MAG-MMAR-2018-06

MONTHLY MARKET ASSESSMENT REPORT

For the Billing Period 26 May to 25 June 2018

PHILIPPINE ELECTRICITY MARKET CORPORATION

MARKET ASSESSMENT GROUP (MAG)

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EXECUTIVE SUMMARY

This monthly report assesses the results of the WESM operation for the June 2018 billing period (26 May to 25 June 2018) and how the market performed compared with the same billing month in the previous month and year.

The June 2018 billing month observed a wider supply margin at 2,050 MW from previous month's 1,851 MW with the lower demand following the onset of the wet season. Consequently, market prices decreased to an average of PhP4,073/MWh coming from PhP4,105/MWh in the previous month. Year-on-year, this month's average price was higher by 19.3 percent when compared to PhP3,414/MWh in the previous year.

System demand decreased to an average of 9,898 MW, which was 4.9 percent lower than previous month's 10,410 MW going into the rainy month of June. This was however higher by 2.7 percent when compared to previous year's 9,640 MW. System-wide reserve schedule averaged at 846 MW. Accordingly, the demand plus reserve schedule averaged at 10,743 MW, posting a decrease of 5.2 percent from last month's 11,331 MW.

Meanwhile, effective supply decreased by 2.9 percent to an average of 12,794 MW this month from previous month's 13,182 MW due to higher level of outage capacity which averaged at 2,122 MW from 1,711 MW in May. On the other hand, this month's average effective supply was higher by 6.4 percent from previous year's 12,022 MW.

The WESM recorded a registered capacity of 18,774 MW by the end of the June billing month, higher than last month by 17 MW. Changes in the respective registered capacity of Masinloc CFTPP unit 2 (from 315 MW to 344 MW), CPPC DPP (70 MW to 64 MW) and EAUC DPP (49.6 to 43.5 MW) were noted.

The market shares when calculated based on registered capacity was dominated by four (4) major namely San Miguel Corporation (SMC) group with market share of 23.1 percent, Aboitiz Power (AP) group with 21.1 percent, First Gen Corporation (FGC) group with 15.3 percent, and Power Sector Asset and Liabilities Management (PSALM) with 11.3 percent. When measured in terms of offered capacity, SMC likewise held the largest share with 29.8 percent followed by AP with 20 percent and FGC with 18.9 percent. When measured in terms of actual generation, SMC group still held the highest market share at 31.8 percent followed by AP with 19.7 and FGC with 18.9 percent.

Meanwhile, the Herfindahl-Hirschman Index (HHI) calculated by major participants' grouping indicated a moderately concentrated market based on registered capacity throughout the June billing month. Meanwhile, when measured in terms of offered capacity, 391 trading intervals (52.6 percent of the time) showed a moderately concentrated market while the remaining 353 trading intervals (47.4 percent) showed a concentrated market. On the other hand, HHI calculation based on actual generation indicated a concentrated market more frequently at 583 trading intervals (78.4 percent) while the remaining 161 trading intervals (21.6 percent) indicated a moderately concentrated market.

Table of Contents

List of Figures

List of Tables

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This monthly report assesses the results of the WESM operation for the June 2018 billing period (26 May to 25 June 2018) and how the market performed compared with the same billing month in the previous month and year.

I. Capacity Profile

The WESM recorded a registered capacity of 18,774 MW by the end of the June billing month, higher than last month by 17 MW. Changes in the respective registered capacity of Masinloc CFTPP unit 2 (from 315 MW to 344 MW), CPPC DPP (70 MW to 64 MW) and EAUC DPP (49.6 to 43.5 MW) were noted.

Of the said WESM registered capacity, about 68 percent (previous month's 70 percent) or an average of 12,735 MW was offered in the market during the month. Outage capacity (11 percent) posted a higher average this month at 2,122 MW coming from 1,711 MW in the previous month. Meanwhile, 12 percent was attributable to capacity not offered in the market which averaged at 2,303 MW.

On the other hand, preferential[1] and non-scheduled capacities averaged 1,500 MW, comprising about 8 percent of the total registered capacity. Lastly, an average of 300 MW or about 1 percent of the WESM registered capacity was attributed to the capacity designation of Malaya TPP as Must Run Unit (MRU), in cases of supply shortfall and to address system security.

Figure 1. Capacity Profile (Ex-ante), June 2018

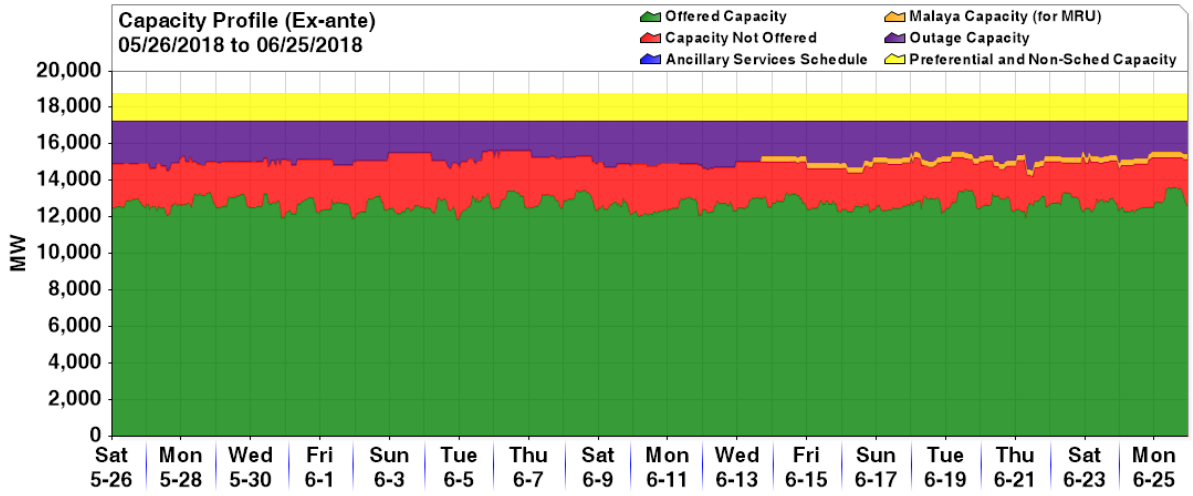


Table 1. Capacity Profile (Ex-ante), June 2018

	June 2018 (In MW)		May 2018 (In MW)		June 2017 (In MW)		% M-on-M Change (May 2018 - Jun 2018)	% Y-on-Y Change (Jun 2017 - Jun 2018)
	Avg MW	% of RegCap	Avg MW	% of RegCap	Avg MW	% of RegCap		
Registered Capacity (end of month)	18,774		18,757		17,748		0.1	5.8
Offered Capacity	12,735	68	13,070	70	12,051	68	(2.6)	5.7
Outage Capacity	2,122	11	1,711	9	1,561	9	24.0	35.9
Capacity Not Offered	2,303	12	2,197	12	2,042	12	4.8	12.8
Ancillary Services Schedule					89	1		(100.0)
Malaya Capacity for MRU	300	1	349	1	602	3	(13.9)	(50.1)
Preferential and Non-Scheduled Capacity	1,500	8	1,500	8	1,377	8	0.0	9.0

[1] Preferential capacity refers to the combined registered capacities of priority dispatch and must dispatch generating units.

II. Demand and Supply Situation

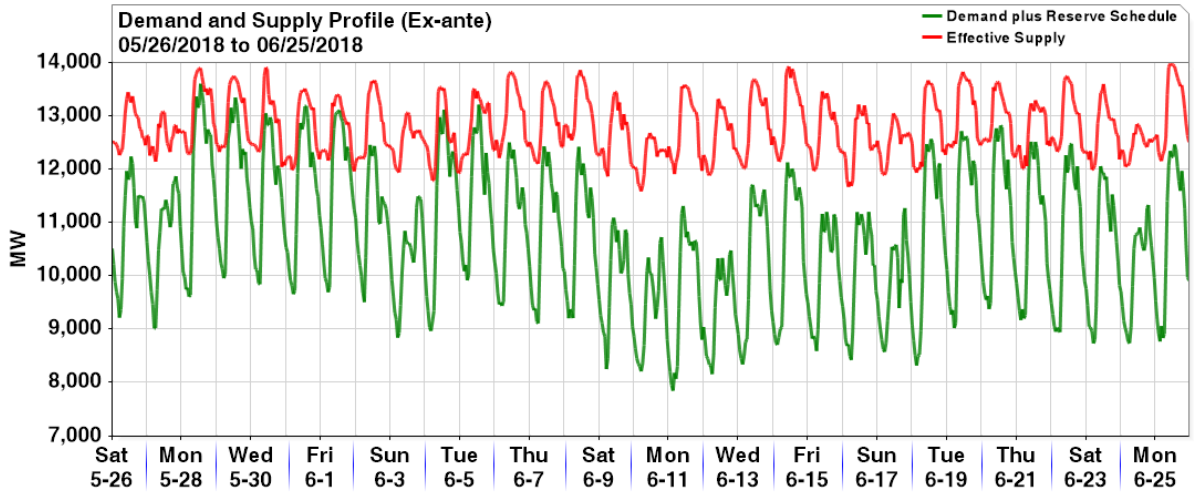
With the onset of the rainy season, system demand[2] declined to an average of 9,898 MW from previous month's 10,410 MW. Demand during the week 11 to 17 June was relatively low averaging at 9,032 MW following the holiday declaration on 12 June (Independence Day) and 15 June (Eid'l Fitr or Feast of Ramadan). Year-on-year, this month's average demand was 2.7 percent higher than previous year's average at 9,640 MW.

With the implementation of the central scheduling and dispatch of energy and contracted reserves in Luzon beginning 22 December 2015, and in Visayas beginning 07 October 2017, the level that the supply has to fill up is higher as it also has to sufficiently meet the reserve schedule which averaged at 846 MW. Accordingly, the demand plus reserve schedule averaged at 10,743 MW, demonstrating a 5.2 percent decrease from last month's 11,331 MW.

Effective supply[3] was similarly lower this month at 12,794 MW when compared to previous month's 13,182 MW attributable to the higher level of outage capacity. Weekly average effective supply ranged from 12,730 MW (11 to 17 June) up to 12,846 MW (28 May to 3 June). This month's average was 6.4 percent higher than previous year's 12,022 MW.

Following the higher rate of decrease in demand than supply, wider supply margin[4] was recorded this month at 2,050 MW coming from previous month's 1,851 MW. Lowest supply margin recorded was 118 MW on 5 June at 1400H following the high demand requirement. Weekly average supply margin ranged from 1,405 MW (28 May to 3 June) to 2,729 MW (11 to 17 June). This month's average supply margin was 32 percent higher than previous year's 1,553 MW.

Figure 2. Demand and Effective Supply (Ex-ante), June 2018



[2] Demand is equal to the total scheduled MW of all load resources in Luzon and Visayas plus losses.
[3]The system effective supply is equal to the offered capacity of all scheduled generator resources, nominated loading level of non-scheduled generating units and projected output of preferential dispatch generating units adjusted for any security limit and ramp rates. Scheduled output of plants on testing and commissioning, through the imposition of security limit by SO, are accounted for in the effected supply. Likewise included is the scheduled output of Malaya plant when it is called to run as Must Run Unit (MRU).
[4]The supply margin is equal to the effective supply less system demand requirement plus reserve schedule.

Table 2. Demand and Supply Summary (Ex-ante), June 2018, May 2018, and June 2017

	June 2018 (In MW)			May 2018 (In MW)			June 2017 (In MW)			% M-on-M Change (May 2018 - Jun 2018)			% Y-on-Y Change (Jun 2017 - Jun 2018)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Demand	12,751	7,127	9,898	12,689	7,433	10,410	11,886	6,709	9,640	0.5	(4.1)	(4.9)	7.3	6.2	2.7
Reserve Schedule	1,321	386	846	1,359	323	922	1,193	371	828	(2.8)	19.7	(8.3)	10.8	4.0	2.1
Demand plus R/S	13,605	7,855	10,743	13,862	8,370	11,331	12,735	7,594	10,468	(1.9)	(6.2)	(5.2)	6.8	3.4	2.6
Effective Supply	13,980	11,590	12,794	14,724	11,571	13,182	13,786	10,597	12,022	(5.1)	0.2	(2.9)	1.4	9.4	6.4
Supply Margin	4,265	118	2,050	4,290	88	1,851	3,573	54	1,553	(0.6)	33.9	10.8	19.4	117.4	32.0

Note: The derived values were non-coincident.

Table 3. Weekly Demand and Supply Summary (Ex-ante), June 2018

	26 to 27 May 2018 (in MW)			28 May to 3 June 2018 (in MW)			4 to 10 June 2018 (in MW)			11 to 17 June 2018 (in MW)			18 to 24 June 2018 (in MW)			25 June 2018 (in MW)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Demand	11,374	8,190	9,988	12,751	8,047	10,630	12,524	7,507	9,998	10,868	7,127	9,032	11,938	7,450	9,903	11,529	7,955	9,908
Reserve Schedule	1,022	726	870	1,144	435	811	1,107	386	705	1,312	578	969	1,321	586	883	1,095	715	899
Demand plus R/S	12,242	9,025	10,858	13,605	8,850	11,440	13,213	8,218	10,703	12,131	7,855	10,001	12,824	8,328	10,786	12,466	8,777	10,806
Effective Supply	13,447	12,146	12,709	13,909	11,946	12,846	13,860	11,590	12,757	13,927	11,674	12,730	13,828	11,940	12,817	13,980	12,158	13,133
Supply Margin	3,258	879	1,851	3,130	201	1,405	3,719	118	2,054	4,265	1,354	2,729	3,613	580	2,030	3,457	1,457	2,326

III. Power Plant Outages

System-wide outage capacity posted an increase to 2,122 MW from previous month's 1,711 MW. This was driven by the increases in average outage capacity involving coal plants, from previous month's 493 MW to current month's 663 MW, and oil-based plants, from previous month's 404 MW to current month's 558 MW.

Outage capacity reached a high of 2,739 MW on 27 May from 1500H to 1600H following the forced outage of Sta. Rita NGPP unit 3 on top of the outages of major plants Malaya TPP units 1 and 2, SLPGC CFTPP unit 1, Calaca CFTPP unit 2, San Roque unit 1, 2, and 3, and units of Makban GPP and Palinpinon GPP.

Figure 3. Plant Outage Capacity (by Plant Type), June 2018

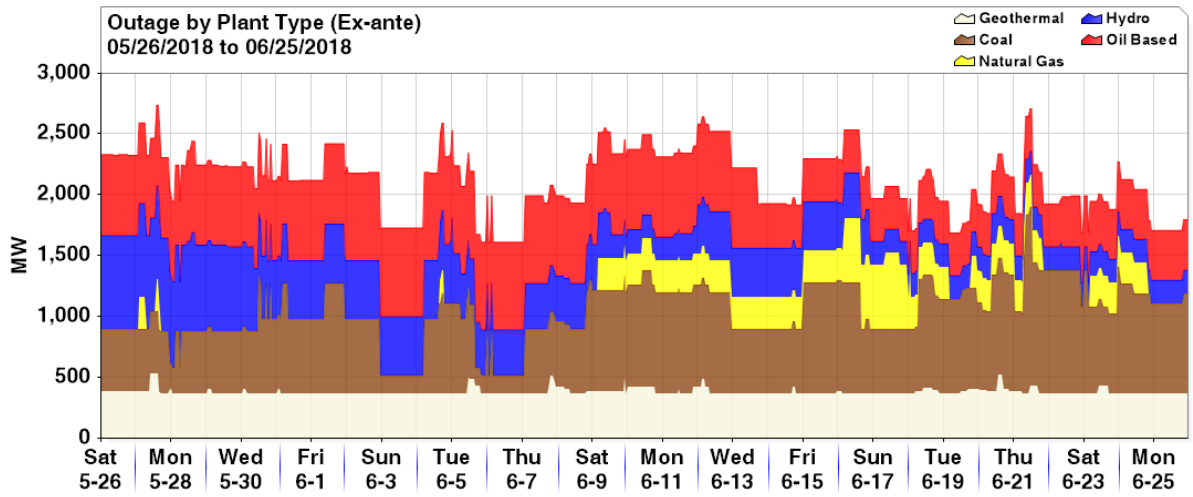


Table 4. Outage Summary (Ex-ante), June 2018, May 2018, and June 2017

Resource Type	June 2018 (In MW)			May 2018 (In MW)			June 2017 (In MW)			% M-on-M Change (May 2018 - Jun 2018)			% Y-on-Y Change (Jun 2017 - Jun 2018)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Coal	1,474	150	663	1,263	150	493	1,382	103	573	16.7	0.0	34.6	6.6	45.6	15.7
Natural Gas	627	0	136	600	0	70	529	0	227	4.5		95.1	18.6		(40.0)
Geothermal	533	367	380	439	290	332	505	289	363	21.4	26.6	14.5	5.5	27.0	4.6
Hydro	815	195	385	733	255	413	675	50	314	11.3	(23.5)	(6.8)	20.7	290.0	22.9
Oil Based	770	350	558	804	4	404	335	23	84	(4.2)	8,233.3	38.1	130.0	1,421.7	563.0
TOTAL	**2,739**	**1,612**	**2,122**	**3,124**	**995**	**1,711**	**2,250**	**905**	**1,561**	(12.3)	62.1	24.0	21.7	78.1	35.9

Luzon

Luzon's average outage capacity, which accounted for 95 percent of the system-wide outage capacity, likewise observed an increase to current month's 2,026 MW coming from previous month's 1,622 MW. This was driven by higher coal plants' outage capacity, from previous month's 468 MW to current month's 635 MW, which was mainly attributable to the planned outage of Pagbilao CFTPP unit 2 beginning 7 June. In addition, QPPL CFTPP underwent forced outage from 30 May to 2 June while Calaca CFTPP unit 1 underwent maintenance outage from 8 to 12 June on top of the existing forced outage of SLPGC CFTPP unit 1 since 6 March.

Oil-based plants similarly observed a higher average at 550 MW from 399 MW in May related to the forced outage of Malaya TPP unit 2 since 19 May as well as the maintenance outage of Malaya TPP unit 1 from 3 May to 13 June.

On the other hand, hydro plants' outage capacity averaged at 385 MW which mainly involved the planned outages of San Roque HEP unit 3 from 12 March, Angat M HEP from 29 January, San Roque HEP units 1 and 2 from 26 May to 5 June, and Kalayaan PSPP from 12 to 16 June and maintenance outage of Pantabangan HEP unit 2 from 23 April. Meanwhile, geothermal plants' average outage capacity was recorded at 319 MW related to the maintenance outage of Tiwi GPP unit C, deactivated shutdown of units of Tiwi GPP unit B and Makban GPP unit C and forced outages of Tiwi GPP unit A and another unit of Makban GPP unit C.

Meanwhile, natural gas plants' outage capacity averaged at 136 MW (from previous month's 70 MW) which was mainly attributable to the maintenance outage of San Lorenzo NGPP unit 2 from 9 to 19 June.

