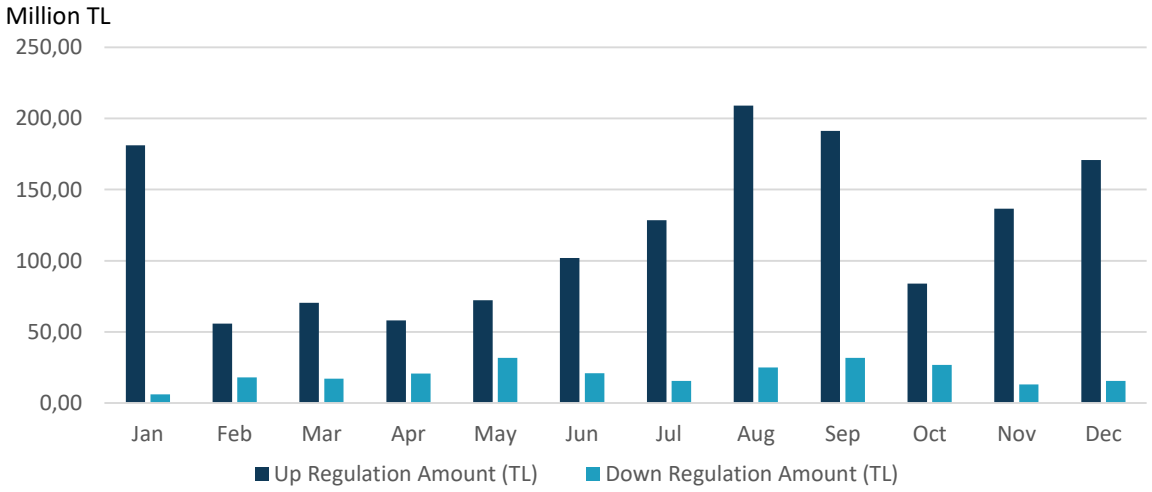


Figure 50: Total BPM Amount in Up-Down Regulation in 2018

The monthly distribution of total amount of up and down regulation is shown in Figure 50.

7.4.3. Total BPM Regulation Volume

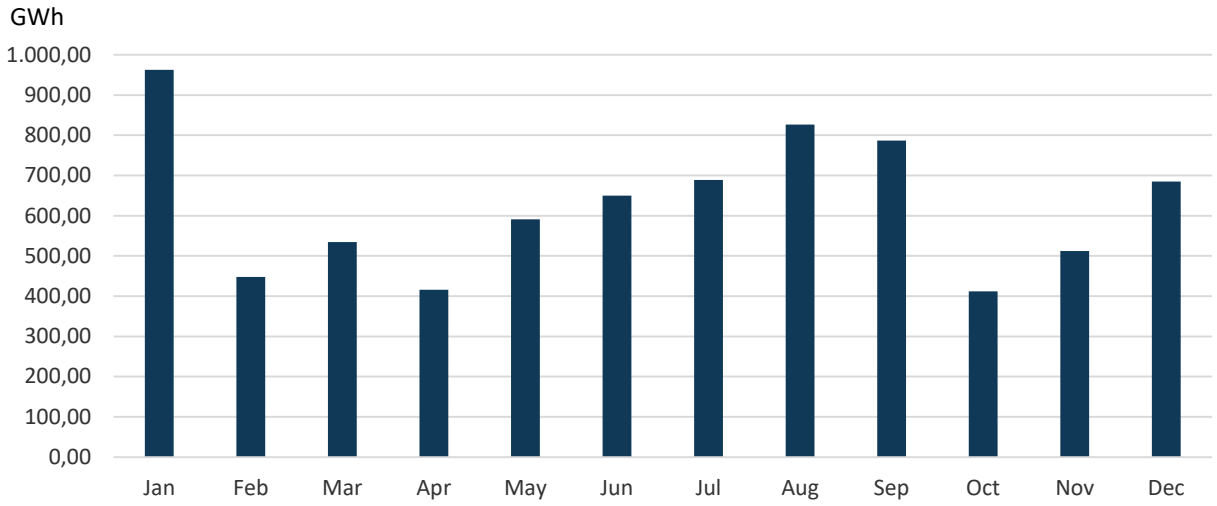


Figure 51: Total BPM Regulation Volume in 2018

The monthly distributioın of total BPM Regulation is shown in Figure 51.