Figure 4. Plant Outage Capacity (by Plant Type), Luzon – June 2018

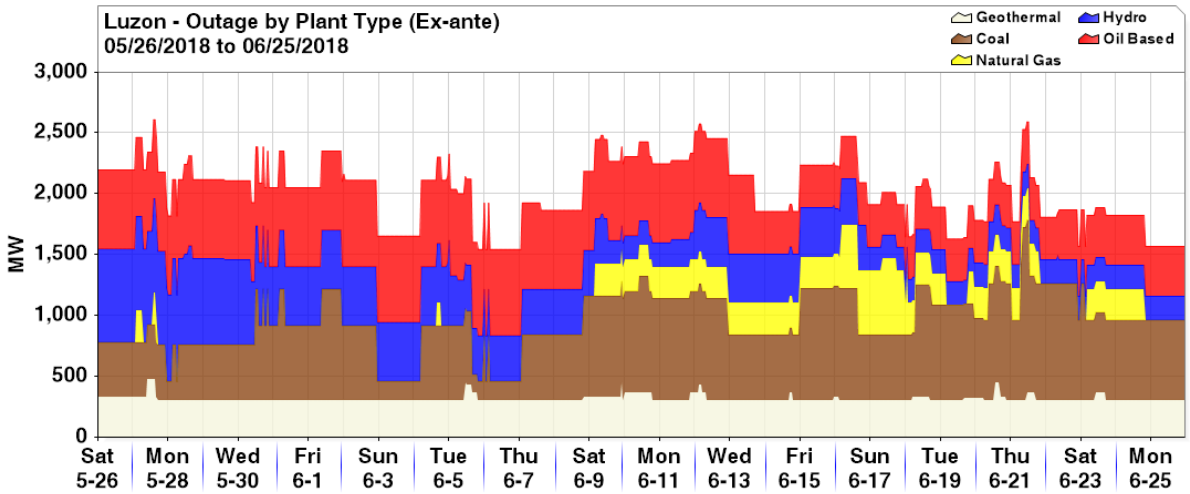


Table 5. Luzon Outage Summary (Ex-ante), June 2018, May 2018, and June 2017

Resource Type	June 2018 (In MW)			May 2018 (In MW)			June 2017 (In MW)			% M-on-M Change (May 2018 - Jun 2018)			% Y-on-Y Change (Jun 2017 - Jun 2018)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Coal	1,414	150	635	1,247	150	468	1,279	0	524	13.4	0.0	35.6	10.5		21.2
Natural Gas	627	0	136	600	0	70	529	0	227	4.5		95.1	18.6		(40.0)
Geothermal	476	310	319	336	233	271	356	233	282	41.7	33.1	17.7	33.7	33.1	13.2
Hydro	815	195	385	733	255	413	675	50	314	11.3	(23.5)	(6.8)	20.7	290.0	22.9
Oil Based	760	350	550	800	0	399	329	23	82	(5.0)		37.9	131.4	1,421.7	573.3
TOTAL	**2,611**	**1,545**	**2,026**	**2,973**	**938**	**1,622**	**2,089**	**733**	**1,429**	(12.2)	64.7	24.9	25.0	110.8	41.8

Note: The derived values by resource type were non-coincident. The total values were derived based on aggregate hourly outage.

Table 6. Major Plant Outages, Luzon – June 2018

Plant Type	Plant/ Unit Name	Capacity (MW)	Date Out	Date In	Duration (Days)	Outage Type	Remarks	Total
GEO	Tiwi 3	43.7	10/23/2005 13:26			Deactivated Shutdown	Tiwi 3 decommissioned since May 26 2009	744
GEO	Makban 6	55	04/11/2013 22:44			Deactivated Shutdown	Conducted gas compressor test	744
GEO	Tiwi 1	59	03/08/2017 0:07	06/05/2018 15:15	454.63	Deactivated Shutdown	Low steam supply	255
GEO	Makban 5	55	03/12/2017 1:55			Forced Outage	High turbine vibration	744
HYD	Angat M 3	50	01/29/2018 0:01			Planned Outage	Annual overhauling until 29 July 2018	744
COAL	SLPGC 1	150	03/06/2018 5:02			Forced Outage	On emergency shutdown due to turbine vibration	744
HYD	San Roque 3	145	03/12/2018 16:15			Planned Outage	Planned Outage. ETI 8 September 2018	744
HYD	Pantabangan 2	60	04/23/2018 8:01			Maintenance Outage	Maintenance outage until 27 May 2018	48
OIL	Malaya 1	300	05/03/2018 15:52	06/13/2018 15:36	40.99	Maintenance Outage	Maintenance outage until 20 May 2018	447
GEO	Makban 7	20	05/04/2018 10:25	06/05/2018 10:56	32.02	Forced Outage	Manually tripped for steam optimization due to insufficient steam supply caused by	250
COAL	Calaca 2	300	05/15/2018 12:06	05/27/2018 22:25	12.43	Forced Outage	Emergency shutdown due to boiler tube leak	46
GEO	Tiwi 5	57	05/18/2018 5:05			Maintenance Outage	Maintenance outage	744
OIL	Malaya 2	350	05/19/2018 13:01			Forced Outage	Burn air heater 2A	744
HYD	Kalayaan 2	180	05/23/2018 0:01	05/29/2018 20:29	6.85	Planned Outage	Planned outage until 01 June 2018	92
GEO	Makban 9	20	05/23/2018 14:08			Forced Outage	On reserve shutdown pending availability of steam supply	744
HYD	Binga 1	35	05/24/2018 8:01	05/30/2018 14:25	6.27	Maintenance Outage	Maintenance outage until 31 May 2018	110
HYD	Botocan 2	10	05/25/2018 8:00	05/29/2018 14:39	4.28	Planned Outage	Under approved maintenance	86
HYD	San Roque 1	145	05/26/2018 7:01	06/05/2018 0:01	9.71	Planned Outage	Tunnel inspection until 4 June 2018	233
HYD	San Roque 2	145	05/26/2018 7:01	06/05/2018 0:01	9.71	Planned Outage	Tunnel inspection until 4 June 2018	233
NATG	Sta. Rita 3	265.5	05/27/2018 1:11	05/27/2018 6:35	0.22	Forced Outage	Actuation of GT protection	5
NATG	Sta. Rita 3	265.5	05/27/2018 13:36	05/27/2018 16:32	0.12	Forced Outage	Emergency shutdown for rectification of GT communication	3
COAL	Calaca 2	300	05/28/2018 1:47	05/28/2018 5:04	0.14	Forced Outage	Evacuation valve trouble	4
COAL	Calaca 2	300	05/28/2018 5:59	05/28/2018 6:20	0.01	Forced Outage	Control valve trouble	1
COAL	Calaca 2	300	05/28/2018 6:28	05/30/2018 13:48	2.31	Forced Outage	Control valve trouble	55
COAL	QPPL	459	05/30/2018 10:54	06/02/2018 21:58	3.46	Forced Outage	Detached common discharge pipeline at sea water. Cooling supply system	83
COAL	Calaca 2	300	05/30/2018 19:16	05/30/2018 20:47	0.06	Forced Outage	Control valve trouble	1
COAL	Calaca 2	300	05/31/2018 2:58	05/31/2018 7:54	0.21	Forced Outage	Tripped due to rotor vibration	5
COAL	Calaca 2	300	06/01/2018 7:55	06/01/2018 21:59	0.59	Forced Outage	Tripped at 260 MW. System frequency at 59.42 Hz	14
OIL	Limay 7	60	06/02/2018 0:01	06/07/2018 14:15	5.59	Maintenance Outage	Maintenance outage until 8 June 2018	134
COAL	QPPL	459	06/04/2018 5:28	06/05/2018 15:40	1.43	Forced Outage	Repair of circulating water pump A and water box inlet	34
NATG	Ilijan A1	190	06/04/2018 13:27	06/04/2018 18:33	0.21	Forced Outage	Fuel gas pilot pressure control valve problem	5
HYD	Kalayaan 3	180	06/05/2018 0:01	06/09/2018 12:10	4.51	Planned Outage	Maintenance outage until 9 June 2018	108
GEO	Makban 8	20	06/05/2018 13:21			Forced Outage	On reserve shutdown pending availability of steam supply (steam optimization)	491
GEO	Tiwi 2	59	06/05/2018 15:29			Forced Outage	Low steam supply	489
COAL	Pagbilao 2	382	06/07/2018 2:52			Planned Outage	Maintenance outage until 5 July 2018	454
COAL	Calaca 1	300	06/08/2018 19:50	06/12/2018 22:09	4.10	Maintenance Outage	Repair of boiler tube leak at heat recovery area until 14 June 2018	99
NATG	San Lorenzo 2	261.8	06/09/2018 3:29	06/19/2018 2:57	9.98	Maintenance Outage	Maintenance outage until 14 June 2018	239
COAL	SLTEC 1	121	06/10/2018 9:13	06/10/2018 16:21	0.30	Forced Outage	High furnace pressure	7
HYD	Caliraya 1	14	06/11/2018 8:01	06/15/2018 20:24	4.52	Planned Outage	Maintenance outage until 15 June 2018	108
HYD	Caliraya 2	14	06/11/2018 8:01	06/15/2018 20:24	4.52	Planned Outage	Maintenance outage until 15 June 2018	108
HYD	Kalayaan 4	180	06/12/2018 0:01	06/16/2018 19:41	4.82	Planned Outage	Planned outage until 17 June 2018	115
COAL	Pagbilao 1	382	06/15/2018 0:57	06/16/2018 15:36	1.61	Maintenance Outage	Maintenance outage until 17 June 2018	39
NATG	San Lorenzo 1	264.8	06/16/2018 4:12	06/18/2018 1:01	1.87	Maintenance Outage	Maintenance outage until 17 June 2018	45
NATG	Avion 1	50.3	06/17/2018 8:01	06/17/2018 16:59	0.37	Maintenance Outage	Maintenance outage	8
NATG	Avion 2	50.3	06/17/2018 8:01	06/17/2018 16:59	0.37	Maintenance Outage	Maintenance outage	8
COAL	SLPGC 2	150	06/18/2018 6:14	06/18/2018 17:19	0.46	Forced Outage	Affected by the tripping of Calaca-Salong Line	11
COAL	SLTEC 1	121	06/18/2018 6:14	06/19/2018 22:09	1.66	Forced Outage	Isolated due to trippng Calaca-Salong Line	40
COAL	SLTEC 2	122.9	06/18/2018 6:14			Forced Outage	Isolated due to trippng Calaca-Salong Line	186
NATG	San Lorenzo 2	261.8	06/19/2018 18:48	06/21/2018 19:45	2.04	Forced Outage	Turbine bearing high temperature	49
COAL	Calaca 2	300	06/20/2018 8:36	06/21/2018 0:08	0.65	Forced Outage	Tripped at 280MW load	16
COAL	QPPL	459	06/21/2018 6:29	06/21/2018 12:53	0.27	Forced Outage	Turbine trouble	6
COAL	Calaca 2	300	06/21/2018 7:27	06/22/2018 21:10	1.57	Forced Outage	Tripped at 280MW load	38
OIL	Limay 3	60	06/22/2018 8:01			Planned Outage	Maintenance outage until 23 October 2018	88
COAL	Calaca 2	300	06/22/2018 23:23	06/23/2018 2:33	0.13	Forced Outage	Turbine IP valve oil leak	3
NATG	Sta. Rita 2	255.7	06/23/2018 4:31	06/24/2018 20:36	1.67	Maintenance Outage	Maintenance outage until 24 June 2018	40
COAL	SMC 2	150	06/25/2018 23:46			Maintenance Outage	Maintenance outage until 18 July 2018	1

Visayas

On a similar note, the Visayas region also posted an increase in average outage capacity at 96 MW (5 percent of system-wide outage capacity) coming from 90 MW in the previous month. This was mainly driven by the increase in coal plants' average outage capacity from 24 MW to 28 MW largely attributable to the forced outages of TPC Sangi CFTPP unit 1, CEDC CFTPP unit 2. Similarly, oil-based plants' outage capacity recorded an increase from previous month's 5 MW to current month's 7 MW, following the forced outages of Calumangan DPP unit 5 from 29 May to 14 June and a unit of Bohol DPP from 31 May to 16 June.

Visayas geothermal plants' outage capacity averaged at 61 MW this month which were still related to the forced outages of Leyte A GPP units and Palinpinon GPP unit 2.

Figure 5. Plant Outage Capacity (by Plant Type), Visayas – June 2018

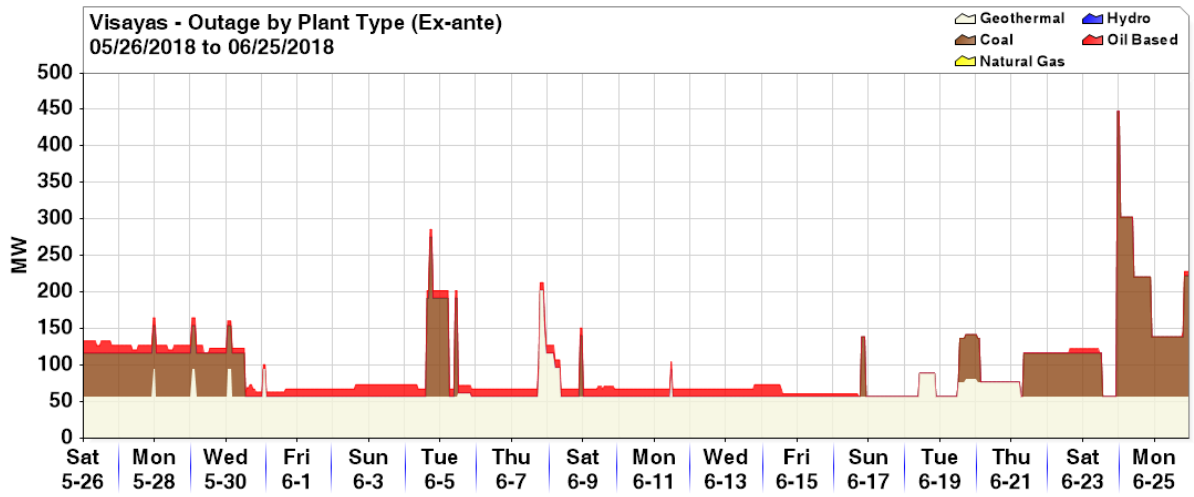


Table 7. Visayas Outage Summary (Ex-ante), June 2018, May 2018, and June 2017

Resource Type	June 2018 (In MW)			May 2018 (In MW)			June 2017 (In MW)			% M-on-M Change (May 2018 - Jun 2018)			% Y-on-Y Change (Jun 2017 - Jun 2018)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Coal	391	0	28	142	0	24	103	0	49	175.4		15.7	279.6		(42.9)
Geothermal	203	57	61	129	57	60	272	52	81	57.2	0.0	0.5	(25.4)	9.6	(25.3)
Oil Based	16	0	7	26	0	5	20	0	2	(37.4)		47.4	(19.6)		209.4
TOTAL	448	57	96	240	57	90	379	56	133	86.4	0.0	7.2	18.1	1.8	(27.6)

Table 8. Major Plant Outages, Visayas – June 2018

Plant Type	Plant/ Unit Name	Capacity (MW)	Date Out	Date In	Duration (Days)	Outage Type	Remarks
GEO	PGPP2 Unit 4	20	06/27/2014 6:07			Forced Outage	Steam being utilized by Nasulo plant
GEO	Upper Mahiao 1	32	12/07/2017 9:10			Forced Outage	Cut out from the system to facilitate PMS. Foced outage since no approved PUSSR
GEO	Mahanagdong B1	5	04/05/2018 22:32			Forced Outage	Due to high vibration
COAL	TPC Sangi 1	60	05/23/2018 20:20	05/30/2018 12:02	6.65	Forced Outage	Boiler no 7 tube leak
OIL	Bohol 4	4	05/25/2018 10:08	05/28/2018 8:25	2.93	Forced Outage	High EGT at cylinder no 7
GEO	PGPP1 Unit 1	37.5	05/27/2018 20:40	05/28/2018 0:08	0.14	Forced Outage	Auto tripped. On going investigation
GEO	PGPP1 Unit 2	37.5	05/29/2018 0:08	05/29/2018 3:36	0.14	Maintenance Outage	Offline. To conduct speed drop adjustment and governor control valve characteristic
OIL	CENPRI 5	6.4	05/29/2018 12:18	06/14/2018 13:02	16.03	Forced Outage	Offline. Under test and commissioning
GEO	PGPP1 Unit 1	37.5	05/30/2018 0:07	05/30/2018 3:16	0.13	Maintenance Outage	Offline to conduct speed drop adjustment and governor control valve characteristics
GEO	PGPP1 Unit 3	37.5	05/31/2018 0:15	05/31/2018 2:41	0.10	Maintenance Outage	Offline to conduct adjustment of generator speed droop setting complying PGC requ
OIL	Bohol 4	4	05/31/2018 23:33	06/16/2018 16:10	15.69	Forced Outage	Abnormal sound on the engine
COAL	PALM 1	135	06/04/2018 14:03	06/05/2018 5:13	0.63	Forced Outage	High frequency due to submarine cable tripping
COAL	PEDC 2	83.7	06/04/2018 14:04	06/04/2018 18:38	0.19	Forced Outage	Auto tripped due to an internal problem
COAL	PALM 1	135	06/05/2018 9:20	06/05/2018 11:30	0.09	Forced Outage	Auto tripped due to internal trouble
GEO	Mahanagdong A1	5	06/05/2018 11:29	06/05/2018 20:25	0.37	Forced Outage	Under assessment
GEO	PGPP1 Unit 2	37.5	06/05/2018 18:49	06/05/2018 20:14	0.06	Forced Outage	Due to earthquake
GEO	Nasulo	48.3	06/07/2018 17:04	06/07/2018 21:21	0.18	Forced Outage	Affected by tripping of 138 kV Amlan-PGPP2 Line 1 and 2
GEO	PGPP1 Unit 1	37.5	06/07/2018 17:04	06/07/2018 19:55	0.12	Forced Outage	Affected by tripping of 138 kV Amlan-PGPP2 Line 1 and 2
GEO	PGPP1 Unit 2	37.5	06/07/2018 17:04	06/07/2018 22:16	0.22	Forced Outage	Affected by tripping of 138 kV Amlan-PGPP2 Line 1 and 2
GEO	PGPP2 Unit 1	20	06/07/2018 17:04	06/08/2018 8:23	0.64	Forced Outage	Affected by tripping of 138 kV Amlan-PGPP2 Line 1 and 2
GEO	PGPP2 Unit 2	20	06/07/2018 17:04	06/08/2018 7:56	0.62	Forced Outage	Affected by tripping of 138 kV Amlan-PGPP2 Line 1 and 2
GEO	PGPP2 Unit 3	20	06/07/2018 17:04	06/08/2018 4:05	0.46	Forced Outage	Affected by tripping of 138 kV Amlan-PGPP2 Line 1 and 2
COAL	PEDC 1	83.7	06/08/2018 20:11	06/08/2018 23:53	0.15	Forced Outage	Cause under investigation
GEO	PGPP1 Unit 3	37.5	06/11/2018 10:35	06/11/2018 11:32	0.04	Forced Outage	Auto tripped. On going investigation
COAL	CEDC 2	82	06/16/2018 18:13	06/16/2018 21:00	0.12	Forced Outage	Clogged up coal
GEO	Upper Mahiao 2	32	06/18/2018 9:21	06/18/2018 20:24	0.46	Forced Outage	Manual cut out to rectify NCG preheater due to pentair leak
GEO	PGPP2 Unit 2	20	06/19/2018 10:36	06/21/2018 5:27	1.79	Forced Outage	Auto tripped due to vacuum pump trouble
COAL	TPC Sangi 1	60	06/19/2018 12:23	06/20/2018 2:40	0.60	Forced Outage	Affected by tripping of CARCON line 2
GEO	Mahanagdong A1	7	06/19/2018 16:41			Forced Outage	Tripped. Under assessment
COAL	TPC Sangi 1	60	06/21/2018 7:23	06/23/2018 12:06	2.20	Forced Outage	Relief valve calibration
COAL	CEDC 1	82	06/23/2018 22:18	06/24/2018 9:28	0.47	Forced Outage	Affected by tripping of 138kV Colon-Calungcalung line
COAL	CEDC 2	82	06/23/2018 22:18			Forced Outage	Affected by tripping of 138kV Colon-Calungcalung line
COAL	CEDC 3	82	06/23/2018 22:18	06/24/2018 21:16	0.96	Forced Outage	Affected by tripping of 138kV Colon-Calungcalung line
COAL	TPC Sangi 2	85	06/23/2018 22:18	06/24/2018 0:38	0.10	Forced Outage	Affected by tripping of 138kV Colon-Calungcalung line
COAL	TPC Sangi 1	60	06/23/2018 22:45	06/23/2018 23:59	0.05	Forced Outage	Affected by tripping of 138kV Colon-Calungcalung line
OIL	Cebu Diesel 5	6	06/25/2018 18:24			Forced Outage	Abnormal sound at turbo charger b-bank

a. Outage Capacity by Outage Category

Based on outage category, bulk of the outage events were forced, averaging at 952 MW, which was higher than previous month's 745 MW (Table 9). On a similar note, increases were noted in average planned outage capacity, from previous month's 401 MW to current month's 607

MW, and average maintenance outage capacity, from previous month's 403 MW to current month's 435 MW.