7.4.4. Total BPM Up-Down Regulation Volume

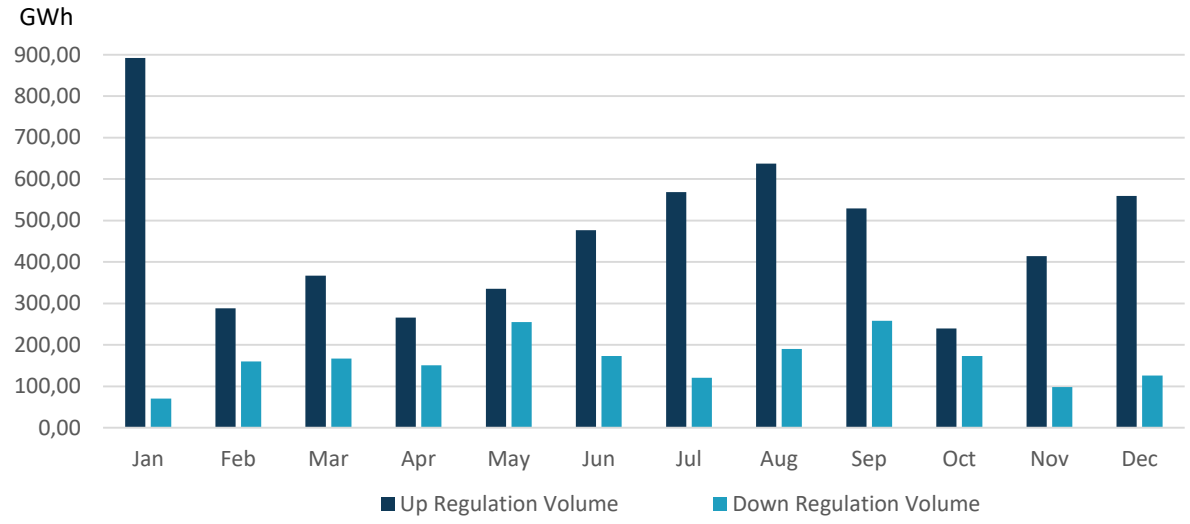


Figure 52: Total BPM Up-Down Regulation Volume in 2018

The monthly distribution of BPM up and down regulation volume is shown in Figure 52.

7.5. Imbalance

7.5.1. Total Volume of Energy Imbalances

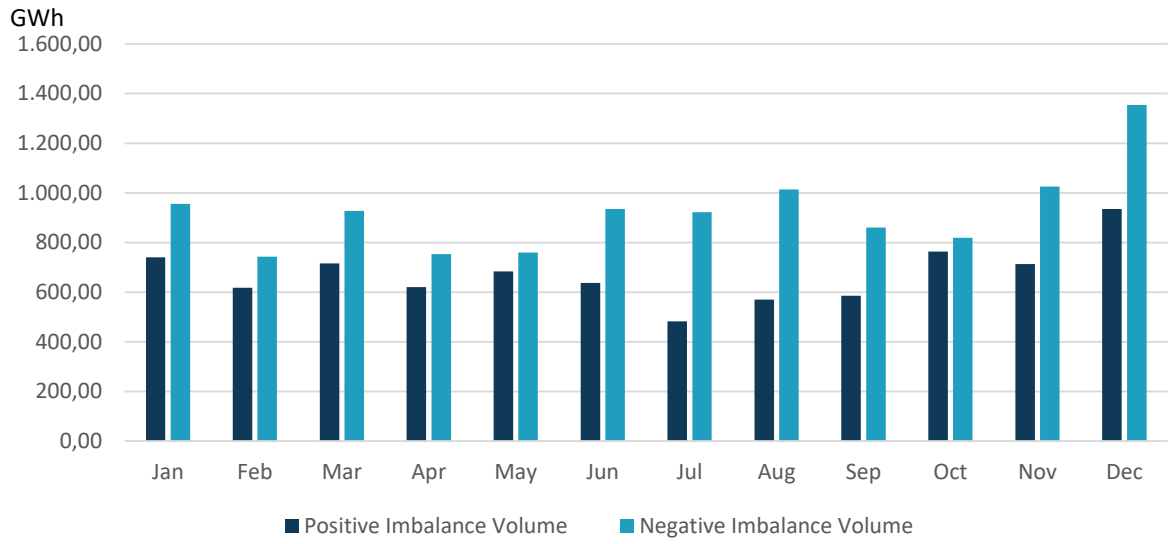


Figure 53: Total Energy Imbalances Volume in 2018

The highest imbalance volume was in December whereas the lowest imbalance volume was in February in 2018

7.5.2. Total Amount of Energy Imbalance

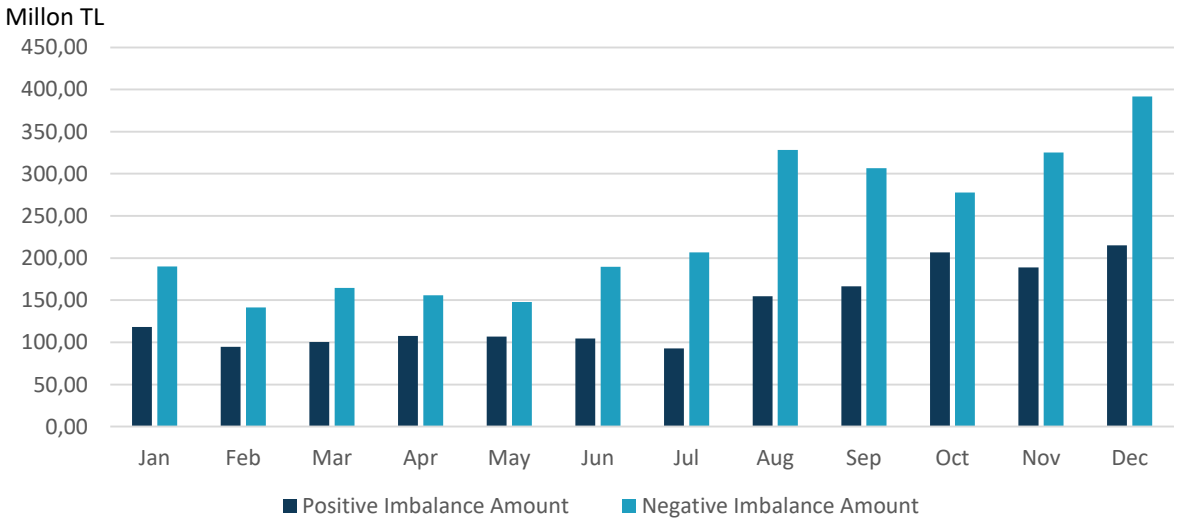


Figure 54: Total Energy Imbalances Amount in 2018

Monthly distribution of financial amount resulted from imbalances is shown in Figure 54. Monthly settlement of YEKDEM mechanism is announced under YEKDEM payable and receivable bullets.

7.6. Injection Volume (UEVM) – Withdrawal Volume (UEÇM) Basis to Financial Settlement

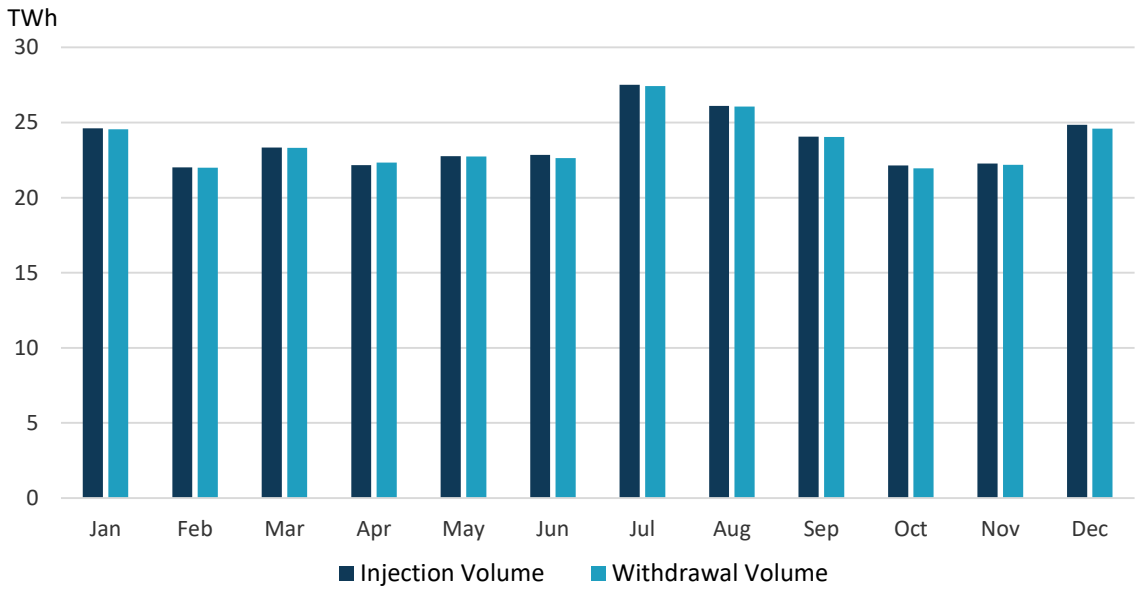


Figure 55: Injection-Withdrawal Volumes Basis to Financial Settlement

Monthly changes in injection and withdrawal volumes basis to financial settlement for 2018 are shown in Figure 55.

7.7. Eligible Customers

7.7.1. Number of Eligible Customers

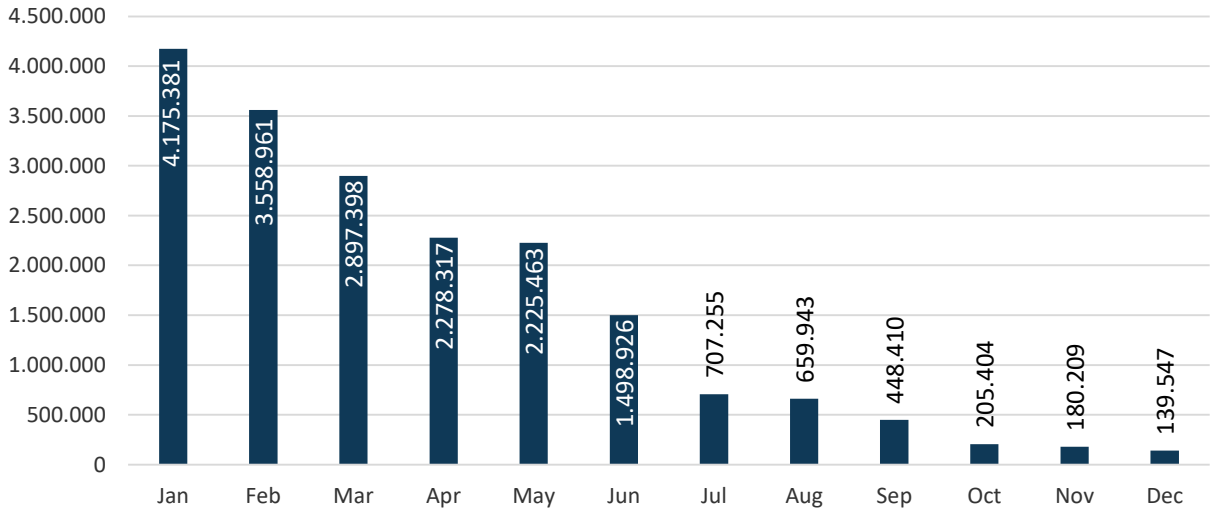


Figure 56: Number of Eligible Customers in 2018

The number of eligible customers are given in Figure 56.