On the other hand, average deactivated shutdown outage capacity decreased to 119 MW from 158 MW.

Figure 6. Plant Outage Capacity (by Outage Category), June 2018

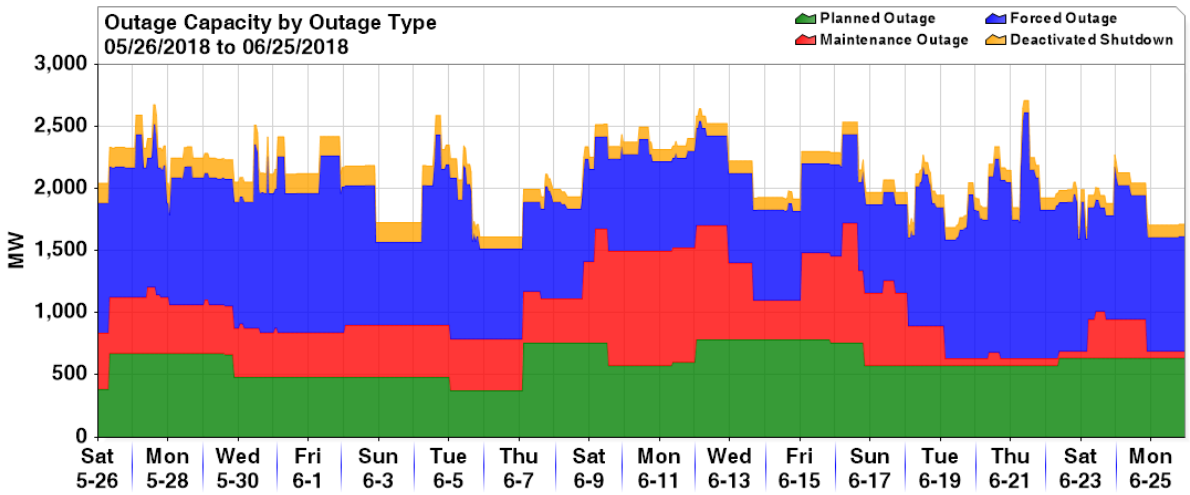


Table 9. Outage Summary, by Outage Category, June 2018, May 2018, and June 2018

Resource Type	June 2018 (In MW)			May 2018 (In MW)			June 2017 (In MW)			% M-on-M Change (May 2018 - Jun 2018)			% Y-on-Y Change (Jun 2017 - Jun 2018)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Planned	785	375	607	1,390	195	401	951	335	530	(43.5)	92.3	51.2	(17.5)	11.8	14.5
Maintenance	966	57	435	1,064	206	403	412	0	127	(9.2)	(72.3)	8.0	134.5		242.0
Forced	1,978	668	952	1,596	282	745	1,648	180	632	23.9	137.0	27.8	20.0	272.4	50.6
Deactivated Shutdown	158	99	119	158	158	158	311	208	268	0.0	(37.4)	(24.5)	(49.2)	(52.5)	(55.6)

Similar to system-wide figures, forced outages contributed most of the outage capacity in Luzon, at an average of 856 MW this billing month. This mainly involved Malaya TPP unit 2 and SLPGC CFTPP unit 1 which underwent forced outages since 19 May and 6 March, respectively. On the other hand, planned outages followed with an average of 607 MW attributable to Pagbilao CFTPP unit 2 since 7 June and San Roque HEP unit 3 since 12 March.

Meanwhile, maintenance outage capacity averaged at 434 MW attributed to the outage of Malaya TPP unit 1 beginning 3 May. Similar with the previous month, Tiwi GPP units A and B and Makban GPP unit C were the main contributors of the capacity on deactivated shutdown, which averaged at 119 MW this month.

Figure 7. Plant Outage Capacity (by Outage Category), Luzon – June 2018

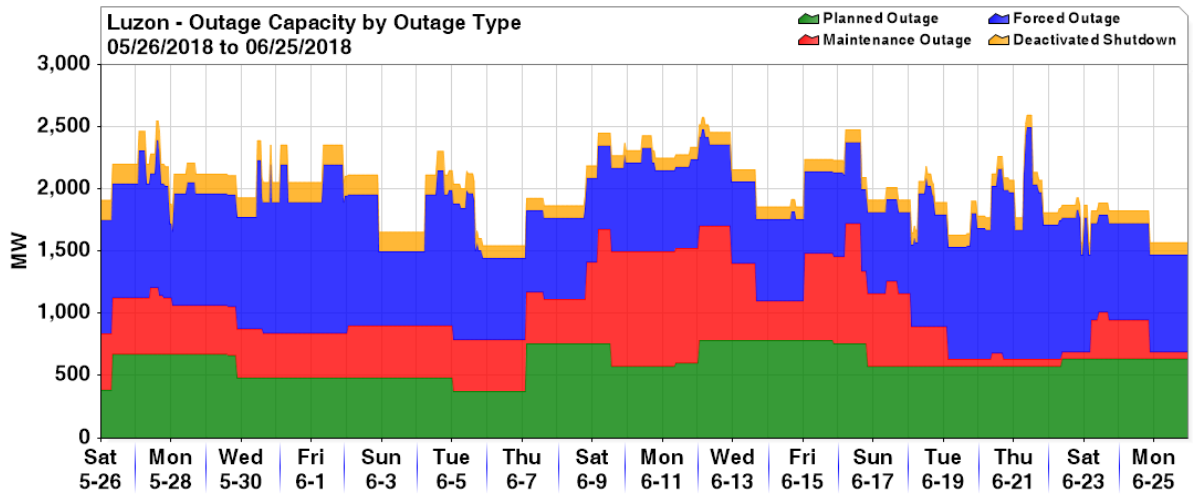


Table 10. Outage Summary, by Outage Category, Luzon – June 2018, May 2018, and June 2017

Resource Type	June 2018 (In MW)			May 2018 (In MW)			June 2017 (In MW)			% M-on-M Change (May 2018 - Jun 2018)			% Y-on-Y Change (Jun 2017 - Jun 2018)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Planned	785	375	607	1,390	195	401	903	287	474	(43.5)	92.3	51.3	(13.1)	30.7	28.1
Maintenance	966	57	434	1,064	206	397	412	0	127	(9.2)	(72.3)	9.3	134.5		241.7
Forced	1,861	595	856	1,535	225	660	1,554	124	555	21.2	164.4	29.7	19.7	381.8	54.3
Deactivated Shutdown	158	99	119	158	158	158	311	208	268	0.0	(37.4)	(24.5)	(49.2)	(52.5)	(55.6)

Almost the entire outage capacity in the Visayas region was related to forced outages which posted an average of 96 MW this month (Table 11). This mainly involved the forced outages of URC Biomass from 25 May and Leyte A GPP (Upper Mahiao unit 1) from 7 December 2017.

Figure 8. Plant Outage Capacity (by Outage Category), Visayas – June 2018

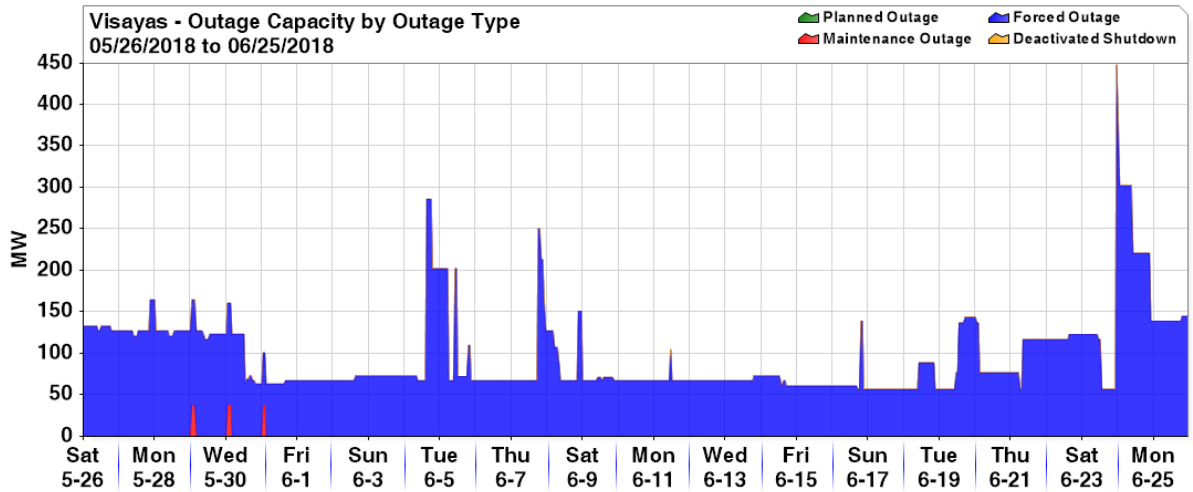


Table 11. Outage Summary, by Outage Category (Ex-ante) – Visayas, June 2018, May 2018, and June 2017

Resource Type	June 2018 (In MW)			May 2018 (In MW)			June 2017 (In MW)			% M-on-M Change (May 2018 - Jun 2018)			% Y-on-Y Change (Jun 2017 - Jun 2018)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Planned	0	0	0	0	0	0	103	0	56			(100.0)	(100.0)		(100.0)
Maintenance	38	0	0	84	0	5	0	0	0	(55.2)		(92.1)			
Forced	448	57	96	240	57	85	276	56	77	86.4	0.0	13.2	62.2	1.8	24.2

b. Outage Factor

Consistent with the discussion on outage capacity in the preceding sections, the system-wide total outage factor was higher this month at 11.4 percent when compared to previous month's 9.2 percent considering that all outage types, except for deactivated shutdown, recorded month-on-month increases (Table 12).

It was observed that forced outage factor increased from previous month's 4 percent to current month's 5.3 percent, planned outage factor increased from previous month's 2.1 percent to current month's 3.2 percent, and maintenance outage factor increased from previous month's 2.2 percent to current month's 2.3 percent.

Meanwhile, deactivated shutdown outage factor decreased to 0.6 percent this month from 0.8 percent in May.

Figure 9. Outage Factor (by Plant Type), June 2018, May 2018, and June 2017

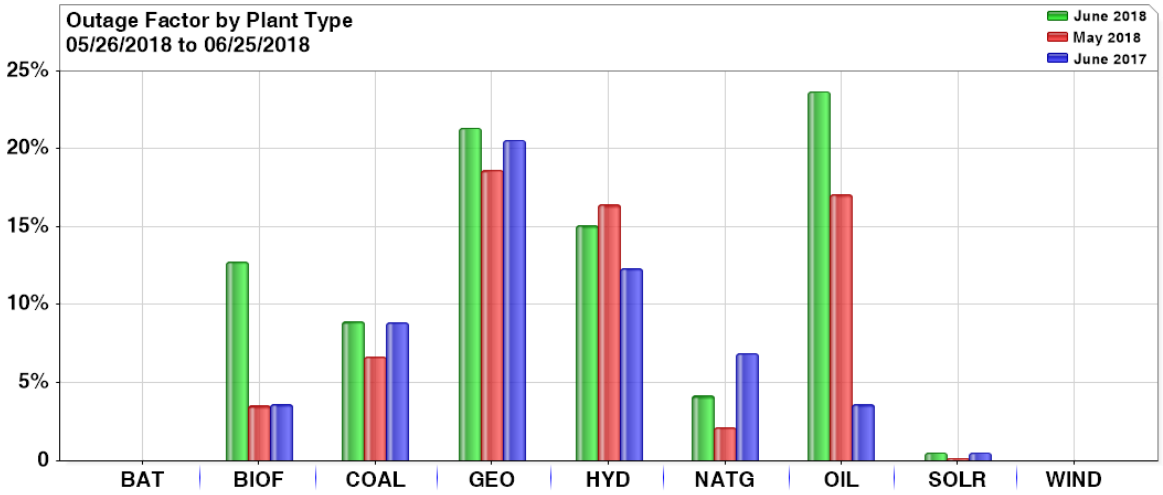


Figure 10. Outage Factor (by Outage Category), June 2018, May 2018, and June 2017

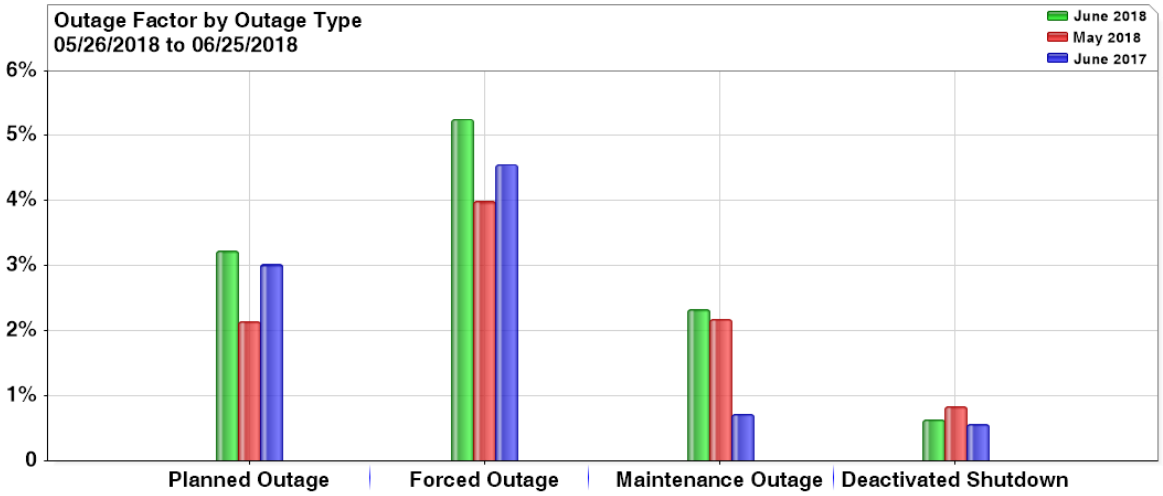


Table 12. Outage Factor, June 2018, May 2018, and June 2017

Plant Type	Total Outage Factor			Forced Outage Factor			Maintenance Outage Factor			Planned Outage Factor			D/S Outage Factor		
	June 2018	May 2018	June 2017	June 2018	May 2018	June 2017	June 2018	May 2018	June 2017	June 2018	May 2018	June 2017	June 2018	May 2018	June 2017
BAT															
BIOF	12.8	3.5	3.6	12.0	1.4	2.7	0.8	2.1	0.2			0.7			
COAL	8.9	6.6	8.9	5.0	5.7	6.7	0.8	0.3	1.0	3.1	0.6	1.1			
GEO	21.3	18.6	20.6	11.4	8.0	13.7	3.3	1.8				1.3	6.7	8.8	5.6
HYD	15.1	16.4	12.3	0.0	0.0	4.3	0.4	4.8		14.7	11.6	8.1			
NATG	4.2	2.1	6.9	0.7	0.2	0.1	3.5	0.0	0.4		1.8	6.3			
OIL	23.7	17.1	3.6	15.2	7.4	0.6	8.1	9.5	2.1	0.3	0.2	1.0			
SOLR	0.5	0.1	0.5	0.5	0.1	0.1					0.1	0.4			
WIND															
Total	**11.4**	**9.2**	**8.9**	**5.3**	**4.0**	**4.6**	**2.3**	**2.2**	**0.7**	**3.2**	**2.1**	**3.0**	**0.6**	**0.8**	**0.6**

Luzon total outage factor was recorded at 13.2 percent which was higher than previous month's 10.6 percent attributable to the higher planned outage factor this month at 4 percent (from previous month's 2.6 percent). This was driven by the increases in coal plants' planned outage factor, from previous month's 0.8 percent to current month's 3.9 percent attributable to the outage of Pagbilao CFTPP unit 2 this month. In addition, hydro plants' planned outage factor increased from previous month's 11.6 percent to current month's 14.8 percent attributable to the planned outages of San Roque HEP units 1 and 2.

Forced outage factor increased from 4.3 percent to current month's 5.6 percent driven by the oil-based plants' forced outage factor which grew to 19 percent from 9.2 percent in May attributable to the forced outage factor incurred by Malaya TPP unit 2. Maintenance outage factor likewise observed an increase, from previous month's 2.6 percent to current month's 2.8 percent, attributable to the maintenance outages of San Lorenzo NGPP unit 2 and unit of Tiwi GPP C. On the other hand, deactivated shutdown factor was recorded at 0.8 percent.

Figure 11. Outage Factor (by Plant Type), Luzon – June 2018, May 2018, and June 2017

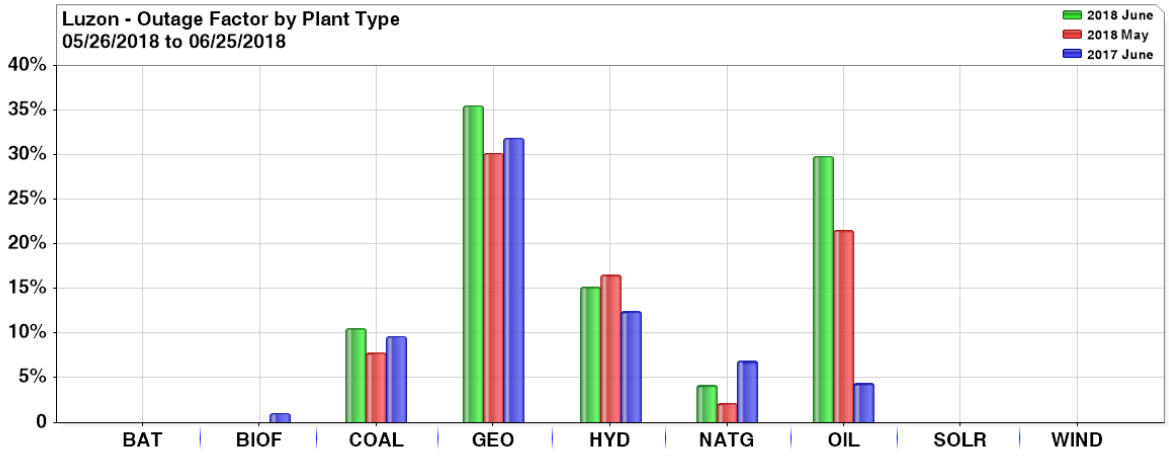


Figure 12. Outage Factor (by Outage Category), Luzon – June 2018, May 2018, and June 2017

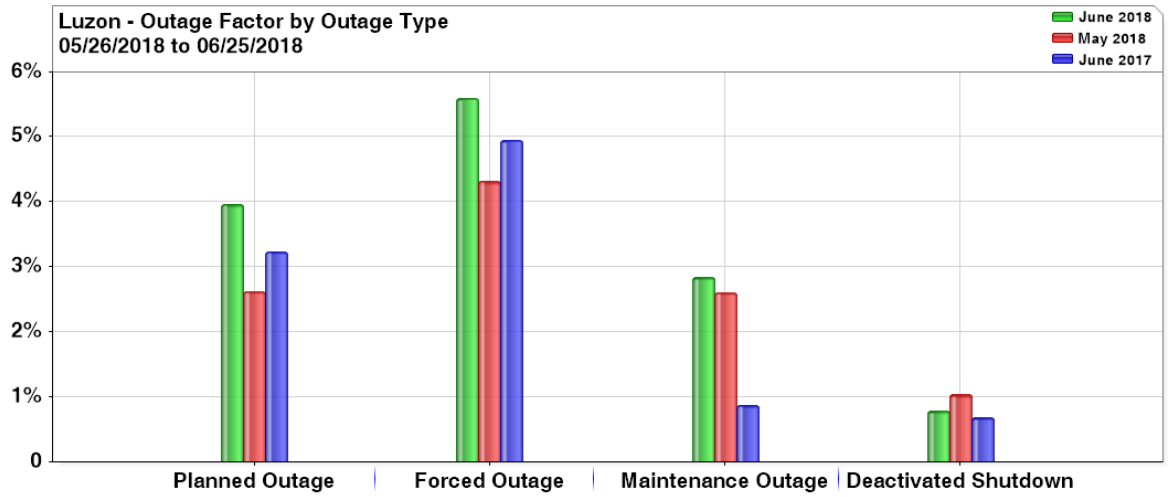


Table 13. Outage Factor, Luzon – June 2018, May 2018, and June 2017

Plant Type	Total Outage Factor			Forced Outage Factor			Maintenance Outage Factor			Planned Outage Factor			D/S Outage Factor		
	June 2018	May 2018	June 2017	June 2018	May 2018	June 2017	June 2018	May 2018	June 2017	June 2018	May 2018	June 2017	June 2018	May 2018	June 2017
BAT															
BIOF			1.0									1.0			
COAL	10.5	7.8	9.7	5.7	6.7	7.7	1.0	0.3	1.2	3.9	0.8	0.7			
GEO	35.5	30.2	31.8	15.8	9.2	20.7	6.5	3.5					13.2	17.5	11.1
HYD	15.2	16.5	12.4	0.0	0.0	4.3	0.4	4.8		14.8	11.6	8.1			
NATG	4.2	2.1	6.9	0.7	0.2	0.1	3.5	0.0	0.4		1.8	6.3			
OIL	29.8	21.6	4.4	19.0	9.2	0.6	10.4	12.2	2.6	0.4	0.2	1.2			
SOLR															
WIND															
Total	**13.2**	**10.6**	**9.7**	**5.6**	**4.3**	**4.9**	**2.8**	**2.6**	**0.9**	**4.0**	**2.6**	**3.2**	**0.8**	**1.0**	**0.7**

Visayas' total outage factor was recorded at 5 percent (from previous month's 2.9 percent) which was contributed by the region's forced outage factor at 4.9 percent (from previous month's 2.6 percent). As discussed, the outage in Visayas mainly involved URC Biomass and Leyte A GPP (Upper Mahiao unit 1).

Figure 13. Outage Factor (by Plant Type), Visayas – June 2018, May 2018, and June 2017

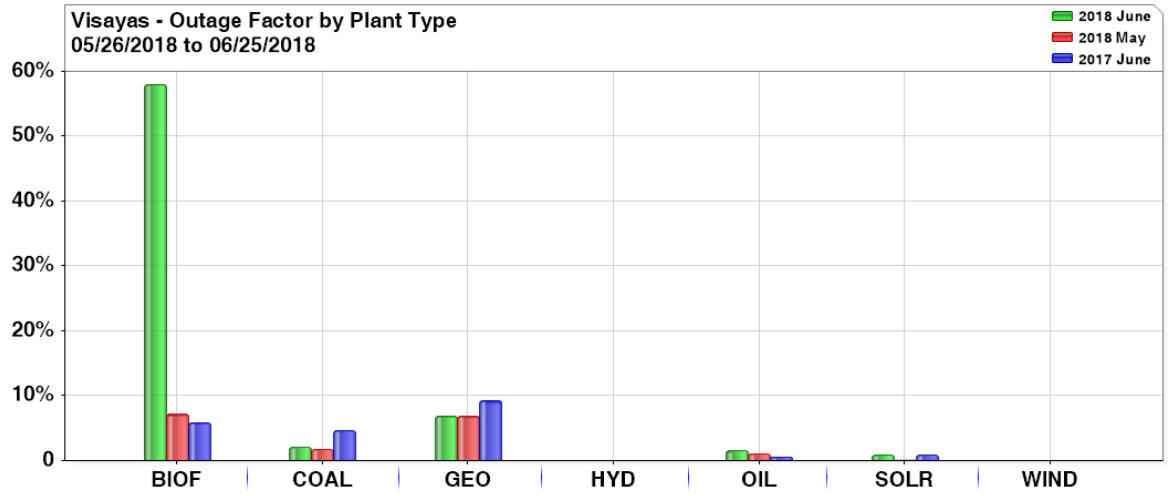


Figure 14. Outage Factor (by Outage Category), Visayas – June 2018, May 2018, and June 2017

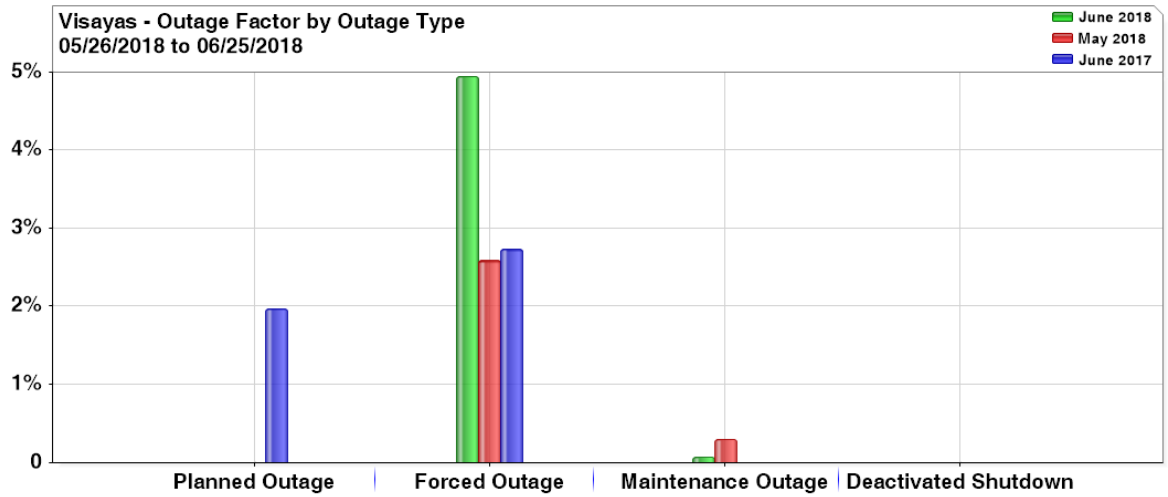


Table 14. Outage Factor, Visayas – June 2018, May 2018, and June 2017

Plant Type	Total Outage Factor			Forced Outage Factor			Maintenance Outage Factor			Planned Outage Factor			D/S Outage Factor		
	June 2018	May 2018	June 2017	June 2018	May 2018	June 2017	June 2018	May 2018	June 2017	June 2018	May 2018	June 2017	June 2018	May 2018	June 2017
BIOF	58.0	7.1	5.8	56.4	2.9	5.0	1.6	4.3	0.4			0.5			
COAL	2.0	1.8	4.7	2.0	1.4	1.5		0.4				3.1			
GEO	6.9	6.8	9.2	6.9	6.8	6.6	0.1					2.6			
HYD															
OIL	1.5	1.0	0.5	1.5	0.9	0.5					0.0				
SOLR	0.9	0.3	0.9	0.9	0.2	0.2					0.1	0.7			
WIND															
Total	**5.0**	**2.9**	**4.7**	**4.9**	**2.6**	**2.7**	**0.1**	**0.3**	**0.0**		**0.0**	**2.0**			

IV. Market Price Outcome[5]

A. Market Prices

Market prices recorded a slightly lower average this month at PhP4,073/MWh when compared to previous month's PhP4,105/MWh following the wider supply margin observed this month. Notwithstanding, this month's average was higher than previous year's average at PhP3,414/MWh.

High prices were noted during the first part of the billing month following the higher demand requirement during the period and occurrences of high level of outage. Price spike of PhP18,202/MWh was noted on 30 May at 1400H driven by the high demand during the hour and lower level of supply brought about by the outage of QPPL CFTPP beginning 1300H. Series of high prices ranging from PhP16,341/MWh to PhP18,563/MWh were also noted on 1 June following the forced outage of Calaca CFTPP unit 2 on top of existing outages of QPPL CFTPP and SLPGC CFTPP unit 1. Maximum price on record was at PhP19,211/MWh on 4 June at 1900H when level of outage was high following the forced outages of Palm CFTPP at 1600H, Ilijan NGPP Block A at 1700H and PEDC CFTPP unit 2 at 1800H.

[5]The market prices were represented by the following: (i) ex-ante load weighted average price (LWAP) for trading intervals without pricing error during ex-ante, (ii) ex-post LWAP for trading intervals with pricing error during ex-ante but without pricing error during ex-post, (iii) LWAP based on the market re-run result for trading intervals with pricing error both during ex-ante and ex-post, and (iv) estimated load reference price (ELRP) for trading intervals where the ERC-approved Price Substitution Mechanism (PSM) was applied.

High prices were also noted during the week of 18 to 24 June, reaching as high as PhP15,466/MWh and recording an average of PhP4,484/MWH, related to the high level of outage from major coal plants namely QPPL CFTPP, SLPGC CFTPP units 1and 2, Pagbilao CFTPP unit 2, Calaca CFTPP unit 2, and SLTEC CFTPP units 1 and 2.

Figure 15. Market Price Trend, June 2018

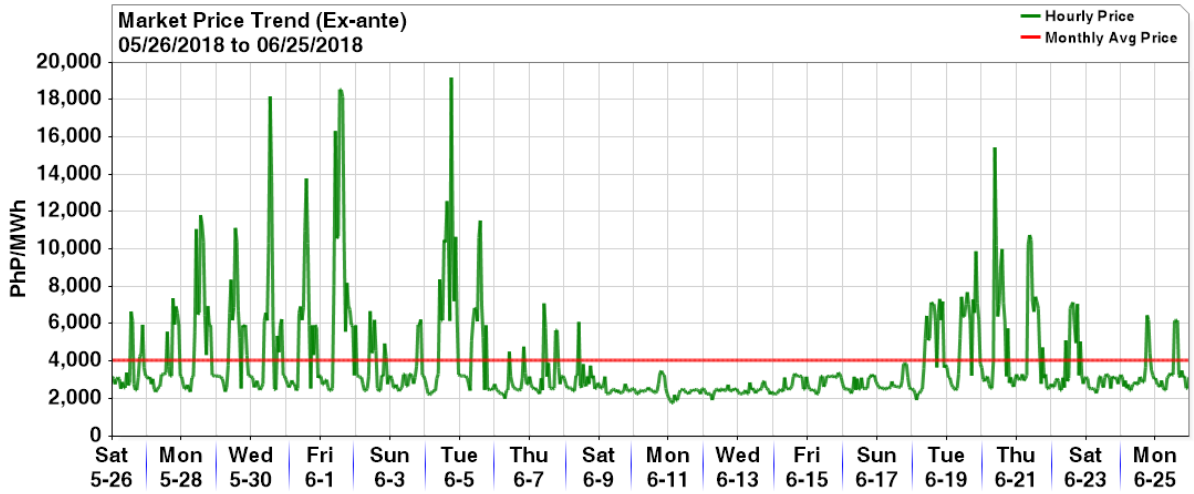


Table 15. Market Price Summary, June 2018, May 2018, and June 2017

	June 2018 (In PhP/MWh)			May 2018 (In PhP/MWh)			June 2017 (In PhP/MWh)			% M-on-M Change (May 2018 - Jun 2018)			% Y-on-Y Change (Jun 2017 - Jun 2018)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Luz-Vis	19,211	1,788	4,073	32,454	0	4,105	15,164	1,488	3,414	(40.8)		(0.8)	26.7	20.2	19.3
Luzon	18,563	1,788	4,077	32,453	0	4,095	15,366	1,488	3,418	(42.8)		(0.4)	20.8	20.2	19.3
Visayas	27,468	667	4,051	32,458	0	4,157	14,168	852	3,393	(15.4)		(2.5)	93.9	(21.8)	19.4

Table 16. Weekly Market Price Summary, June 2018

	26 to 27 May 2018 (in PhP/MWh)			28 May to 3 June 2018 (in PhP/MWh)			4 to 10 June 2018 (in PhP/MWh)			11 to 17 June 2018 (in PhP/MWh)			18 to 24 June 2018 (in PhP/MWh)			25 June 2018 (in PhP/MWh)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Luz-Vis	7,397	2,382	3,749	18,563	2,382	5,316	19,211	2,015	3,801	3,916	1,788	2,657	15,466	1,945	4,484	6,206	2,479	3,479

The market prices in Luzon averaged at PhP4,077/MWh, slightly higher by 0.6 percent than the PhP4,051/MWh recorded in the Visayas region.

Figure 16. Market Price Trend - Luzon, June 2018

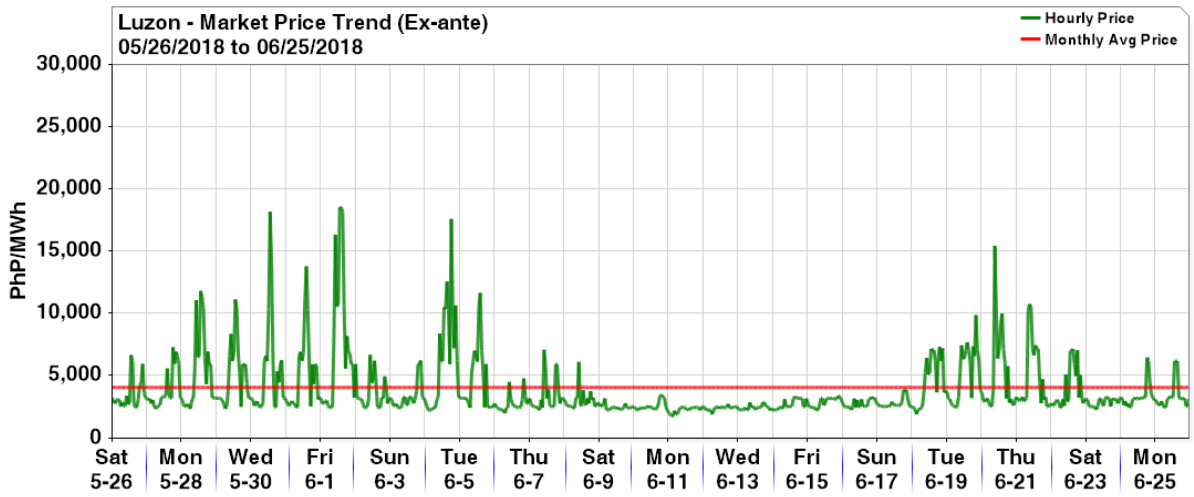


Figure 17. Market Price Trend - Visayas, June 2018

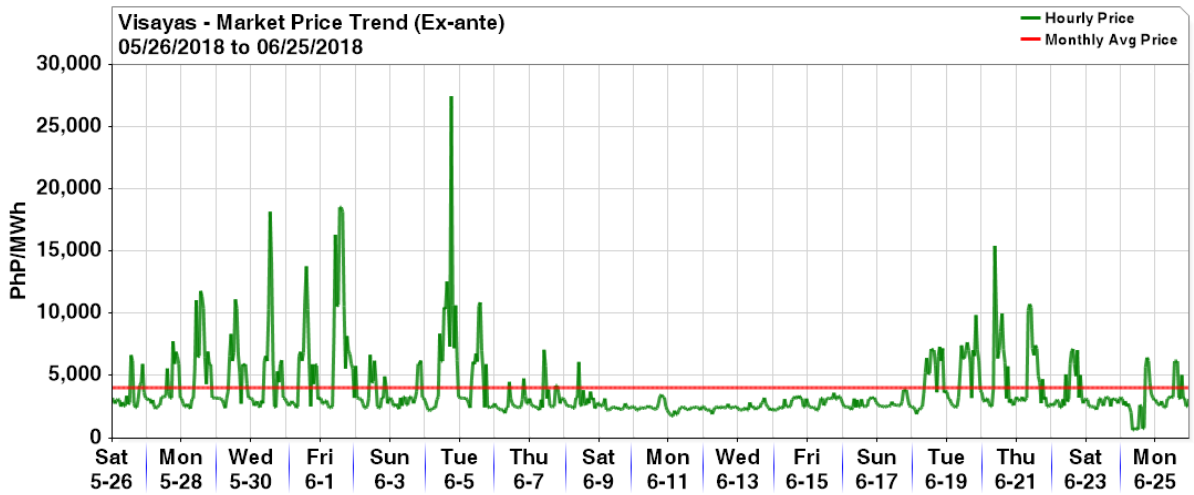


Table 17. Regional Price Summary – June 2018, May 2018, and June 2017

	Luzon (In PhP/MWh)			Visayas (In PhP/MWh)			% Difference		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
June 2018	18,563	1,788	4,077	27,468	667	4,051	(32.4)	168.1	0.6
May 2018	32,453	0	4,095	32,458	0	4,157	(0.0)		(1.5)
June 2017	15,366	1,488	3,418	14,168	852	3,393	8.5	74.6	0.7

B. Price Distribution

The frequency of prices below PhP4,000/MWh increased to 76.9 percent from previous month's 74.2 percent and previous year's 72.2 percent. Also, only 5.4 percent of the market prices this month were above PhP8,000/MWh from 7.4 percent in the previous month. However, this was higher when compared to previous year's 4.8 percent.

Meanwhile, lower frequency of prices ranging from PhP4,000/MWh to PhP6,000/MWH was recorded this month at 7.4 percent coming from 11.3 percent in the previous month and 20.7 percent in the previous year. Also, it was noted that higher frequency of prices ranging from

PhP6,000/MWh up to PhP8,000/MWh was observed this month at 10.3 percent when compared to previous month's 7.2 percent and previous year's 2.3 percent.

Figure 18. Price Distribution, June 2018, May 2018, and June 2017

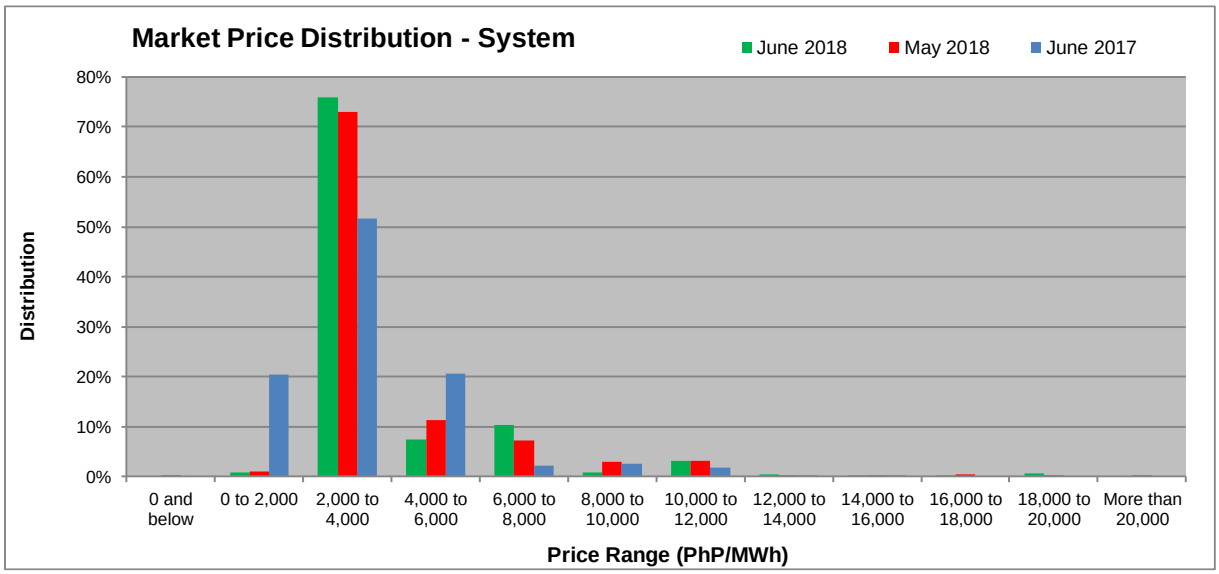


Table 18. Price Distribution – June 2018, May 2018, and June 2017

Price Range (PhP/MWh)	% Distribution		
	June 2018	May 2018	June 2017
0 and below	0.0	0.1	0.0
0 to 2,000	0.9	1.0	20.4
2,000 to 4,000	75.9	73.1	51.7
4,000 to 6,000	7.4	11.3	20.7
6,000 to 8,000	10.3	7.2	2.3
8,000 to 10,000	0.8	3.1	2.6
10,000 to 12,000	3.2	3.2	1.9
12,000 to 14,000	0.4	0.1	0.1
14,000 to 16,000	0.1	0.1	0.3
16,000 to 18,000	0.1	0.4	0.0
18,000 to 20,000	0.7	0.3	0.0
More than 20,000	0.0	0.1	0.0

C. Price Duration Curve

The price duration curves for both the off-peak and peak hours demonstrate the higher market prices, especially in peak hours, during the June billing month when compared to the previous month.