7.7.2. Eligible Customer Consumption

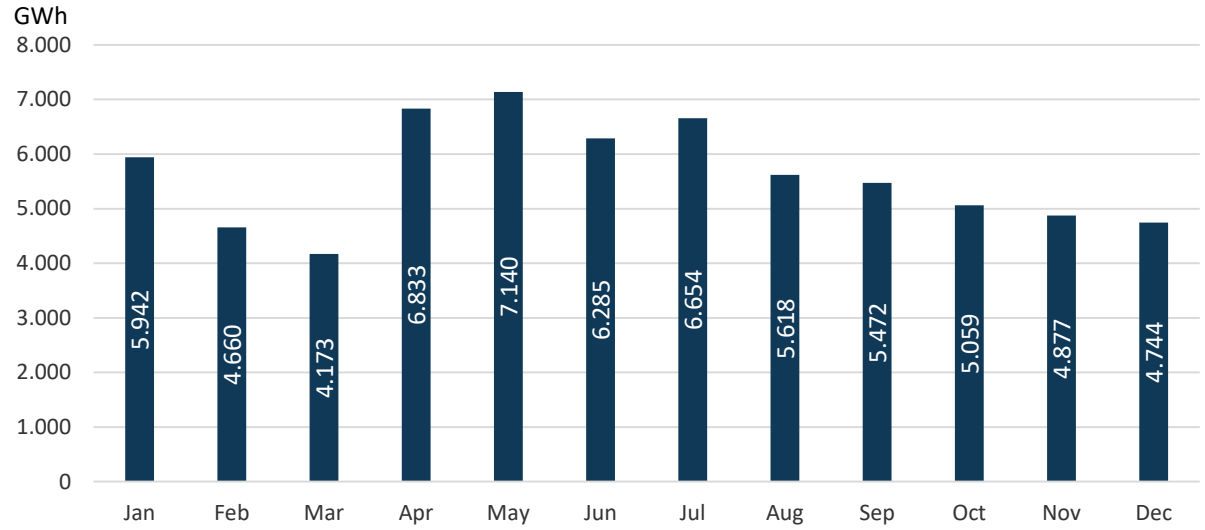


Figure 57: Eligible Customer Consumption in 2018

The monthly withdrawal volume of eligible customers is shown in Figure 57.

7.8. Number of Market Participants

Month	Distribution	Retail	Transmission	OSB Generation	Wholesale	Generation	Total
January	21	63	1	1	152	828	1.066
February	21	63	1	1	153	836	1.075
March	21	63	1	1	153	841	1.080
April	21	63	1	1	153	843	1.082
May	21	63	1	1	154	844	1.084
June	21	63	1	1	154	847	1.087
July	21	63	1	1	153	853	1.092
August	21	63	1	1	150	863	1.099
September	21	63	1	1	150	866	1.102
October	21	63	1	1	150	888	1.124
November	21	63	1	1	156	898	1.140
December	21	63	1	1	155	899	1.140

Table 9: Number of Participants on monthly basis

Registration process consists of approval of power plants, participation agreement, registration of participants' legal entities and eligible customers. As such, the number of active participants in market is listed in terms of licenses granted by EMRA.

TEİAŞ Statistics

8. TEİAŞ Statistics

* This part of market report comprises of data compiled from TEİAŞ and National Dispatch Center Database (YTBS) as of March 6, 2018.

8.1. Generation and Consumption, 2017-2018

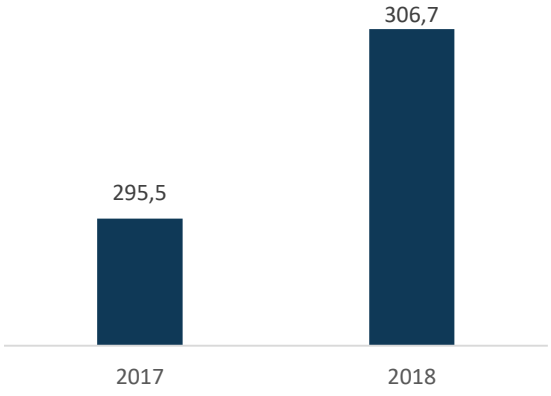


Figure 59: Generation (TWh), 2017-2018

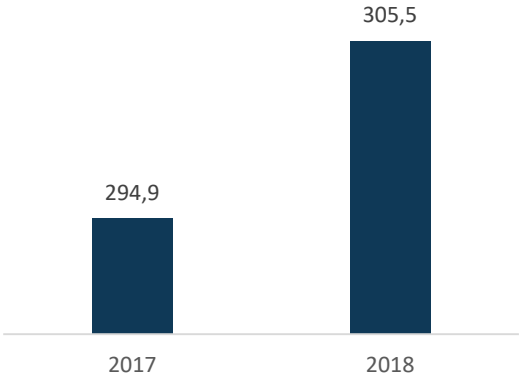


Figure 58: Consumption (TWh), 2017-2018

As seen in Figure 58 and Figure 59, in 2018 generation volume increased by 3,8% and consumption volume increased by 3,46% compared to those of 2016.

8.2. Monthly Generation, 2017-2018

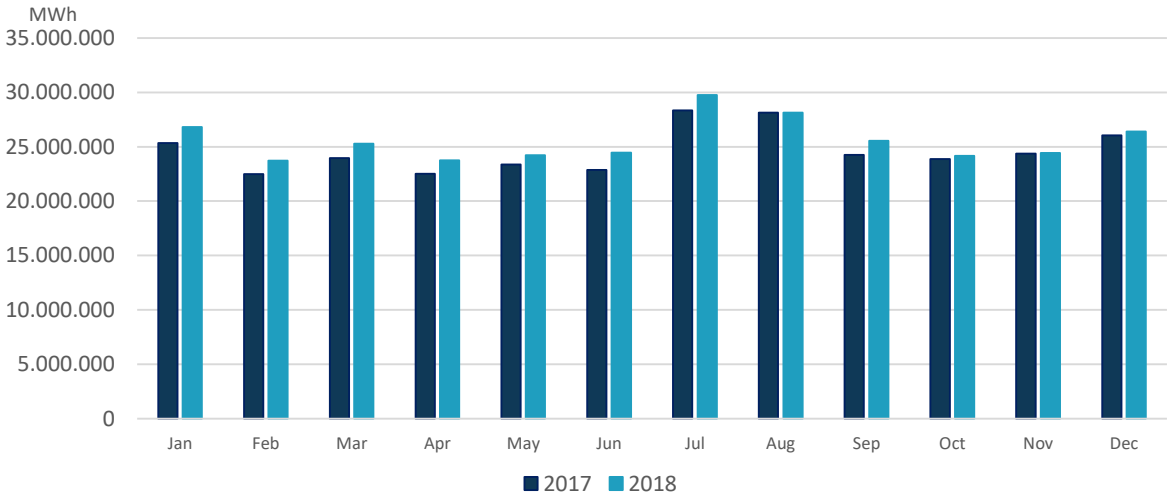


Figure 60: Monthly Generation, 2017 - 2018

Compared to values 2017 vs. 2018;

- The highest increase in generation volume took place in June by 3,7% in 2018.
- The highest monthly power generation was in July, whereas the lowest monthly power generation was in February 2018. As for power generation by energy source in 2018, natural gas power stations had the greatest portion of generation by 33%, while imported coal power stations was in second place by 23%.

- The highest peak demand was 45.996 MWh at 17:00 on August 3, 2018. The highest instantaneous peak demand was 46.160 MW at 15:20 on August 1, 2018 and lowest instantaneous demand was 18.212 MW at 06:00 on June 16, 2018.

8.3. Number of Power Stations by Electric Utilities

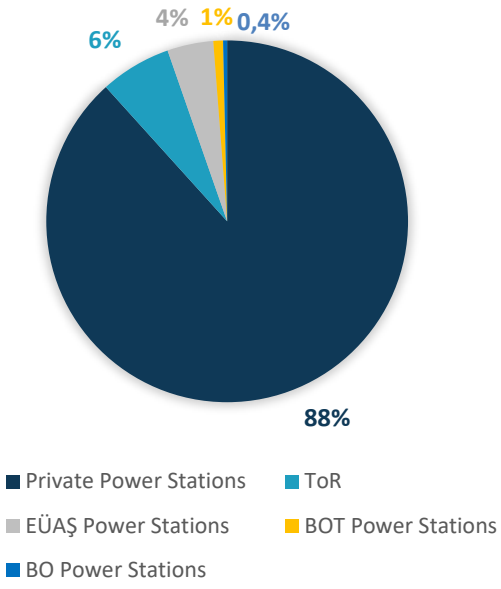


Figure 61: % of Power Stations by Electric Utilities in 2018

Electric Utilities	Number of Power Stations
Private Power Stations	1.223
Transfer of Operational Rights (ToR)	88
EÜAŞ Power Stations	57
BOT	12
BO	5
Unlicensed Power Stations	6.059

Table 10: Number of Power Stations by Electric Utilities in 2018

8.4. Number of Power Stations by Energy Source

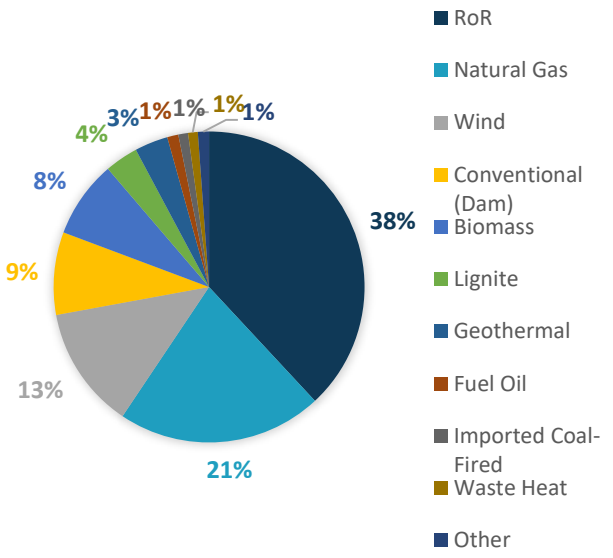


Figure 62: % of Licensed Power Stations by Energy Source in 2018

Energy Source	Licensed Stations
RoR & Natural Lake	527
Natural Gas	295
Wind	176
Conventional (Dam)	119
Biomass	111
Lignite	48
Geothermal	48
Fuel Oil	16
Imported Coal-Fired	14
Waste Heat	14
Other	16
Energy Source	**Unlicensed Stations**
Solar	5.864
Wind	74
Waste Heat	54
Biomass	34
Natural Gas	22
RoR	11