Bulk of the market prices during the off-peak hours of the billing month, at 93.5 percent, were within the price range PhP2,000/MWh to PhP4,000/MWh (Figure 19). About 1.7 percent was from PhP0/MWH to PhP2,000/MWh while the remaining 4.8 percent fell within the PhP4,000/MWh to PhP12,000/MWh range.

On the other hand, market prices during peak hours were higher than the off-peak hours as denoted by higher frequency of prices above PhP4,000/MWh. In Figure 20, it was noted only 53.4 percent was below PhP4,000/MWh and 43.6 percent was between PhP4,000/MWh and

PhP12,000/MWh. In addition, 3.1 percent of the market prices during peak hours were at above PhP12,0000/MWh.

Figure 19. Price Duration Curve (Off-Peak Period), June 2018

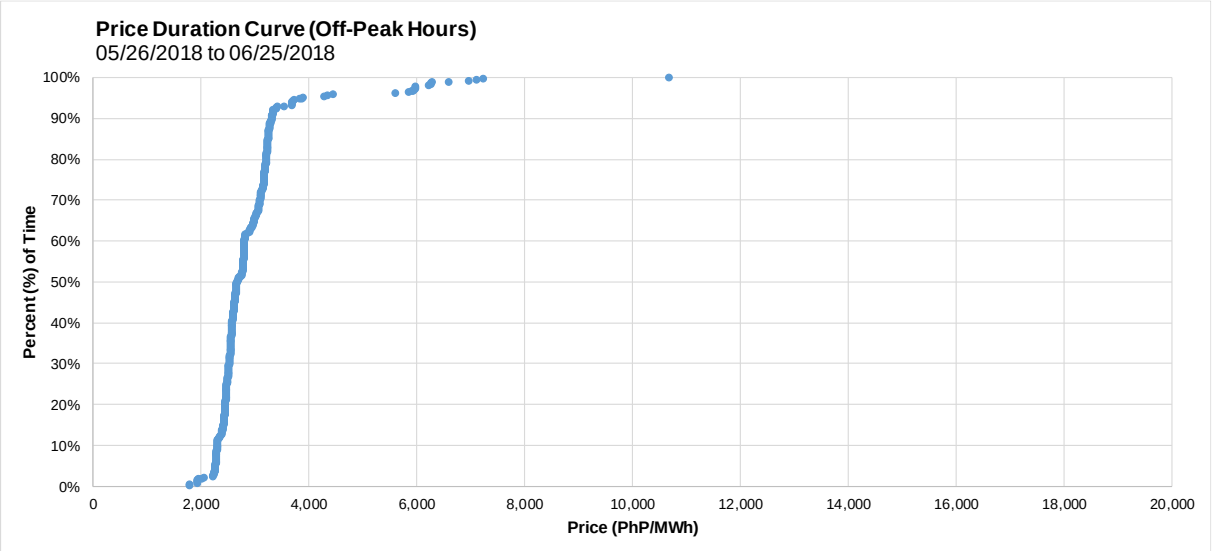
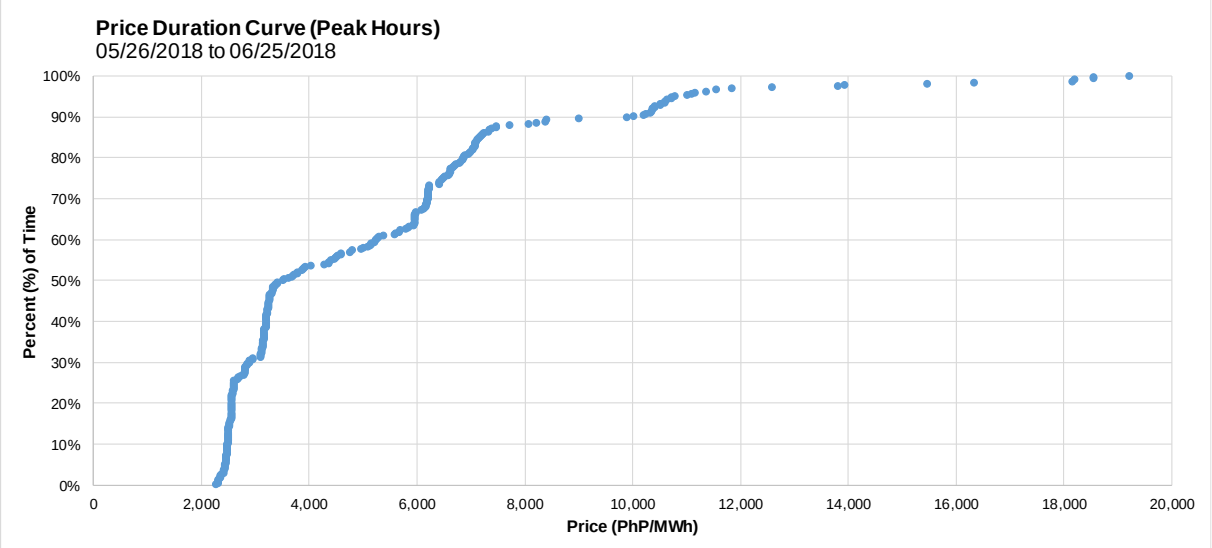


Figure 20. Price Duration Curve (Peak Period), June 2018



D. Interesting Pricing Event

Interesting pricing events refer to intervals determined to have price outliers based on the relationship of market price and supply margin. Prices within the upper and lower reference price thresholds are considered as “normal prices”, while prices outside or beyond the thresholds are tagged as “interesting pricing events”. Annex A provides details on the MSC-approved methodology in determining interesting pricing events.

As seen in Table 19, three (3) trading intervals namely 1 June at 1400H, 4 June at 1900H, and 20 June at 1000H, were considered as interesting pricing events during the June billing month.

Provided also are the details on the supply margin during the said hour and the corresponding reference price threshold for each interesting pricing event.

Figure 21. Supply Margin and Market Price, June 2018

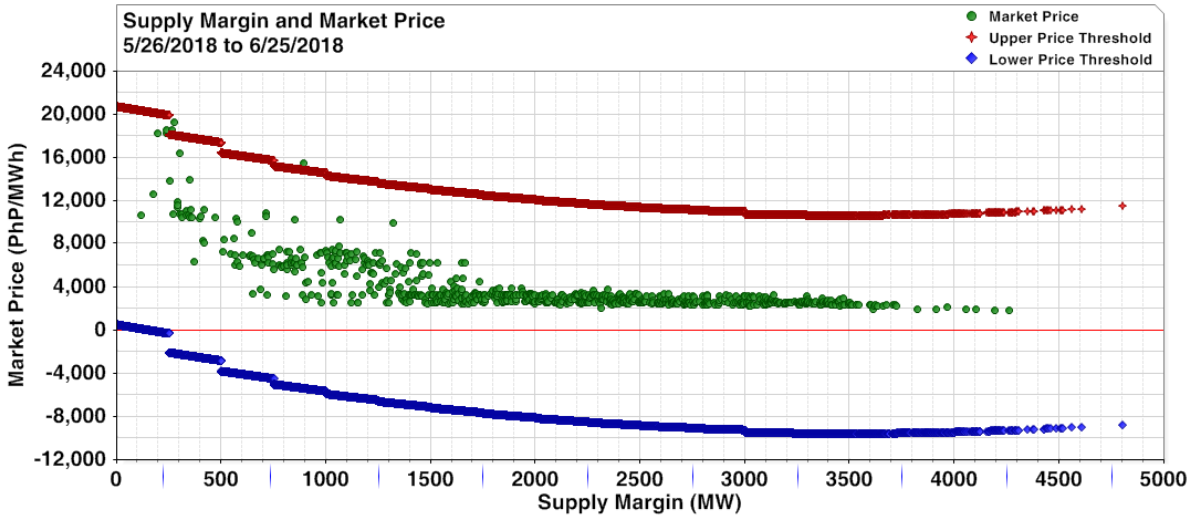


Table 19. Interesting Pricing Events – June 2018

Date	Hour	Market Price (PhP/MWh)	Supply Margin (MW)	Reference Price Threshold (PhP/MWh)
Jun 01, 2018	14	18,563	268	18,092
Jun 04, 2018	19	19,211	277	18,063
Jun 20, 2018	10	15,466	896	14,825

V. Pricing Errors and Market Intervention

System-wide non-congestion pricing errors affected 2 trading intervals or 0.3 percent of the time in the ex-ante and another two (2) trading intervals or 0.3 percent of the time in the ex-post during the June billing month, mainly related to inappropriate input data which affected the generation of prices and schedules. This posted a decrease from previous month's non-congestion pricing error occurrences that affected 15 trading intervals or 2.1 percent of the time during the ex-ante, and nine (9) trading intervals or 1.3 percent of the time during the ex-post.

In Luzon, the frequency of issuances of non-congestion pricing errors affected five (5) trading intervals or 0.7 percent of the time in the ex-ante and two (2) trading intervals or 0.3 percent of the time in ex-post related to the localized constraint violation on Araneta and Paco transformers. This posted a decrease from last month's 26 intervals or 3.6 percent of the time in the ex-ante and increase from last month's one (1) trading interval or 0.1 percent of the time in the ex-post.

In Visayas, non-congestion pricing errors affected 10 trading intervals or 1.3 percent of the time, lower than last month's 11 trading intervals or 1.5 percent of the time in the ex-ante while 9 trading intervals or 1.2 percent of the time were affected in the ex-post, lower than last month's 14 trading intervals or 1.9 percent of the time. These were mainly on account of the localized constraint violation on Palinpinon 1 and Amlan transformers.

Meanwhile, an increase in the system-wide application of Price Substitution Methodology (PSM) was observed this month, affecting a total of 179 trading intervals or 24.1 percent of the time (previous month's 161 trading intervals or 22.4 percent of the time) in the ex-ante and 164 trading intervals or 22 percent of the time (previous month's 155 trading intervals or 21.5 percent of the time) in the ex-post. PSM application this month was mainly due to constraint on Samboan-Amlan Line 1 (Cebu-Negros submarine cable).

Table 20. PEN, PSM and MI Summary, June 2018

	Luz-Vis		Luzon		Visayas		Total	
	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time
PEN (RTD)	2	0.3	5	0.7	10	1.3	17	2.3
PEN (RTX)	2	0.3	2	0.3	9	1.2	13	1.7
PSM (RTD)	179	24.1	-	-	1	0.1	180	24.2
PSM (RTX)	164	22.0	-	-	1	0.1	165	22.2
MI	-	-	-	-	-	-	-	-

Note: The column "Total" refers to the total number of trading intervals with PEN, PSM or MI (system-wide or regional)

Shown in Table 21 below are the non-congestion pricing errors by type during the month. It was noted that system-wide non-congestion pricing errors, affecting a total of two (2) trading intervals in the ex-ante and two (2) trading intervals in the ex-post were related to inappropriate input data.

In Luzon, regional contingency-related pricing errors affected three (3) trading intervals. Meanwhile, two (2) trading intervals in the ex-ante and two (2) trading interval in the ex-post were affected by pricing errors due to load shedding.

On the other hand, in the Visayas region, pricing errors due to base case constraint affected four (4), trading intervals during the ex-ante and three (3) trading interval during the ex-post while pricing errors due to load shedding affected five (5) trading intervals in the ex-ante and six (6) trading intervals in the ex-post. In addition, pricing error due to over-generation affected one (1) trading interval during the ex-ante.

Table 21. PEN Type Summary, June 2018

	Luz-Vis		Luzon		Visayas		Total	
	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time	Freq.	% of Time
PEN (RTD)	**2**	**0.3**	**5**	**0.7**	**10**	**1.3**	**17**	**2.3**
Contingency	-	-	3	0.4	-	-	3	0.4
Base Case	-	-	-	-	4	0.5	4	0.5
Over-generation	-	-	-	-	1	0.1	1	0.1
VoLL	-	-	2	0.3	5	0.7	7	0.9
Inappropriate Input Data	2	0.3	-	-	-	-	2	0.3
PEN (RTX)	**2**	**0.3**	**2**	**0.3**	**9**	**1.2**	**13**	**1.7**
Contingency	-	-	-	-	-	-	-	-
Base Case	-	-	-	-	3	0.4	3	0.4
Over-generation	-	-	-	-	-	-	-	-
VoLL	-	-	2	0.3	6	0.8	8	1.1
Inappropriate Input Data	2	0.3	-	-	-	-	2	0.3

VI. HVDC Scheduling

Power flow through the HVDC Interconnection was generally directed towards the Luzon region for 642 trading intervals in the ex-ante during the billing month, with schedules ranging

from 1.8 to 420 MW. It was noted that the 420 MW-limit was maximized for two (2) trading intervals during the billing month.

On the other hand, the HVDC power flow was directed towards the Visayas for the remaining 102 trading intervals in the ex-ante during the billing month, with schedules ranging from 0.3 to 150.9 MW.

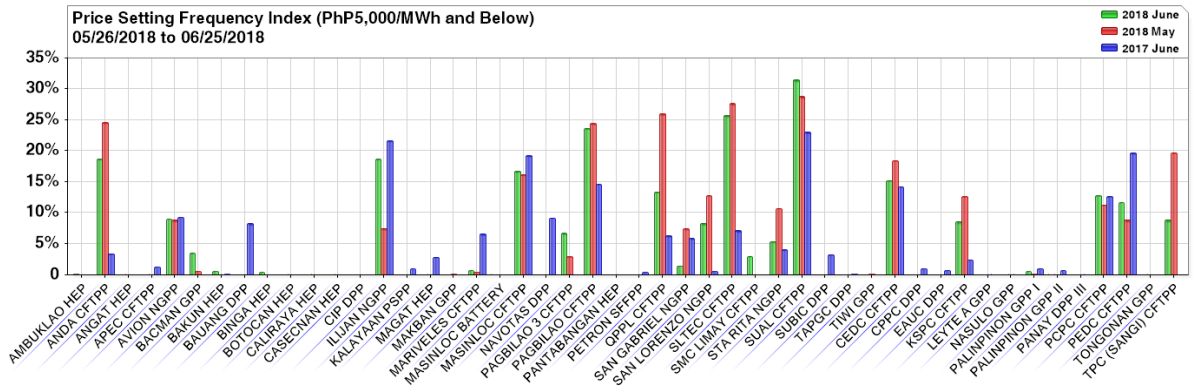
Table 22. Summary of HVDC Limits Imposed by NGCP-SO and Results of HVDC Schedules (Ex-ante and Ex-post), June 2018

Results of HVDC Scheduling	HVDC Limit during Ex-ante (Visayas/Luzon) (No. of Trading Intervals)		HVDC Limit during Ex-post (Visayas/Luzon) (No. of Trading Intervals)	
	250/420	Total	250/420	Total
Visayas to Luzon	**642**	**642**	**651**	**651**
Limit Not Maximized	*640*	*640*	*648*	*648*
Limit Maximized [1]	*2*	*2*	*3*	*3*
Luzon to Visayas	**102**	**102**	**93**	**93**
Limit Not Maximized	*102*	*102*	*93*	*93*
Limit Maximized [1]		-		-
TOTAL	**744**	**744**	**744**	**744**

VII. Price Setting Plants[6]

Majority of the market prices during the billing month were below PhP5,000/MWh (at 79.3 percent) with Luzon coal plants as frequent price setters, namely Sual CFTPP at 31.5 percent, SLTEC CFTPP at 25.7 percent, Pagbilao CFTPP at 23.7 percent, Anda CFTPP at 18.7 percent, and Masinloc CFTPP at 16.7 percent. Ilijan NGPP is also a frequent price setter at 18.7 percent of the time.

Figure 22. Price Setting Frequency Index (PhP5,000/MWh and Below), June 2018, May 2018, and June 2017

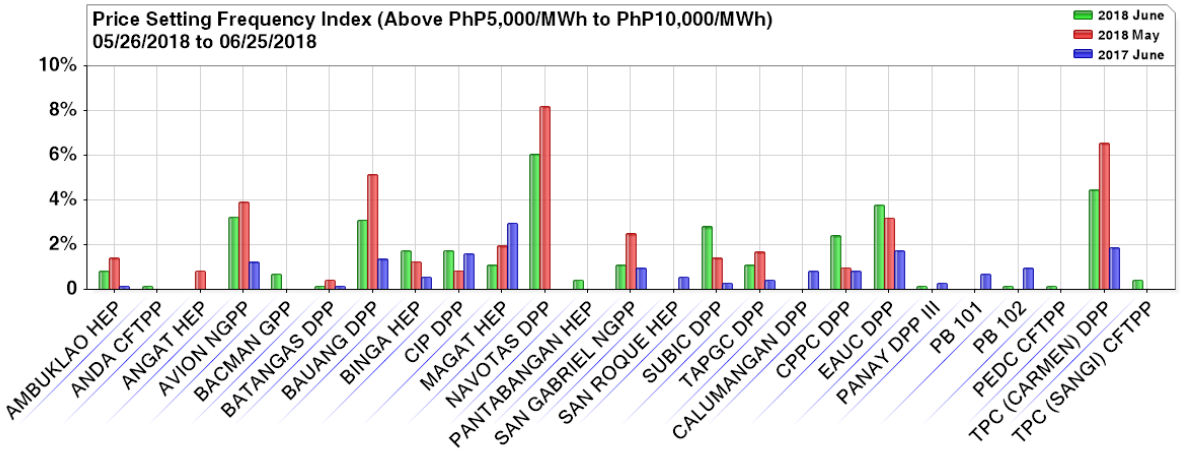


The market prices also ranged between PhP5,000/MWh to PhP10,000/MWh at 16.1 percent of the time. Oil-based plants obtained the highest frequencies in setting the prices including

[6] A generator trading node is considered as a price setter when its last accepted offer price is between 95% to 100% of its nodal price. A generating plant is considered as price setter if at least one of its trading nodes was price setter in a given trading hour. The determination of the price setter/s in a trading interval factors in the prevailing pricing condition for the same. The price setters are determined from: (i) ex-ante for trading intervals without pricing error during ex-ante, (ii) ex-post with pricing error during ex-ante but without pricing error during ex-post, (iii) market re-run results for trading intervals with pricing error both in ex-ante and ex-post, and (iv) trading intervals where the price substitution methodology (PSM) was applied. For trading intervals affected by PSM, the unconstrained marginal plants are considered price setters. Further, in instances of regional price separation, price setters are determined separately for each region.

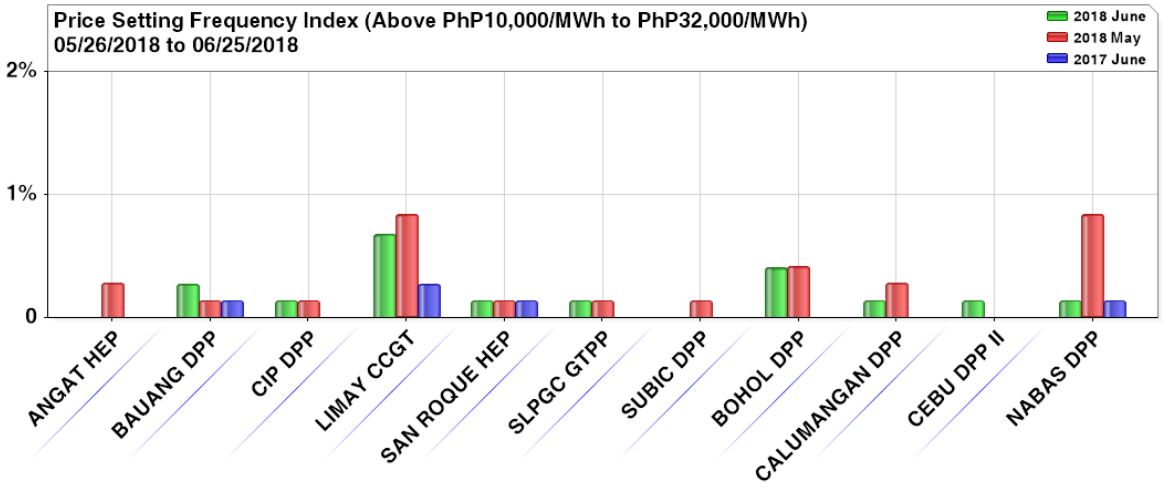
Navotas DPP at 6 percent, TPC Carmen DPP at 4.4 percent, EAUC DPP at 3.8 percent, and Bauang DPP at 3.1 percent. Natural gas plant Avion NGPP is also noted as price setter at 3.2 percent of the time.

Figure 23. Price Setting Frequency Index (Above PhP5,000/MWh to PhP10,000/MWh), June 2018, May 2018, and June 2017



The rest of the market prices were above PhP10,000/MWh at 4.6 percent of the time. Oil-based plants also set the prices, namely Limay CCGT, Bohol DPP, Bauang DPP, CIP DPP, SLPGC GTPP, Cebu DPP II, and Nabas DPP.

Figure 24. Price Setting Frequency Index (Above PhP10,000/MWh to PhP20,000/MWh), June 2018, May 2018, and June 2017



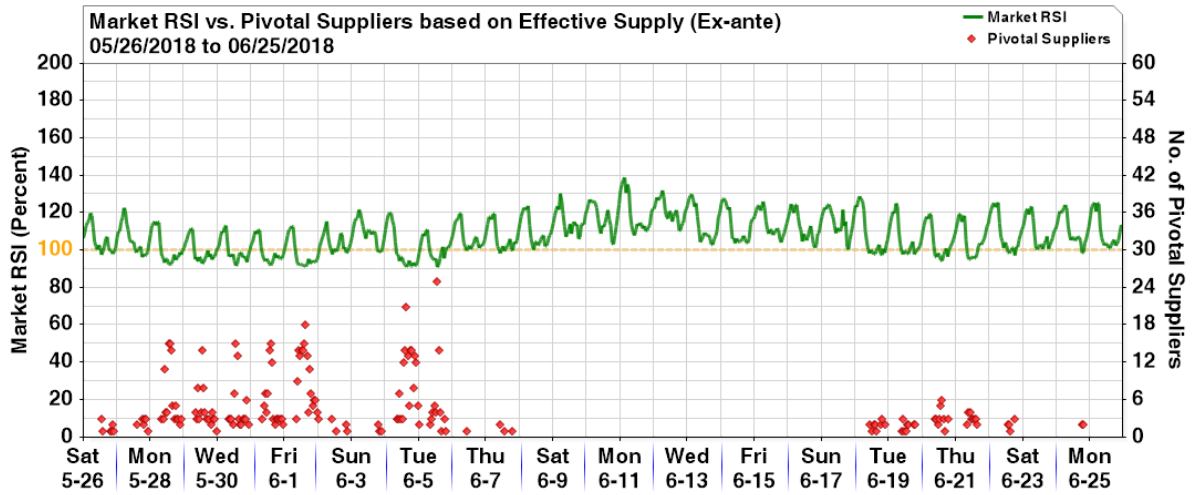
VIII. Residual Supply

The succeeding figure below show the hourly trend of the Market Residual Supply Index (Market RSI)[7] plotted against the number of pivotal supplier/s.

[7] For a generator, the Residual Supply Index (RSI) is a dynamic continuous index measured as ratio of the available generation without that generator to the total generation required to supply the demand. The Market RSI is measured as the lowest RSI among all generators in the market. A Market RSI less 100% indicates the presence of pivotal generator/s or supplier/s.

The market RSI fell below the 100 percent mark for 23 percent of the time or in 168 trading intervals (previous month's 38 percent or 276 trading intervals), indicating that there were no pivotal suppliers for the majority of the trading intervals during the billing month.

Figure 25. Market RSI vs. Pivotal Suppliers (Ex-Ante), June 2018

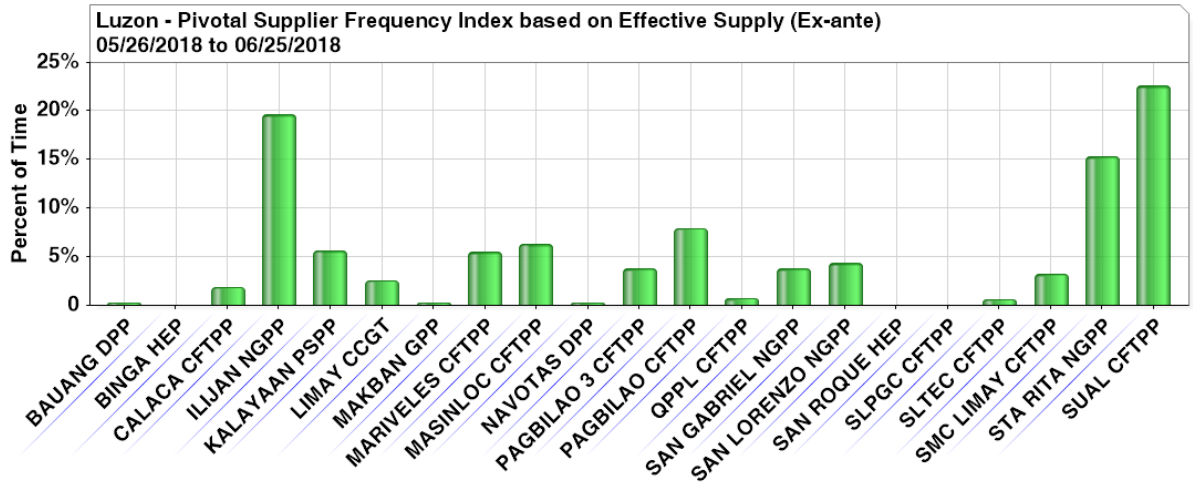


IX. Pivotal Suppliers[8]

A total of 21 Luzon plants emerged as pivotal suppliers during the June billing month led by Sual CFTPP for having been pivotal for 22.6 percent of the time and natural gas plants Ilijan NGPP for 19.6 percent and Sta. Rita NGPP for 15.3 percent.

Coal plants Pagbilao CFTPP (7.9 percent) and Masinloc CFTPP (6.3 percent) followed, albeit distantly, as well as Kalayaan PSPP (5.6 percent) and Mariveles CFTPP (5.5 percent) as most frequent pivotal suppliers.

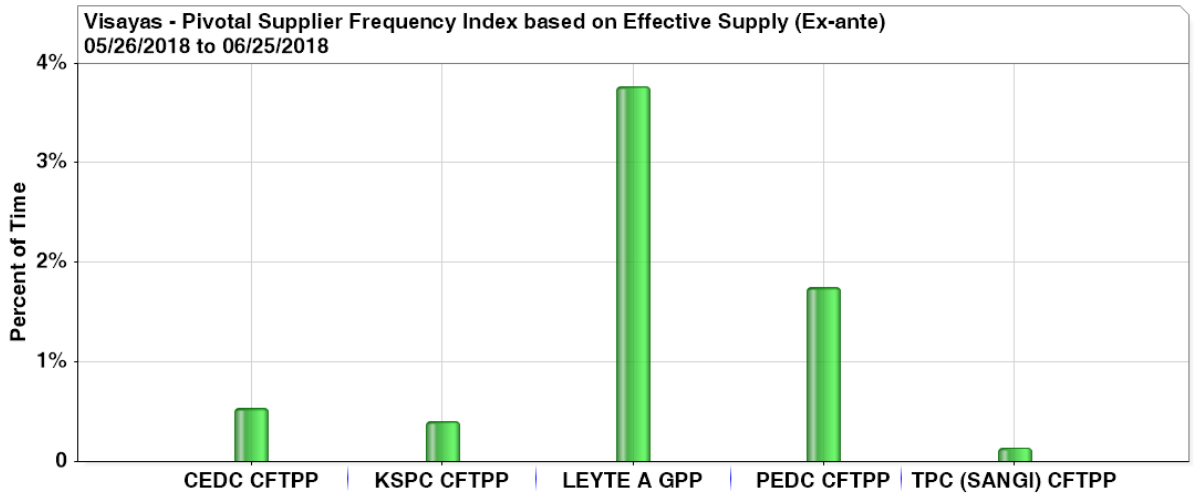
Figure 26. Pivotal Supplier Frequency Index - Luzon, June 2018



[8] The Pivotal Supply Index (PSI) measures how critical a particular generator is in meeting the total demand at a particular time. It is a binary variable (1 for pivotal and 0 for not pivotal) which measures the frequency that a generating is pivotal for a particular period.

Meanwhile, 5 Visayas plants became pivotal suppliers during the June billing month led by Leyte A GPP for being pivotal for 3.8 percent of the time. Coal plants PEDC CFTPP, CEDC CFTPP, KSPC CFTPP, and TPC (Sangi) CFTPP followed for being pivotal for 1.7 percent, 0.5 percent, 0.4 percent, and 0.1 percent of the time, respectively.

Figure 27. Pivotal Supplier Frequency Index - Visayas, June 2018



X. Price-Setters and Pivotal Plants

Eight (8) Luzon plants and one (1) Visayas plant became price setters at the same time that they were pivotal. These plants were led by Ilijan NGPP at 7.3 percent, Sual CFTPP at 4.7 percent, and Magat HEP at 1.7 percent. Limay CCGT and San Gabriel NGPP similarly were pivotal suppliers and price-setters at the same time for 1.2 percent and 0.8 percent of the time, respectively.

Figure 28. PSI vs. PSFI, June 2018

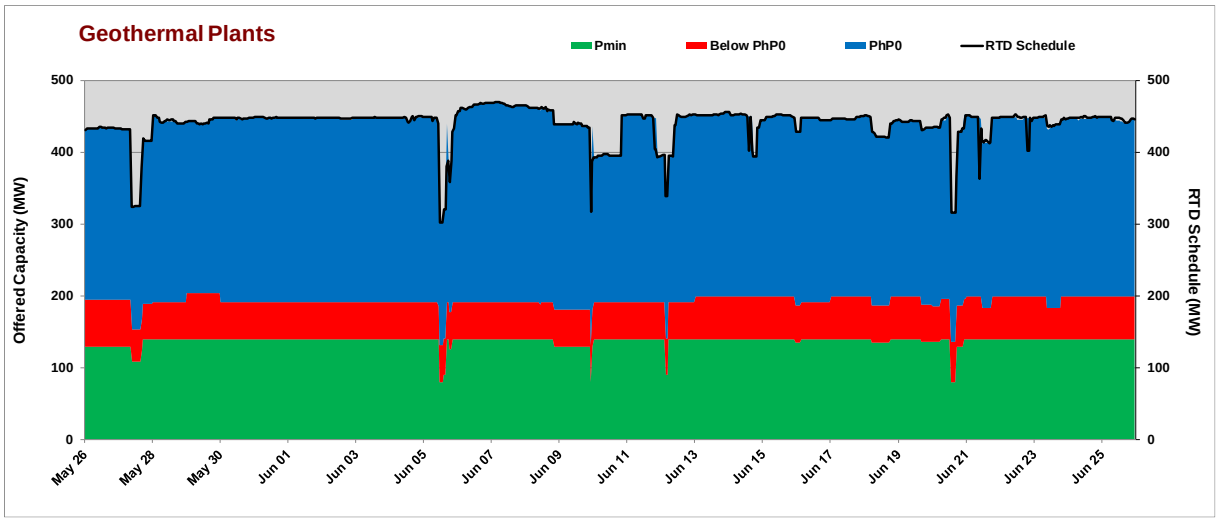
XI. Generator Offer Pattern

Luzon geothermal plants offered almost its entire capacity (99.9 percent) at PhP0/MWh and below. In particular, about 56.4 percent was priced at exactly PhP0/MWh while the remaining

43.5 percent was priced below PhP0/MWh (Figure 31). The remaining 0.1 percent was offered at PhP0/MWh to PhP5,000/MWh.

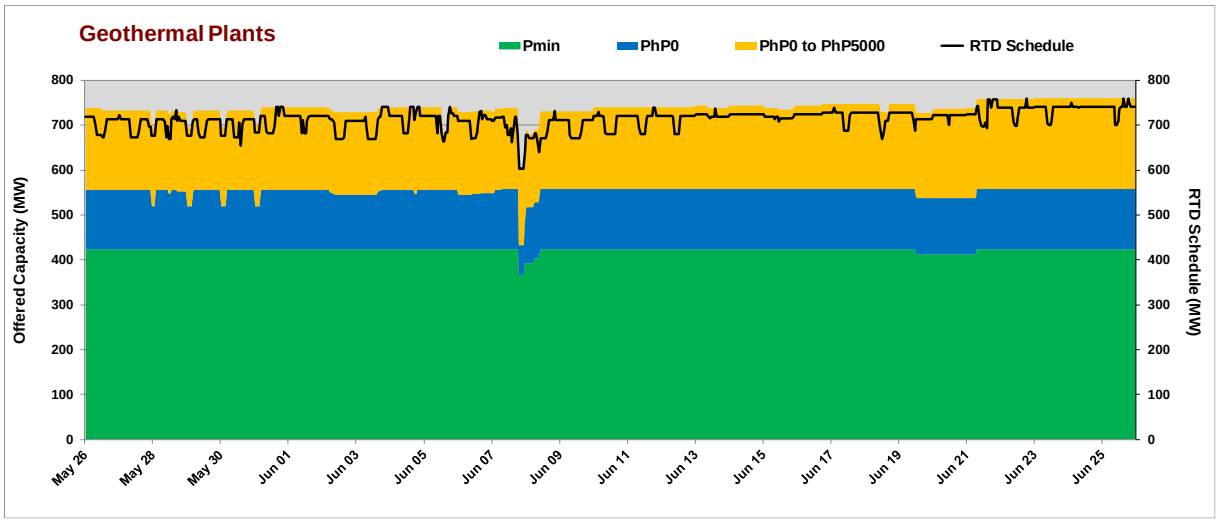
Accordingly, all of its submitted capacity offers, at 99.8 percent, were scheduled for dispatch in the market.

Figure 29. Geothermal Plants Offer Pattern, Luzon – June 2018



On the other hand, Visayas geothermal plants had slightly higher-priced offers compared to Luzon geothermal plants. It was noted that about 25.1 percent of Visayas geothermal plants' offered capacity was priced at above PhP0/MWh up to PhP5,000/MWh while the remaining 74.9 percent was priced at PhP0/MWh and below (Figure 32). It was noted that about 97 percent of these capacity offers were scheduled for dispatch.

Figure 30. Geothermal Plants Offer Pattern, Visayas – June 2018

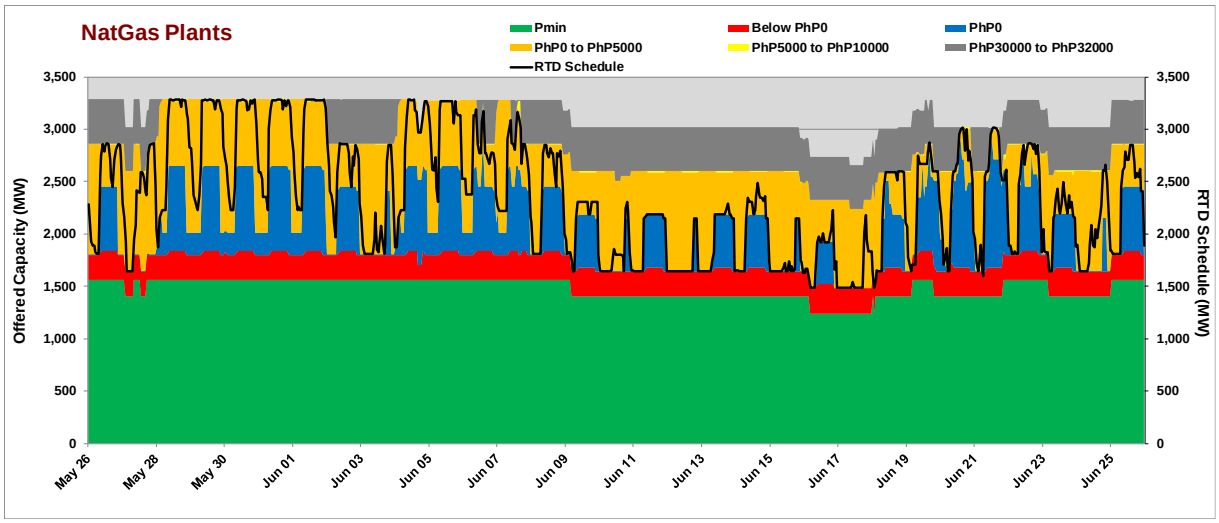


About 67.1 percent of the natural gas plants' capacity offers were priced at PhP0/MWh and below, 23 percent was priced above PhP0/MWh to PhP5,000/MWh and 0.2 percent was priced at above PhP5,000/MWh to PhP10,000/MWh (Figure 33).

It was noted that 9.6 percent of capacity offers (from previous month's 2.7 percent), were priced above PhP30,000/MWh to PhP32,000/MWh which were mostly submitted by San Gabriel NGPP.

Accordingly, about 75 percent of the offers of natural gas plants were scheduled for dispatch within the month.

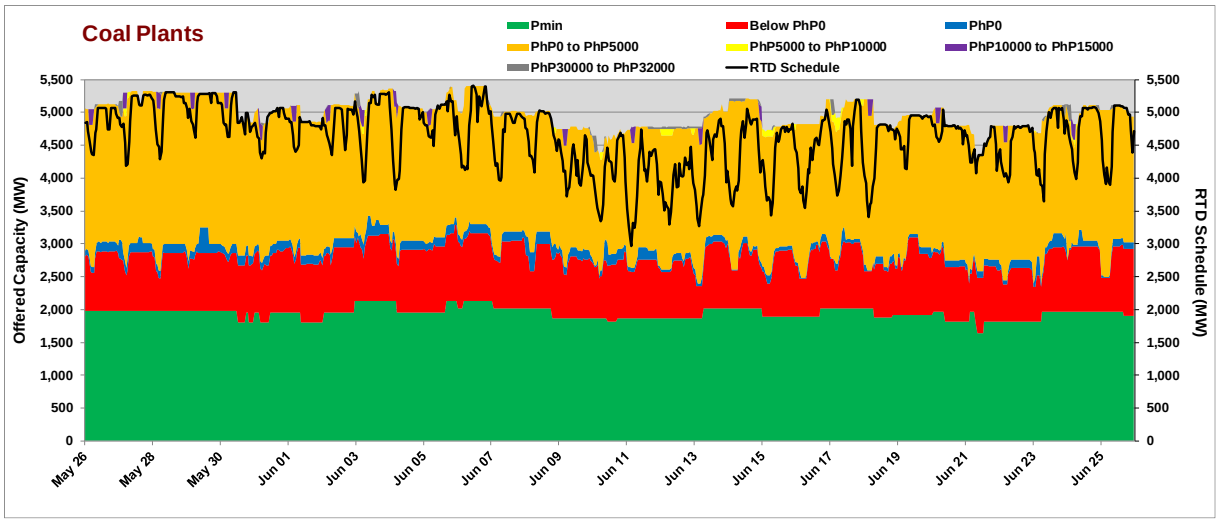
Figure 31. Natural Gas Plants Offer Pattern, Luzon – June 2018



Luzon coal plants submitted 58.7 percent of its capacity offers at prices ranging from PhP0/MWh and below while 40.6 percent was submitted at prices above PhP0/MWh to PhP5,000/MWh (Figure 34). About 0.5 percent of their offered capacity were priced between PhP5,000/MWh to PhP15,000/MWh. The remaining 0.2 percent of the capacity offers were priced at PhP30,000/MWh to PhP32,000/MWh which were primarily submitted by Sual CFTPP units 1 and 2, Anda CFTPP, and SMC Limay CFTPP units 1 and 3.