Table 11: Number of Power Stations by Energy Source in 2018

8.5. Installed Capacity by Energy Source

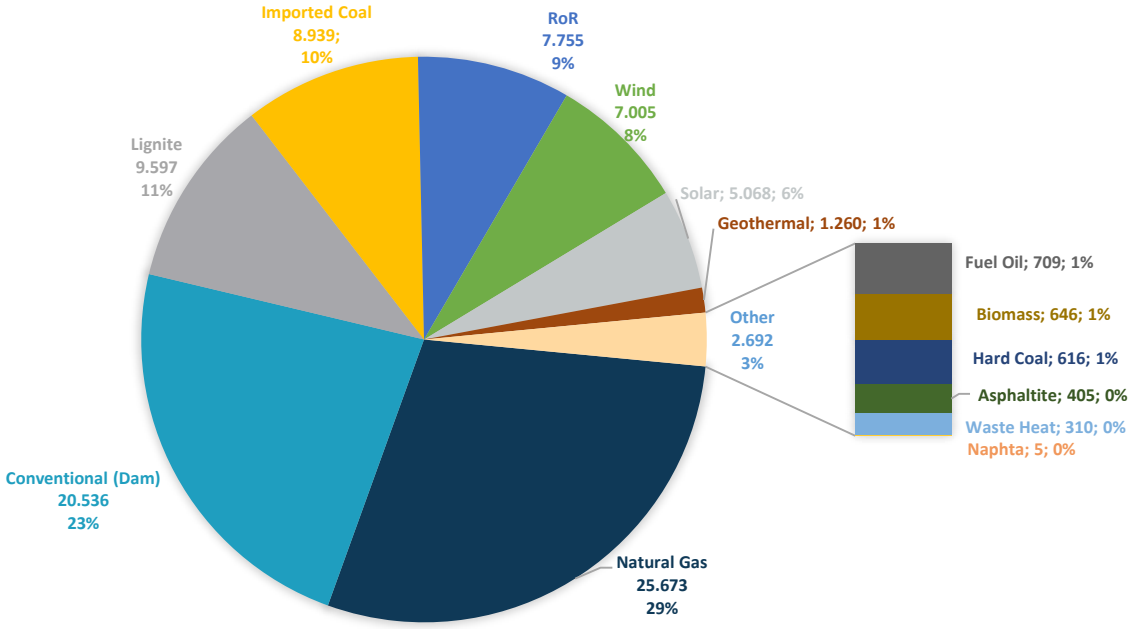


Figure 63: Installed Capacity (MW) by Energy Source in 2018

Turkey's total installed capacity is 88.526 MW, comprised of 83.150 MW licensed and 5.376 MW unlicensed power stations as of January 1, 2019. The installed capacity of power stations benefited from renewable support mechanism is 19.266 MW.

The proportion of power stations based on renewable energy sources in total installed capacity is 47,8%.

Solar power stations had the highest increase in installed capacity respectively from 2017 to 2018.

8.6. Installed Capacity by Electric Utilities

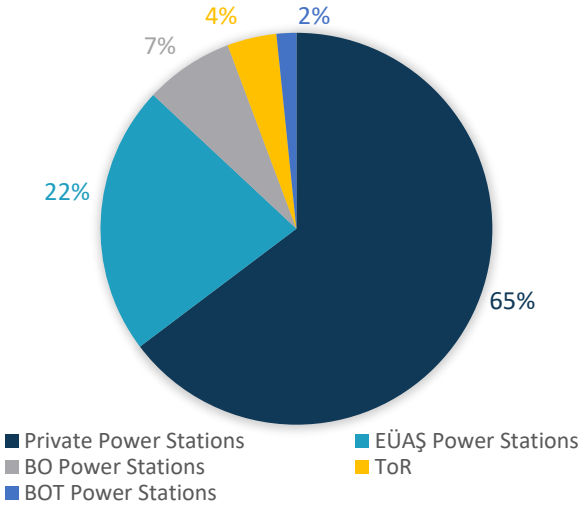


Figure 64: % of Installed Capacity by Licensed Electric Utilities in 2018

Electric Utility	Installed Capacity (MW)
Private Power Stations	53.814
EÜAŞ Power Stations	18.489
BOT	6.102
Transfer of Operational Rights	3.387
BOT	1.359
Unlicensed Power Stations	5.376
Total	88.526

Table 12: Installed Capacity by Electric Utilities in 2018

Private power stations cover 77,8% of installed capacity state owned public power stations cover 22,2% of installed capacity.