About 87 percent of the capacity offers of Luzon coal plants were scheduled for dispatch within the month.

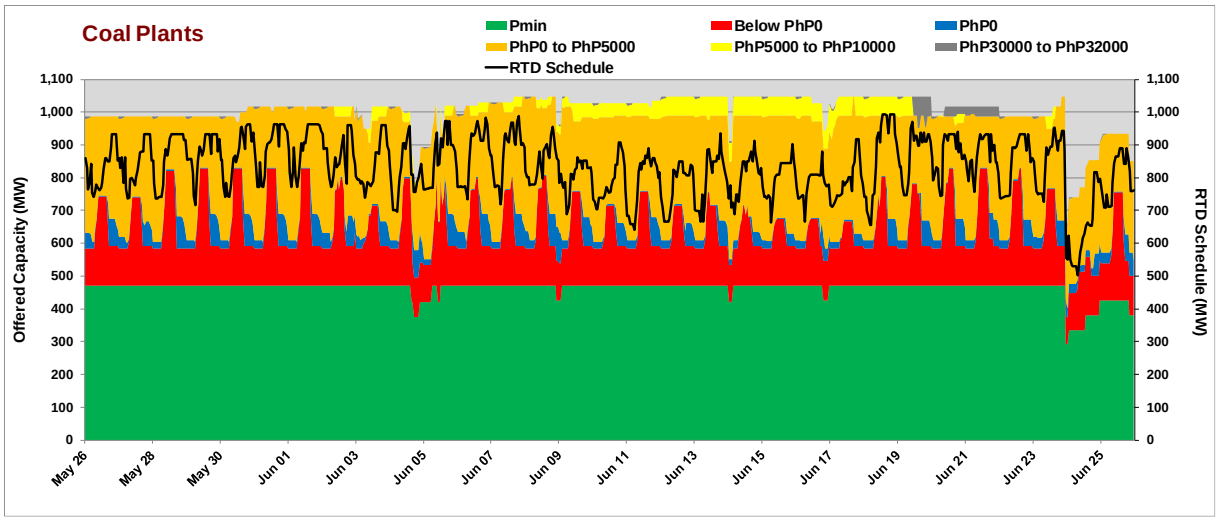
Figure 32. Coal Plants Offer Pattern – Luzon, June 2018



Meanwhile, about 67 percent of Visayas coal plants' capacity offers was priced at PhP0/MWh and below, 32.7 percent at above PhP0/MWh to PhP10,000/MWh. A minimal percentage, at 0.3 percent, was offered at prices ranging between PhP30,000/MWh and PhP32,000/MWh which were mostly from KSPC CFTPP units 1 and 2 (Figure 35).

About 83 percent of the offered capacity from Visayas coal plants was scheduled for dispatch.

Figure 33. Coal Plants Offer Pattern, Visayas – June 2018

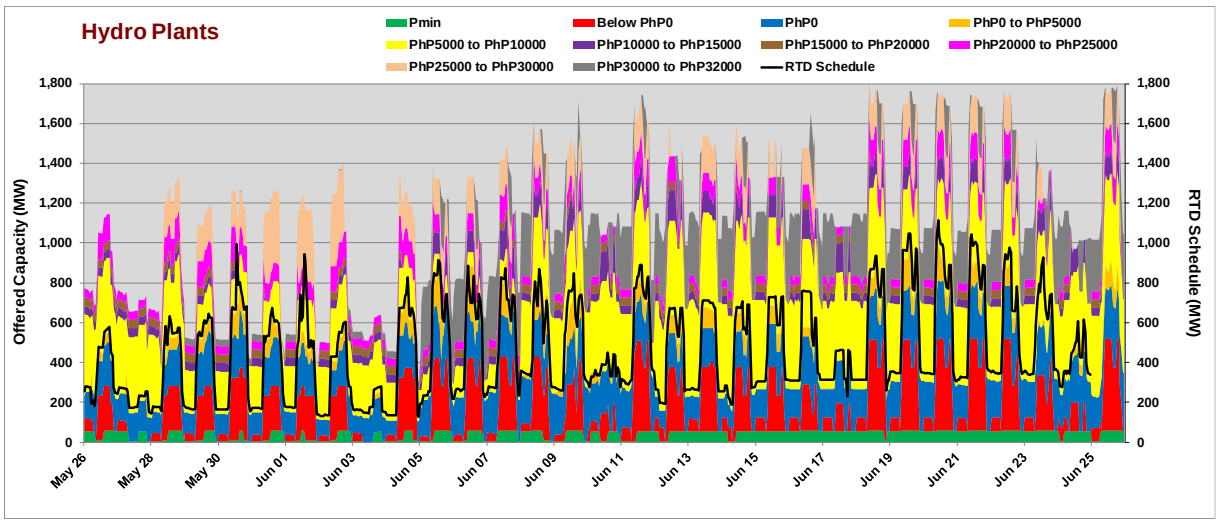


Offer prices of Luzon hydro plants remained to be relatively higher when compared with other plant types, as bulk of their offered capacity, at 30.2 percent were offered at prices ranging from PhP5,000/MWh to PhP10,000/MWh, 6.8 percent were priced at PhP10,000/MWh to PhP20,000/MWh, and 12.9 percent were priced at PhP20,000/MWh to PhP30,000/MWh (Figure 36).

Further, it was noted that 11.7 percent was offered at PhP30,000/MWh to PhP32,000/MWh which were mostly submitted by San Roque HEP units 1 and 2 beginning the second week of the billing month following the its outage during the start of the month.

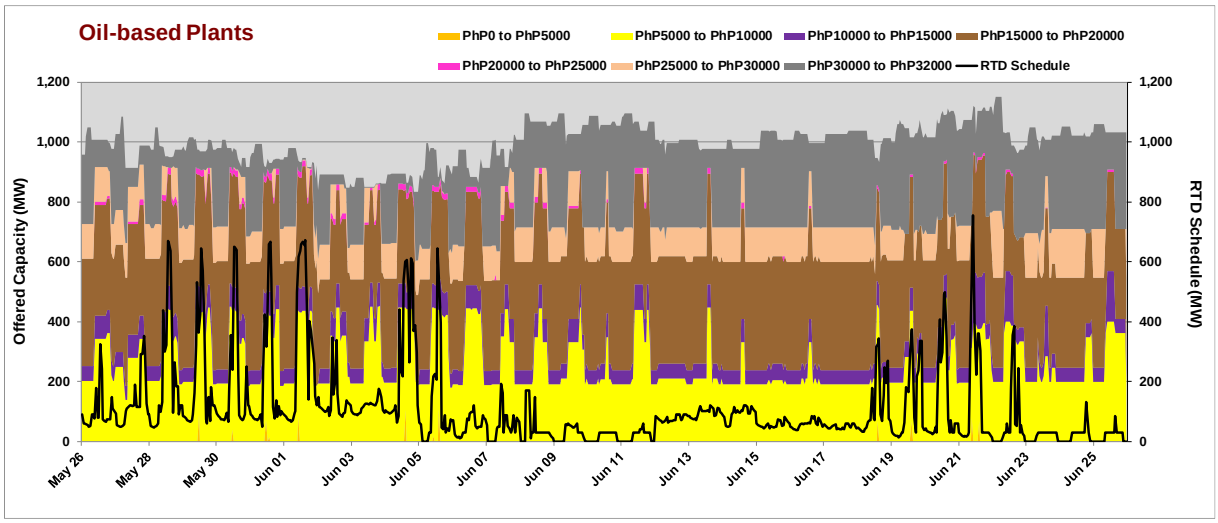
In addition, only 38.4 percent of their capacity offers were priced below PhP5,000/MWh.

Figure 34. Hydro Plants Offer Pattern, Luzon – June 2018



Luzon oil-based plants submitted the highest offer prices with 26.8 percent of its capacity offers priced at PhP5,000/MWh up to PhP10,000/MWh, 40.7 percent at PhP10,000/MWh to PhP20,000/MWh and 9.1 percent at PhP20,000/MWh to PhP30,000/MWh (Figure 37). Moreover, 23.3 percent was offered at PhP30,000/MWh to PhP32,000/MWh.

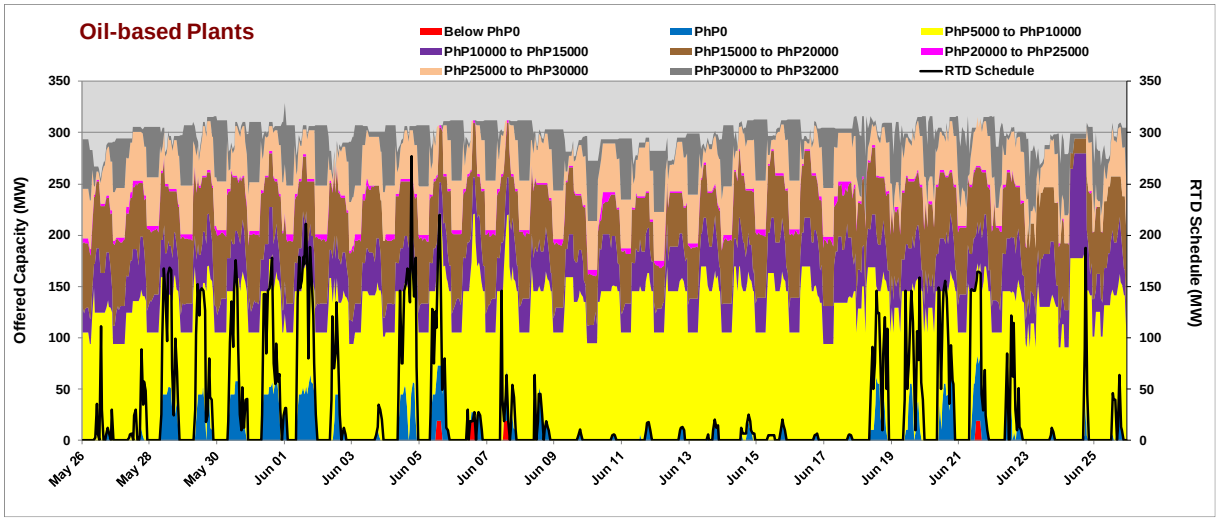
Figure 35. Oil-based Plants Offer Pattern, Luzon – June 2018



Similarly, Visayas oil-based plants offered their capacities at relatively higher prices when compared with other plant types with 22.6 percent priced above PhP20,000/MWh (Figure 38). About 41.8 percent was offered at PhP5,000/MWh to PhP10,000/MWh, 12.5 percent at PhP10,000/MWh to PhP15,000/MWh and 19.9 percent at PhP15,000/MWh to PhP25,000/MWh. Only 3.2 percent of their capacity offers were priced at PhP0/MWh and below.

About 8.5 percent of Visayas oil-based plants' capacity offered were scheduled for dispatch during the month June billing month.

Figure 36. Oil-based Plants Offer Pattern, Visayas – June 2018



XII. Capacity Factor

Luzon

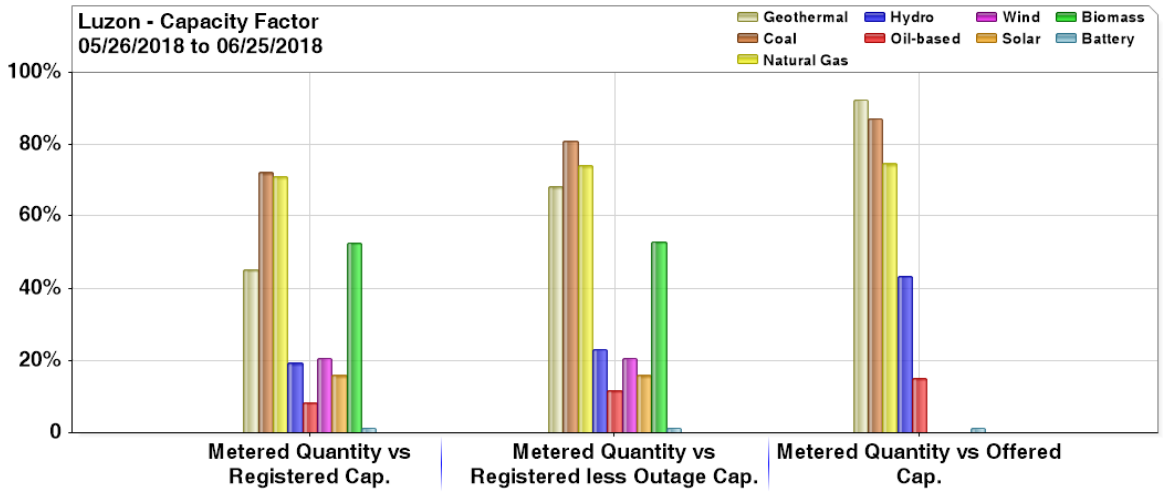
Coal plants observed the highest utilization when measured in terms of registered capacity among resource types with capacity factor at 72 percent. Natural gas and geothermal plants followed with capacity factors of 71 percent and 45 percent, respectively. Hydro and oil-based plants came next at 19 percent 8 percent, respectively. On the other hand, when measured in terms of registered capacity net of outage, coal and natural gas plants obtained the highest utilization at 81 percent and 74 percent, respectively. Geothermal plants followed with a capacity factor of 68 percent, hydro plants with 23 percent, and oil-based plants with 12 percent.

Utilization among lower-priced plants was highest when measured in terms of offered capacity, indicating that capacities, when offered, are generally scheduled for dispatch. Geothermal plants posted the highest capacity factor at 92 percent. Coal plants followed at 87 percent and natural gas plants at 75 percent. Higher-priced hydro and oil-based plants had lower capacity factors, at 43 and 15 percent, respectively.

Meanwhile, preferential dispatch plants – biomass plants' capacity factors were posted at 53 percent each when measured based on registered capacity and registered less outage capacity while wind plants recorded the same capacity factors at 21 percent each. On the other hand, lower utilization level was noted for Luzon solar plants with their capacity factors based on registered capacity, and registered less outage capacity each at 16 percent.

On the other hand, sole battery energy storage facility in the WESM, Masinloc Battery, posted a capacity factor of 1 percent each when measured in terms of registered capacity, registered capacity net of outage, and offered capacity.

Figure 37. Capacity Factor – Luzon Plants, June 2018

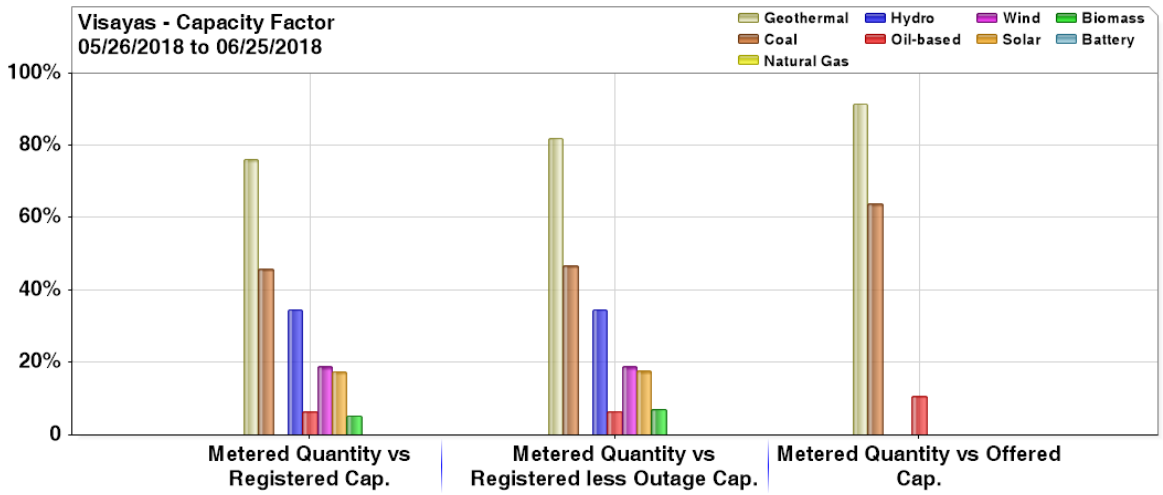


In Visayas, geothermal plants and coal plants obtained the highest utilization among resource types in terms of registered capacity with capacity factors at 76 percent and 46 percent, respectively. In terms of registered capacity net of outage, geothermal and coal plants obtained capacity factors at 82 percent and 47 percent, respectively. Hydro plants followed with capacity factors in terms of registered capacity and registered capacity net of outage at 35 percent each while oil-based plants recorded lowest utilization at 6 percent each.

In terms of offered capacity, geothermal plants recorded a capacity factor at 92 percent while coal plants' capacity factor was at 64 percent. Meanwhile, oil-based plants posted a capacity factor of 11 percent.

Wind plants' capacity factors based on registered capacity and based on registered capacity net of outage in the region was recorded at 19 percent while solar plants recorded the same at 18 percent. Biomass plants had the lowest utilization among non-scheduled units with both of their capacity factors based on registered at 5 percent and registered capacity less outage capacity at 7 percent.

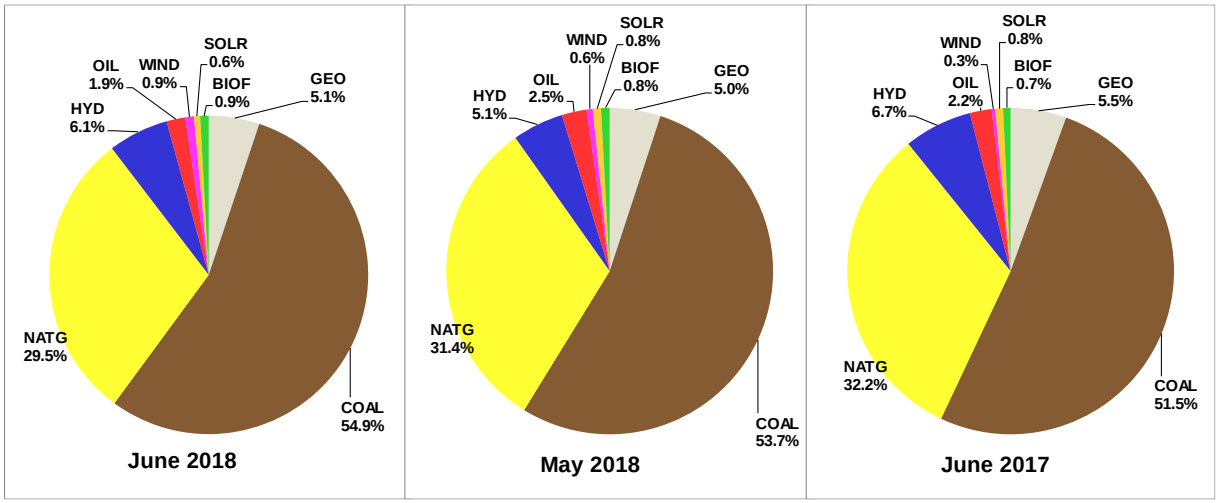
Figure 38. Capacity Factor, Visayas Plants – June 2018



XIII. Generation Mix

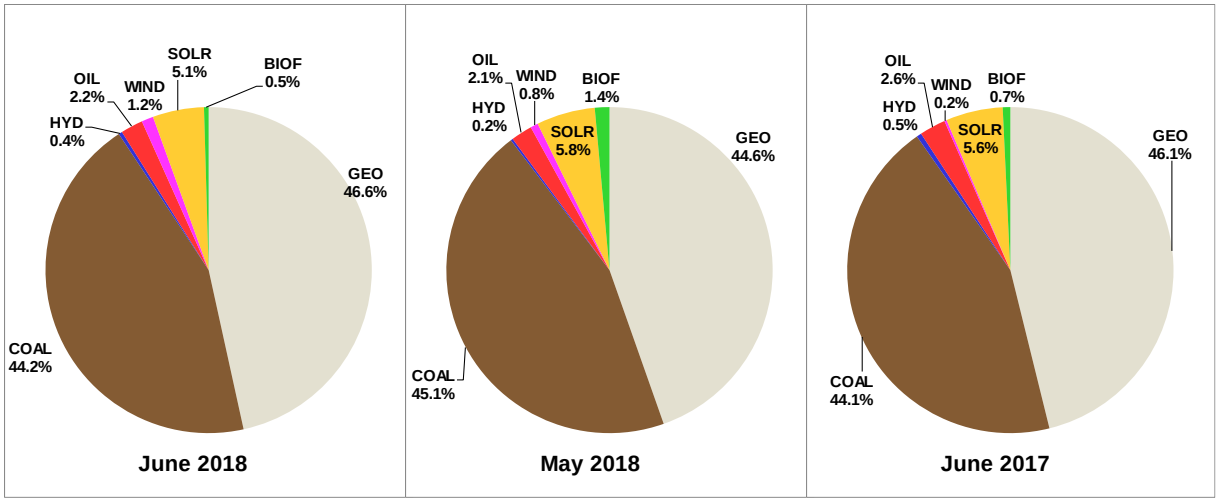
Coal plants contributed the largest chunk of the metered quantity at 54.9 percent (previous month's 53.7 percent). Natural gas plants followed with 29.5 percent (previous month's 31.4 percent). Hydro and geothermal plants came next with 6.1 percent and 5.1 percent, respectively. Oil-based plants' contribution was recorded at 1.9 percent. Meanwhile, the contribution of preferential and must-dispatch generating units was recorded at 2.4 percent.