8.7. Electricity Generation Figures, 2017 - 2018

8.7.1. Electricity Generation Figures by Energy Source, 2017 - 2018

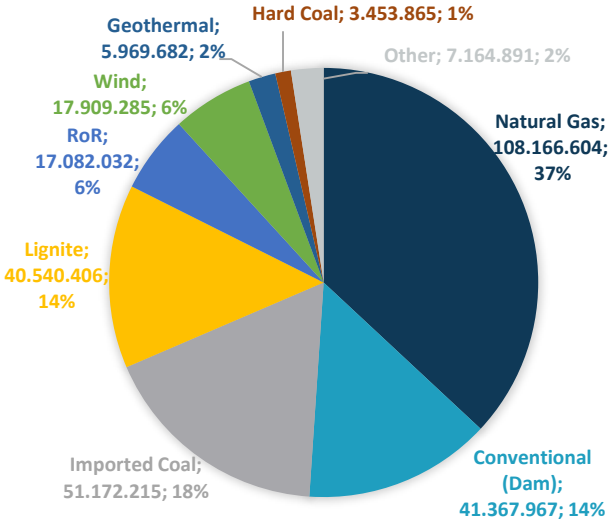


Figure 66: Generation (MWh) by Energy Source in 2017

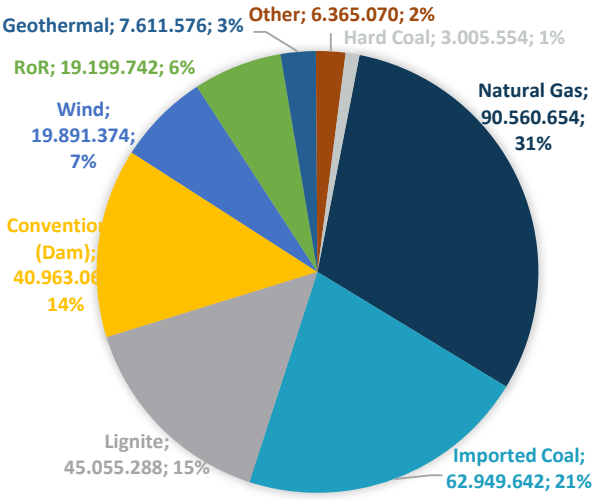


Figure 65: Generation (MWh) by Energy Source in 2018

While generation of geothermal power stations increased by 27,5% compared to 2017, generation of natural gas power stations decreased by 7% and imported coal-fired power stations increased by 23% compared to 2017 in 2018.

8.7.2. Generation by Energy Source, 2017 - 2018

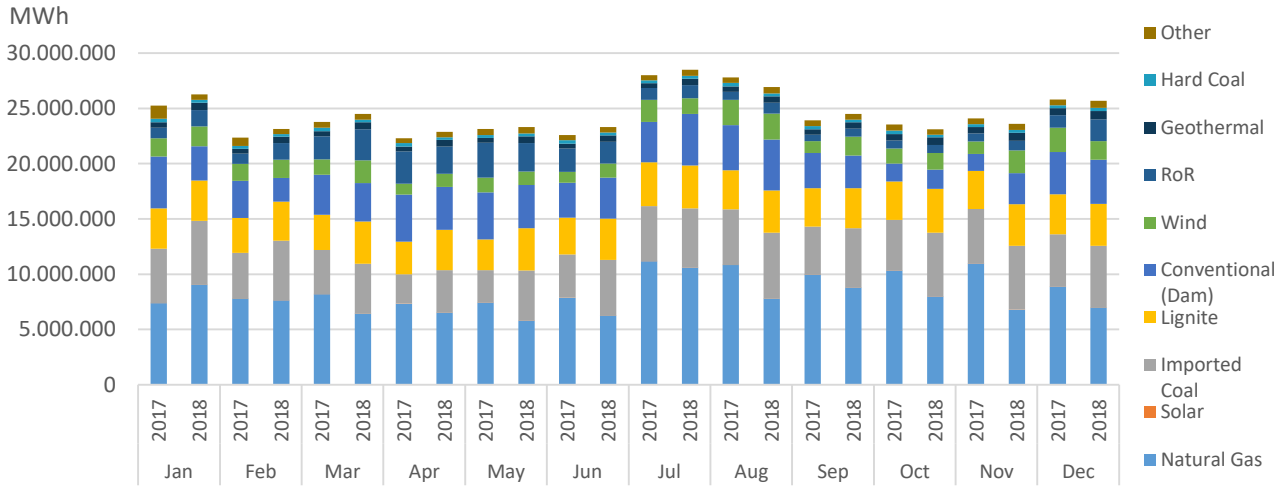


Figure 67: Generation Figures by Energy Sources, 2017-2018

While generation of natural gas power stations decreased, generation of conventional (dam) power stations and imported coal-fired power stations increased in 2018 comparing to 2017.

8.7.3. Electricity Generation by Electric Utilities in 2018

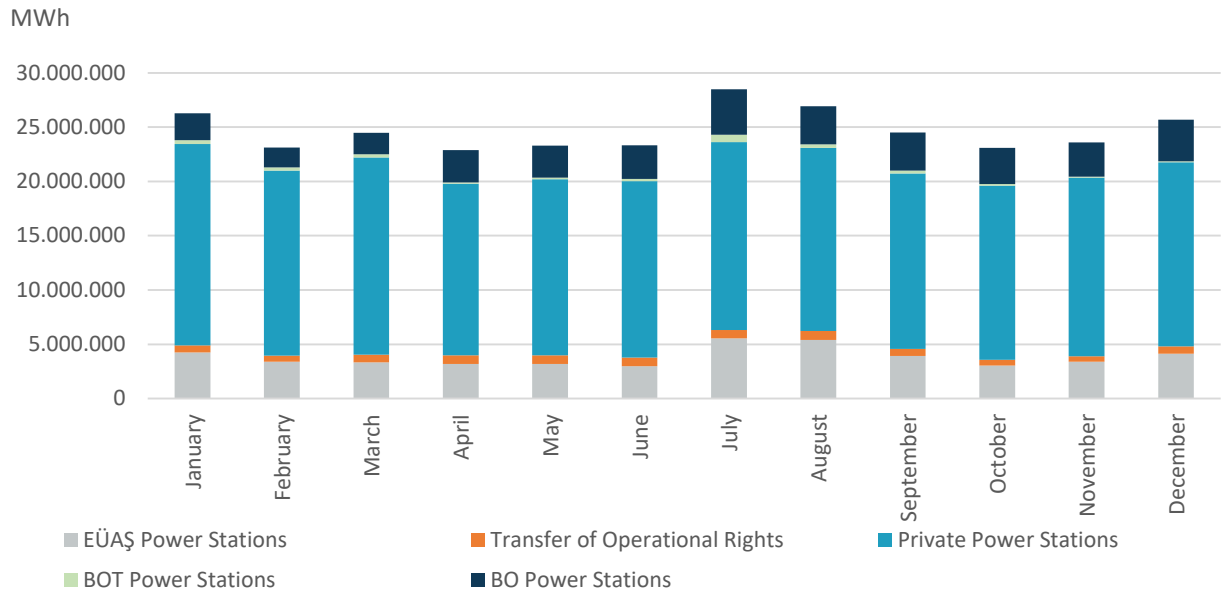


Figure 68: Electricity Generation by Electric Utilities in 2018

Shares of state owned utilities in power generation is 15%, while share of private utilities in power generation is 85% in 2018.

8.8. Annual Electricity Generation by Cities

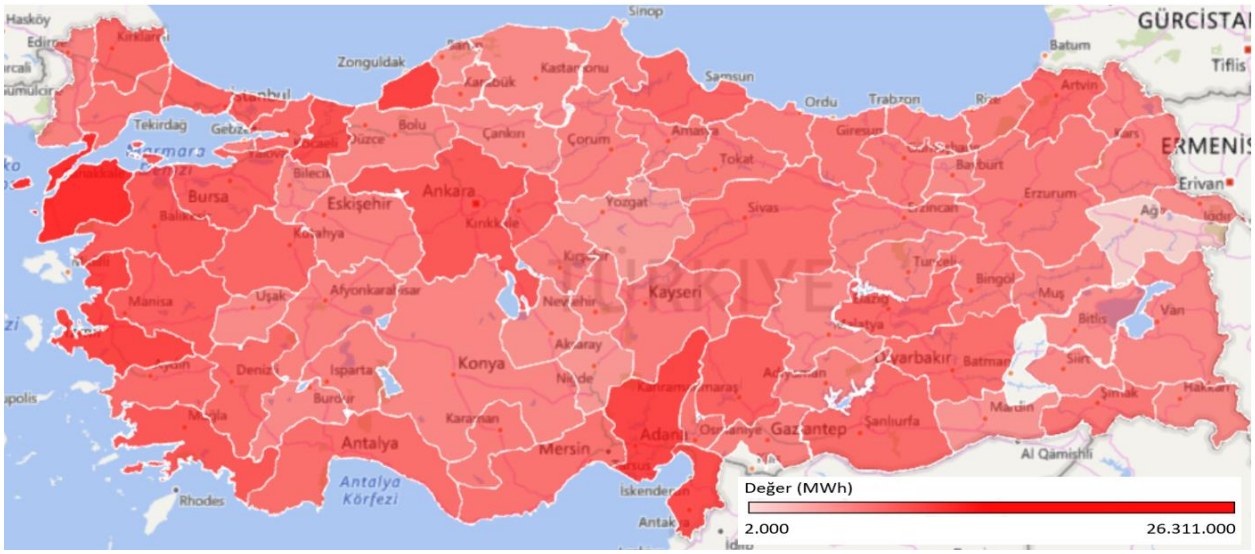


Figure 69: Annual Electricity Generation by Cities in 2018

As for yearly generation figures by cities in Turkey, Çanakkale, Zonguldak, İzmir, Adana and Hatay were top five cities in electricity generation respectively.

8.9. Monthly Volumes of Electricity Import-Export

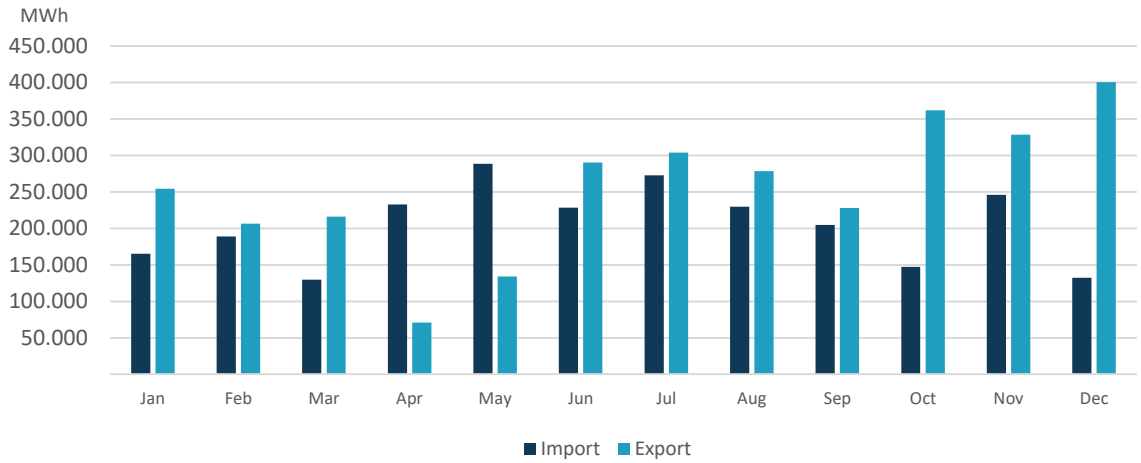


Figure 70: Import-Export of Electricity Trade on a monthly basis in 2018

Total volume of import of electricity was 2.466.009 MWh and total volume of export was 3.073.601 MWh in 2018. During 2018, the largest volume of electricity import was 288.626 MWh in May, whereas the largest volume of electricity export was 400.387 MWh in December.

FIGURES

TABLES

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