Figure 39. Generation Mix (Based on Metered Quantity) – Luzon, June 2018, May 2018, and June 2017



In the Visayas region, geothermal plants had the highest contribution at 46.6 percent (previous month's 44.6 percent) of total metered quantity this month followed closely by coal plants with 44.2 percent (previous month's 45.1 percent). Oil-based and hydro plants came next with 2.2 percent and 0.4 percent respectively. Meanwhile, solar plants' contribution was recorded at 5.1 percent. Wind and biomass plants had 1.2 percent and 0.5 percent, respectively.

Figure 40. Generation Mix (Based on Metered Quantity), Visayas – June 2018, May 2018, and June 2017

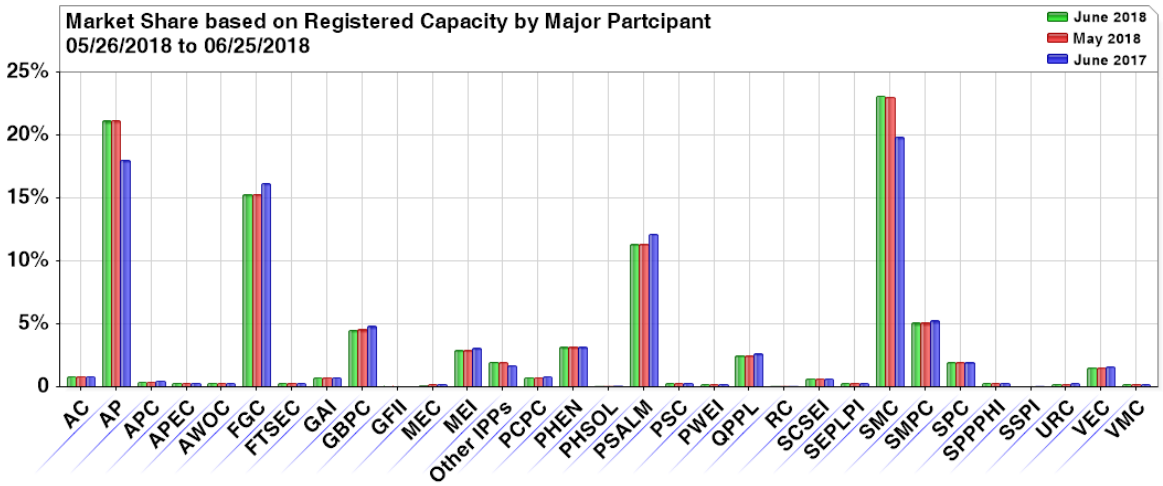


XIV. Market Concentration

a. Market Share

The integrated Luzon and Visayas market remained to be dominated by four (4) major participant groups based on registered capacity led by San Miguel Corporation (SMC) group with a market share of 23.1 percent and Aboitiz Power (AP) group with market share of 21.1 percent. First Gen Corporation (FGC) group and Power Sector Asset and Liabilities Management (PSALM) followed with 15.3 percent and 11.3 percent, respectively. Semirara Mining Power Corporation (SMPC) and Global Business Power Corporation (GBPC) came next with market shares of 5.1 percent and 4.5 percent, respectively.

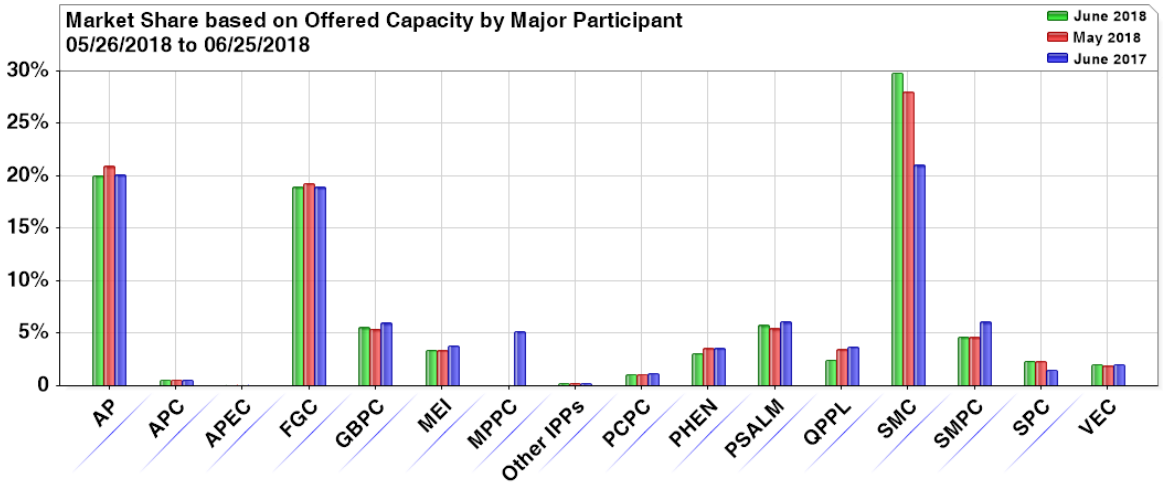
Figure 41. Market Share by Major Participant Group based on Registered Capacity, June 2018, May 2018, and June 2017



Similarly, when market share is calculated based on offered capacity of scheduled generators, SMC group held the largest share of the market at 29.8 percent. AP held the second highest share at 20 percent while FGC had 18.9 percent.

PSALM and GBPC were also among the highest market shareholders with 5.8 percent and 5.6 percent of the offered capacity, respectively.

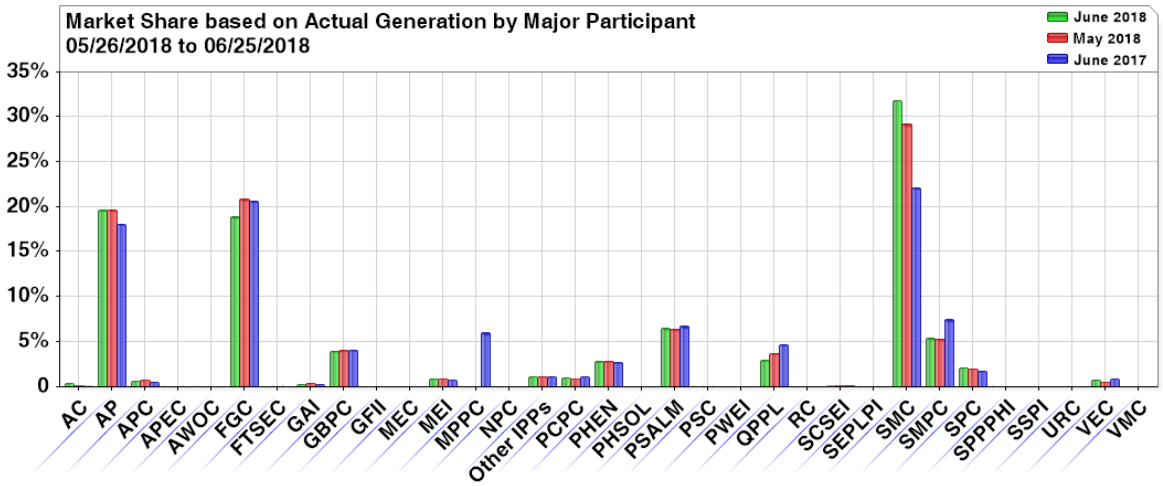
Figure 42. Market Share by Major Participant Group based on Offered Capacity, June 2018, May 2018, and June 2017



Meanwhile, when market share is calculated based on actual generation of scheduled generators, SMC group likewise held the largest share of the market at 31.8 percent. AP and FGC followed with 19.7 percent and 18.9 percent, respectively.

PSALM and SMPC were also among the highest market shareholders with 6.5 percent and 5.4 percent of the actual generation.

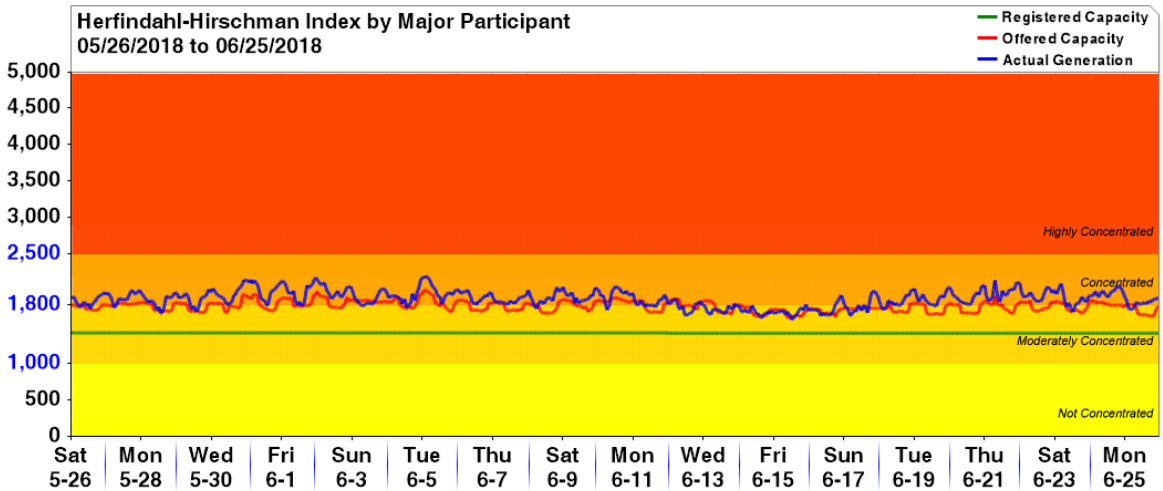
Figure 43. Market Share by Major Participant Group based on Actual Generation, June 2018, May 2018, and June 2017



b. Herfindahl-Hirschman Index (HHI)

The Herfindahl-Hirschman Index (HHI)[9] calculated based on registered capacity by major participants' grouping indicated a moderately concentrated market throughout the June billing month. Meanwhile, when measured in terms of offered capacity, 391 trading intervals (52.6 percent of the time) showed a moderately concentrated market while the remaining 353 trading intervals (47.4 percent) showed a concentrated market. On the other hand, HHI calculation based on actual generation indicated a concentrated market more frequently at 583 trading intervals (78.4 percent) while the remaining 161 trading intervals (21.6 percent) indicated a moderately concentrated market.

Figure 44. Hourly HHI based by Major Participant Grouping, June 2018

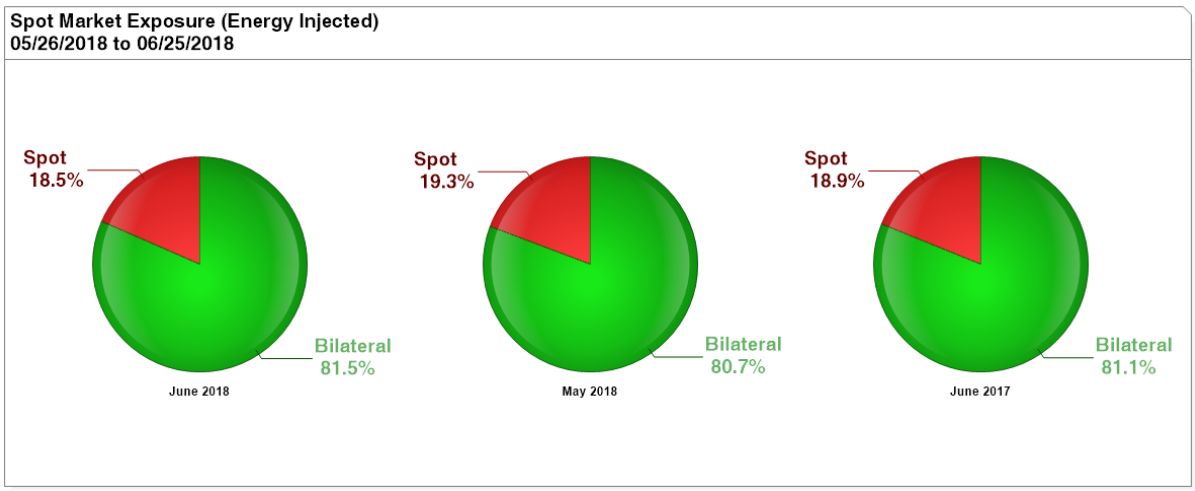


[9] The HHI measures the degree of market concentration, taking into account the relative size and distribution of participants in the monitored market. It is calculated as the sum of squares of the participant's market share. The following are the widely-ised HHI screening numbers: the HHI approaches zero when the market has very large number of participants with each having a relatively small market share. In contrary, the HHI increases as the number of participants in the market decreases, and the disparity in the market shares among the participants increases. The following are the widely-used HHI screening numbers: (1) when HHI is less than 1,000 the market is not concentrated; (2) in the range of 1,000 to 1,800 the market is moderately concentrated; (3) greater than 1,800 to 2,500 the market is concentrated; and (4) greater than 2,500 the market is highly concentrated and signals lack of competition in the market.

XV. Spot Exposure

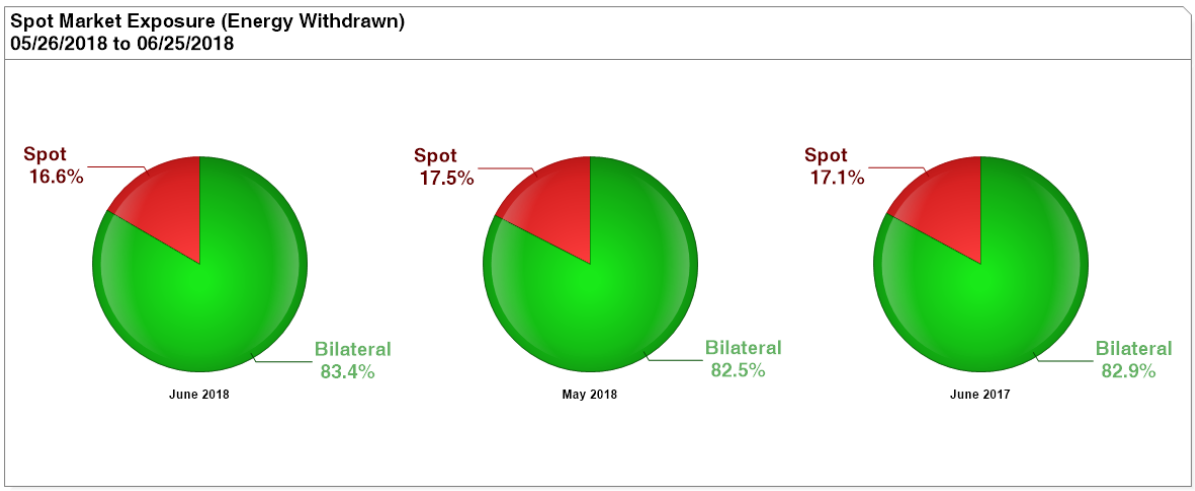
Spot market transaction of generator-trading participants comprised about 18.5 percent of the total energy transaction in the WESM. This was lower than previous month's 19.3 percent and previous year's 18.9 percent. Still, majority of the total energy injected into the grid was covered by bilateral contracts.

Figure 45. Spot Market Exposure of Generator-Trading Participants, June 2018, May 2018, and June 2017



On the side of the customers, only 16.6 percent of the total energy transaction during the billing month was attributed to spot market transactions. This was similarly lower than previous month's 17.5 percent and higher than previous year's 17.1 percent.

Figure 46. Spot Market Exposure of Customers, June 2018, May 2018, and June 2017



Methodology in Determining Interesting Pricing Events

Supply margin is defined as the MW difference between the system effective supply[10] and demand requirement plus reserve schedules[11].

The market price is represented by the load weighted average of the final prices (LWAP) used for settlements which could either be of the following: (i) ex-ante prices for trading intervals without pricing error during ex-ante, (ii) ex-post prices for trading intervals with pricing error during ex-ante but without pricing error during ex-post, (iii) market re-run prices for trading intervals with pricing error both during ex-ante and ex-post, and (iv) estimated load reference prices (ELRP) for trading intervals where the ERC-approved Price Substitution Mechanism (PSM) was applied.

To determine the interesting pricing events, a combination of statistical methods namely, bandwidth method, ordinary least squares (OLS) method and non-parametric method was used to create the upper and lower reference price thresholds[12]. Further, the following criteria were considered in the determination of thresholds:

1. Market prices and supply margin from 26 December 2013 to 25 December 2017 to only include the periods when the PhP32,000/MWh offer price cap was adopted;
2. Upper and lower reference price thresholds were computed using ±3 percent standard deviations to provide a reasonable tolerance price levels;
3. Exclusion of intervals with market intervention and/or suspension and secondary price cap imposition; and
4. Exclusion of intervals with negative supply margin to ensure normal market conditions (e.g. no under-generation).

The resulting reference price thresholds corresponding to the supply margin range are provided in the Table 1.

Table 1: Fix Reference Price Thresholds

Supply Margin Range (in MW)	Reference Price Threshold	
	Upper (PhP/MWh)	Lower (PhP/MWh)
0 to 250	20,733	515
250 to 500	18,146	(2,072)
500 to 750	16,424	(3,794)
750 to 1000	15,201	(5,017)
1,000 to 1,250	14,305	(5,913)
1,250 to 1,500	13,609	(6,609)
1,500 to 1,750	13,023	(7,195)
1,750 to 2,000	12,501	(7,717)
2,000 to 2,250	12,050	(8,167)
2,250 to 2,500	11,680	(8,538)
2,500 to 2,750	11,374	(8,720)
2,750 to 3,000	11,127	(8,844)
3,000 and above	11,504	(9,091)

Prices within the upper and lower reference price thresholds are considered as “normal prices”, while prices outside or beyond the thresholds are tagged as “interesting pricing events”.

[10] The system effective supply is equal to the offered capacity of all scheduled generator resources, nominated loading level of non-scheduled generating units and projected output of preferential dispatch generating units. Scheduled output of plants on testing and commissioning, through the imposition of security limit by SO, are accounted for in the effective supply. Likewise included is the scheduled output of Malaya plant when it is called to run as Must Run Unit (MRU).

[11] With the implementation of the central scheduling and dispatch of energy and contracted reserves in Luzon beginning 22 December 2015, and in Visayas beginning 07 October 2017, the level that the supply has to fill up is higher as it also has to sufficiently meet the hourly reserve schedule.

[12] The methodology adopted in this report is closely similar to the methodology discussed by the Market Surveillance Administrator of the Alberta Electricity System Operator in their report entitled “Supply Cushion Methodology and Detection of Events of Interest” published at www.albertamsa.ca.